BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-25-12
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	))))	Order No. 202-25-13

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 16
Saffran Q3 2025 Outage Testimony

FILED
November 20, 2025
INDIANA UTILITY
REGULATORY COMMISSION

VERIFIED DIRECT TESTIMONY OF DAVID SAFFRAN

Q1. Please state your name, title, and business address.

A1. My name is David Saffran. My title is Generation Business Systems Administrator in the Operations Management Reporting division of Northern Indiana Public Service Company LLC ("NIPSCO" or the "Company"). My business address is 2755 Raystone Drive, Valparaiso, Indiana 46383.

Q2. Please describe your educational and employment background.

A2. I hold an Associate degree in Electronic Systems Technology from the Community College of the Air Force, an Associate degree in Aerospace Ground Equipment Technology from the Community College of the Air Force and have attended classes for three years working towards a Bachelor of Science degree in Computer Networking Information Technology at Purdue Northwest. I have been employed by NiSource Inc. or NIPSCO since May of 2004 in a variety of technical, supervisory, and administrative positions.

Q3. What are your responsibilities as Generation Business Systems

Administrator in the Operations Management Reporting division of NIPSCO?

A3. My current responsibilities include managing NIPSCO's various business systems and programs, recording data concerning Generation's operational and maintenance performance, and analyzing the results to identify adverse trends and recommend corrective actions to improve performance. In addition, I am responsible for submitting various NIPSCO Generation reports and filings to local, state, and federal agencies such as the Indiana Utility Regulatory Commission ("Commission"), Midcontinent Independent System Operator, Inc., North American Electric Reliability Council, Federal Energy Regulatory Commission ("FERC") and Indiana Department of Natural Resources ("DNR").

Q4. Are you familiar with the Company's Verified Petition, including the exhibits attached thereto, initiating this proceeding, a copy of which has been marked <u>Attachment 1-A</u>?

A4. Yes.

Q5. What is the purpose of your direct testimony in this proceeding?

A5. The purpose of my testimony is to provide information relevant to Paragraph 6 of Exhibit A - Settlement Terms, attached to the Stipulation and Agreement filed October 16, 2007 in Cause No. 38706-FAC71-S1 approved by the Commission on January 30, 2008 ("FAC71-S1 Agreement") and Paragraph 6(f.) of the Stipulation and Agreement filed September 23, 2009 in Cause No. 38706-FAC80-S1 approved by the Commission on November 4, 2009 ("FAC80-S1 Agreement") (collectively, the "Reporting Agreements"). Paragraph 6 of the FAC71-S1 Agreement calls for NIPSCO to submit testimony in its quarterly FAC proceedings regarding major forced outages that occur within the pertinent FAC timeframe. Under this provision, NIPSCO must describe the length and cause of each major forced outage, generating unit involved, and proposed solutions to prevent such outages from occurring in the future. In addition to the above provision regarding the details of each major forced outage, Paragraph 6(f.) of the FAC80-S1 Agreement calls for NIPSCO to file testimony describing the details of and the steps taken to minimize such major forced outages in the future. Paragraph 6(f.) of the FAC80-S1 Agreement defines a "major forced outage" as a unit forced outage lasting longer than three (3) consecutive days.

Q6. Are you sponsoring any attachments to your testimony?

A6. Yes. I am sponsoring Attachment 4-A and Confidential Attachment 4-B, both of which were prepared by me or under my direction and supervision. Attachment 4-A describes each major forced outage NIPSCO's generating units experienced during the third quarter of 2025, which is the reconciliation period in this FAC proceeding. Confidential Attachment 4-B contains root-cause analysis reports regarding the outages listed in Attachment 4-A that were complete at the time of this filing.

Q7. Does Attachment 4-A comply with the Reporting Agreements?

A7. Yes. In the Attachment, I explain each major forced outage and state the actions NIPSCO has already taken or is able to take to prevent each outage from occurring again.

Q8. Does Confidential Attachment 4-B comply with the Commission's October 29, 2019 Order in Cause No. 38706-FAC-124 ("FAC-124 Order")?

A8. Yes. In its FAC-124 Order, the Commission directed NIPSCO to provide in its future quarterly FAC filings, a root cause analysis for forced outages when such an analysis has been completed at the time of the FAC filing. That information is provided in Confidential Attachment 4-B.

Q9. Does this conclude your prepared direct testimony?

A9. Yes.

VERIFICATION

I, David Saffran, Generation Business Systems Administrator in the Operations Management Reporting division of Northern Indiana Public Service Company LLC, affirm under penalties of perjury that the foregoing representations are true and correct to the best of my knowledge, information and belief.



David Saffran

Dated: November 19, 2025

Major Forced Outage Report (Q3, 2025)

Michigan City 12 August 15 *84 hours*	1B aeration blower motor failed and tripped the 480-volt breaker. The 1B blower motor shorted to ground, and blower 3B was not developing adequate pressure. A minimum of two blowers is required for proper operation. The 1B blower motor and 3B blower were replaced.
R. M. Schahfer 16A July 18 *240 hours*	Turbine flame scanner #14 out of service and spark rods not igniting. A secondary problem concerning damaged fuel nozzles and combustion can baskets was discovered during startup and forced the unit offline. The fuel nozzles and baskets were replaced and the unit placed in service.
R. M. Schahfer 16A August 21 *976 hours*	Unit 16A transitioned to a forced outage after high vibration was experienced during operation. A borescope inspection showed significant blade damage to the forward compressor. Repairs are currently ongoing and expect to be completed at the end of April 2026.
R. M. Schahfer 16B August 6 *1,331 hours*	The unit stalled twice at 2,375 rpm while in startup. This prompted a borescope inspection. The inspection revealed damage to the compressor section of the turbine beginning in Row 9, with heavy damage throughout the mid and aft compressor sections. The turbine assembly was removed and sent out for inspection and repair. The unit is expected to be available mid-February 2026.
R. M. Schahfer 17 July 1 *182 hours*	The unit was taken offline due to a boiler wall tube leak on the southwest corner. The root cause was wall thinning, likely due to falling slag. Three dutchmen were used to replace the failed tubes.
R. M. Schahfer 17 August 7 *264 hours*	The unit was removed from service for an unsafe boiler flue gas leak. The root cause was due to normal wear in a harsh flue gas environment.

	Contractors completed all required ductwork repairs and the unit placed in service.
R. M. Schahfer 17 August 18 *125 hours*	Boiler wall tube leaks. The root cause was washout likely due to boiler cleaning or a malfunctioning soot blower. Three dutchmen were used to replace the bad tubes.
R. M. Schahfer 17 September 6 *201 hours*	Boiler wall tube leaks on the lower slope. The likely cause was due to wall thinning caused by falling slag. A dutchmen and two pad welds were required to replace bad tubes and repair previously installed dutchmen.
R. M. Schahfer 18 July 9 *1,996 hours*	The unit tripped due to high turbine bearing vibration indications on all rotor bearings. Initial inspections inside the upper condenser hot well revealed significant damage to the upper portion of the condenser tubes on the governor end. One of the L-0 blades on the governor end liberated approximately 1/3 of the way down from the tip. Management is weighing options. The unit is currently scheduled to retire December 31, 2025
Norway Hydro June 6 *559 hours*	All turbine units were shut down three times due to low river water and low dissolved oxygen readings. This is an Out of Management Control event. No additional action is needed.

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Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 17
DOE Order No. 202-20-2

Department of Energy
Washington, DC 20585

Order No. 202-20-2

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA), 16 U.S.C. § 824a(c), and section 301(b) of the Department of Energy Organization Act, 42 U.S.C. § 7151(b), and delegated to the Deputy Secretary of Energy by paragraph 1.11(A) of Delegation Order No. 00-001.00G (Apr. 10, 2018), and re-delegated to the Assistant Secretary for Electricity on September 6, 2020, and for the reasons set forth below, I hereby determine that an emergency exists in California due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes, and that issuance of this Order will meet the emergency and serve the public interest.

On September 6, 2020, the California Independent System Operator (CAISO), the Regional Transmission Organization whose service territory includes California and a portion of Nevada, filed a *Request for Emergency Order Pursuant to Section 202(c) of the Federal Power Act* (Application) with the United States Department of Energy (Department) "to preserve the reliability of bulk electric power system."

Since August, California has experienced several periods of extreme heat, some of which have resulted in rolling blackouts. On September 2, 2020, California Governor Gavin Newsom issued an emergency proclamation to help alleviate the stress on the state's power grid due to an "Extreme Heat Event." In declaring a statutory emergency, the proclamation cited a number of factors and observations, including the following:

- "[B]eginning on September 2, 2020, a significant heat wave struck California, bringing widespread temperatures well in excess of 100 degrees throughout the State;"
- "[T]he National Weather Service [has] issued multiple Excessive Heat Warnings within [California];"
- "[T]he Extreme Heat Event has and will continue to put significant demand and strain on California's energy grid; and"
- "[T]he Extreme Heat Event is expected to last through at least September 7, 2020."

The proclamation authorizes emergency use of stationary generators, portable generators, and "auxiliary engines by ocean-going vessels berthed in California ports," and directs the state's Air Resources Board to "exercise maximum discretion to permit the use of stationary and portable generators or auxiliary ship engines to reduce the strain on the energy infrastructure and increase energy capacity." The proclamation also

suspends "[a]ny permit, regulation or law prohibiting, restricting or penalizing the use of stationary or portable generators or auxiliary ship engines" as allowed by the proclamation order.

On September 3, the CAISO issued a statewide flex alert for September 5-7, encouraging voluntary load reduction between 3:00 p.m. and 9:00 p.m. local time each day. The alert warns that consumers should "be prepared for potential power outages, both planned and unplanned during heat waves, especially in extremely high temperatures that last multiple days," noting that "[h]ot weather can also impact generation and transmission equipment, as it runs harder and longer with less time to cool, which can cause machinery failure." The alert explains that there is little energy available to import due to high heat predicted throughout the West, and that the wildfires in the state may take out transmission lines or cause lines to be shut down for the safety of firefighters in the area.

The CAISO notes that "[e]lectric demand forecasts have continued to increase since the issuance of the California Governor's emergency proclamation and the CAISO balancing authority area has lost additional generation supply because of wildfires." Application at 3. To address the situation, the "CAISO has started to direct all generators in its balancing authority area to produce to their maximum capability during certain times of the day," and has gone so far as to allow, when reliable and safe based on currently operating conditions, "certain generators to generate more than their interconnection capacity to provide additional power to the grid." *Id.* at 3. The impetus for the Application, however, arose on September 5, 2020, when the operator of the natural gas-fired resources identified in Exhibit A of the Application informed the CAISO that it could not produce to its maximum generation capability without exceeding its federal air quality or other permit limitations. *Id.* "The CAISO is informed and believes these limitations involve both permit limitations under federal law for nitrogen oxide emissions and ammonia releases as well as a limitations regarding fuel and ammonia throughput." *Id*.

The CAISO requests "that the Secretary issue an order immediately, effective September 6, 2020, authorizing specific electric generating units located within the CAISO balancing authority area to operate at their maximum generation output levels when directed to do so by the CAISO, notwithstanding air quality or other permit limitations." *Id.* at 1. The generating units specified are units 1 - 5 at the Walnut Creek Energy Park in the City of Industry, California; units 5/6 and 7/8 at the El Segundo Energy Center in El Segundo, California; and units 1 - 4 at the Long Beach Generating Station located in Long Beach, California. *Id.* For purposes of this Order, these units are referred to as the "Specified Resources." Collectively, they represent up to as much as 100 MW. The CAISO requests "such order be entered today, September 6, 2020, and remain effective for a period of seven (7) days, without prejudice to the possible issuance of further orders as necessary to address the emergency…[to] ensure additional supply is

available during a period in which California may continue to experience extreme weather and wildfires that have forced generation out of service." *Id*. at 2.

Given the emergency nature of the expected load stress, the responsibility of the CAISO to ensure maximum reliability on its system, and the ability of the CAISO to identify and dispatch generation necessary to meet the additional load, I have determined that additional dispatch of the Specified Resources is necessary to best meet the emergency and serve the public interest for purposes of FPA section 202(c). Because the additional generation may result in a conflict with environmental standards and requirements, I am authorizing only the necessary additional generation, with reporting requirements as described below.

FPA section 202(c)(2) requires the Secretary of Energy to ensure that any 202(c) order that may result in a conflict with a requirement of any environmental law be limited to the "hours necessary to meet the emergency and serve the public interest, and, to the maximum extent practicable," be consistent with any applicable environmental law and minimize any adverse environmental impacts. The CAISO anticipates that this Order may result in exceedance of National Ambient Air Quality Standards under the Clean Air Act and notes that the Specified Resources are located in different communities within California and should not result in any disproportionate impact on a single community. *Id.* at 4. To minimize adverse environmental impacts, this Order limits operation of dispatched units to the times and within the parameters determined by the CAISO for reliability purposes.

Based on my determination of an emergency set forth above, I hereby order:

A. From September 6, 2020, to September 13, 2020, in the event that the CAISO determines that generation from the Specified Resources is necessary to meet the exceptional levels of electricity demand that the CAISO anticipates in California, I direct the CAISO to dispatch such unit or units and to order their operation only as needed to maintain the reliability of the power grid in California between the hours of 14:00 Pacific Daylight Time and 22:00 Pacific Daylight Time on days when the demand on the CAISO system exceeds expected energy and reserve requirements.

B. The CAISO shall select the combination of units that meets the reliability emergency and minimizes environmental impact. Consistent with good utility practice, the CAISO shall exhaust all reasonably and practically available resources, including demand response and identified behind-the-meter generation resources to the extent that such resources provide support to maintain grid reliability, prior to dispatching the Specified Resources.

C. By September 21, 2020, the CAISO shall report all dates between September 6, 2020, and September 13, 2020, on which the Specified Resources were

operated, the hours of operation, and the estimated air emissions (including nitrogen oxides and ammonia releases) and fuel and ammonia throughput associated with operating each unit. The CAISO shall submit a final report by October 13, 2020, with any revisions to the information reported on September 21.

D. This Order shall be effective upon its issuance, and shall expire at 23:59 Pacific Daylight Time on September 13, 2020, with the exception of the reporting requirements in paragraph C. Renewal of this Order, should it be needed, must be requested before this Order expires.

Issued in Washington, D.C. this 6th day of September, 2020.

Bruce J. Walker

Digitally signed by Bruce J. Walker
Date: 2020.09.06 17:19:49 -04'00'

Bruce Walker
Assistant Secretary for Electricity

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Exhibit 18
Wagner Testimony

FILED
November 20, 2025
INDIANA UTILITY
REGULATORY COMMISSION

VERIFIED DIRECT TESTIMONY OF JOHN A. WAGNER

Q1. Please state your name, business address and title.

A1. My name is John A. Wagner. My business address is 801 E. 86th Avenue, Merrillville, Indiana 46410. I am Manager, Fuel Supply for Northern Indiana Public Service Company LLC ("NIPSCO").

Q2. Please describe your educational and employment background.

A2. I graduated from Macomb College with an A.A.S. degree in automotive design, from Wayne State University with a B.S. in mechanical engineering, and I earned a M.B.A. from the University of Michigan. From 1998 to 2015, I held engineering and fuel procurement roles with increasing levels of responsibility at DTE Energy. My last role there was Director of Fuel Supply where I was responsible for the procurement of coal, natural gas, and oil for 10,000 MW of electric generating capacity as well as the oversight of DTE's coal transshipment terminal in Superior, Wisconsin. I started my employment as Manager, Fuel Supply at NIPSCO in 2016.

Q3. What are your responsibilities as Manager, Fuel Supply?

A3. As Manager, Fuel Supply, I am responsible for supervising the purchase and transport of coal used for generating electric energy, that includes negotiation and administration of coal supply agreements, coal transportation agreements, railcar leases, and railcar maintenance service agreements. In addition, Fuel Supply is responsible for the collection of fuel cost data, fuel accounting support and the disposal and sale of coal combustion residuals.

Q4. Are you familiar with the Company's Verified Petition, including the schedules attached thereto, initiating this proceeding, a copy of which has been marked <u>Attachment 1-A</u>?

A4. Yes.

Q5. What is the purpose of your testimony in this proceeding?

A5. The purpose of my testimony is to (1) summarize the fuel mix used by NIPSCO's fossil-fueled generation during July, August, and September 2025 ("Reconciliation Period"); (2) describe NIPSCO's coal procurement process and the coal supply agreements that governed coal shipments NIPSCO received during the Reconciliation Period; (3) provide the delivered cost of the coal consumed by NIPSCO's generating stations

during the Reconciliation Period and summarize any known factors that affected the delivered cost; (4) provide an overview of the coal market, coal pricing, transportation markets, and factors that likely affected those markets during the Reconciliation Period; (5) provide NIPSCO's estimated cost of coal consumption for February, March, and April 2026 (the "Forecast Period") and the assumptions used to develop NIPSCO's fuel forecast and factors that could impact the forecast; (6) provide a status update for NIPSCO's railcar fleet, utilization, and cost management; (7) provide an overview of NIPSCO's coal inventory; (8) provide an update on the status of NIPSCO's Railroad Litigation;[1] and (9) provide an update on the status of coal and transportation decrements.

Q6. What was the generation mix, by fuel type, of the energy produced by NIPSCO's fossil-fueled generation during the Reconciliation Period?

A6. NIPSCO's coal-fired generation provided 44.5% of the energy generated

[1] On September 30, 2019, NIPSCO filed a complaint in the United States District Court for the District of Columbia against the Union Pacific Railroad Company, BNSF Railway Company, CSX Transportation, Inc., and Norfolk Southern Railway Company (currently pending in Civil Action No. 1:19-cv-02927-PLF, consolidated for pre-trial purposes in Misc. No. 1:20-mc-00008-BAH, MDL No. 2925) for illegally conspiring to use rail fuel surcharges as a mechanism to fix, raise, maintain, and stabilize the prices of rail freight transportation services sold in the United States (the "Railroad Litigation").

during the Reconciliation Period, and 55.5% of the energy generated was gas-fired. NIPSCO's coal-fired generation consumes coal from various supply regions. A mix of Powder River Basin ("PRB") coal and Northern Appalachian ("NAPP") coal is consumed at the Michigan City Generating Station ("Michigan City"). Illinois Basin ("ILB") coal is consumed in Units 17 and 18 at the R. M. Schahfer Generating Station ("Schahfer").

Q7. How does NIPSCO procure its coal supply?

A7. NIPSCO solicits as many prospective suppliers as reasonably possible to provide offers for specific coal types and tonnage based on a portion of NIPSCO's estimated future delivery requirements. NIPSCO confirms that a prospective supplier can meet specific quality and quantity requirements and sends a supplier a request for proposal. If a supplier decides to participate, they send offers by email to Fuel Supply.

NIPSCO then performs an evaluation that ranks the offers on a total cost basis, compares offers to published price indices, and considers reliability of the producer/supplier and transportation provider(s). The total cost analysis includes the coal free-on-board (or "F.O.B.") mine price, quality, transportation costs, reliability, railcar costs, dust treatment, emission

control costs, costs associated with coal combustion byproducts and other operational costs. NIPSCO then negotiates commercial terms and conditions with the supplier with the most competitive offer and enters into an agreement after the contract receives legal and executive approval. Agreements are considered a term supply agreement if the contract term is one (1) year or longer.

Q8. What factors need to be considered in purchasing fuel for NIPSCO's coal-fired generating units?

A8. Factors that are considered in purchase evaluations for a specific generating unit include the delivered cost, operational costs, cost of emissions controls, and management of coal combustion byproducts. In addition, combustion and emission characteristics are critical and may eliminate a coal source from consideration if these characteristics adversely affect a generating unit's reliability, increase the total cost (fuel and operational costs) of generation, or inhibit NIPSCO's ability to comply with emission limits. Reliability of the coal source and coal transportation from that source are also critical factors.

Q9. What coal supply agreements were in effect during the Reconciliation

Period?

A9. NIPSCO had three supply contracts that were effective during the Reconciliation Period as follows: one agreement with Peabody COALSALES, LLC ("Peabody") for PRB coal, one agreement with Core Natural Resources ("Core", formerly Arch Coal and CONSOL) for PRB coal, one agreement with American Consolidated Natural Resources ("ACNR") for NAPP coal, and one agreement with Peabody for ILB coal.

Q10. Does NIPSCO have a financial interest in any of the coal producers currently under contract?

A10. No.

Q11. Did NIPSCO sell any coal purchased by NIPSCO to any other party during the Reconciliation Period?

A11. No.

Q12. Did NIPSCO make any new commitments for either spot or term coal purchases or coal transportation during the Reconciliation Period?

A12. Yes. NIPSCO purchased ILB coal from Peabody with a minimum obligation of 45,000 tons and NIPSCO can ship up to 150,000 tons.

Q13. Did NIPSCO renegotiate and/or amend any of its coal or transportation agreements during the Reconciliation Period?

A13. No.

Q14. Did any of NIPSCO's term coal contracts effective during the Reconciliation Period have price adjustments?

A14. Yes. One (1) of the contracts has mostly fixed prices specified in the contract, and a portion of the volume under this agreement was priced using a coal market index. In addition, all NIPSCO's coal supply agreements adjust the price of coal based on a shipment's quality variances from contract specifications.

Q15. What is the purpose of price adjustments in term coal contracts?

A15. In general, producers and customers are reluctant to execute longer term contracts with fixed prices without some type of market price adjustment mechanism. Maintaining a price close to market is beneficial to both parties. For example, long-term coal supply agreements with fixed prices could end up well above future market prices making electricity generated with that supply uneconomic. Therefore, the producer and customer may work together to establish an equitable price adjustment methodology. For

example, the price may be calculated based on a mix of prompt and year-ahead published market prices. The adjustment methodology is incorporated into the terms and conditions of the agreement and price adjustments may be made monthly, quarterly, or annually. Historically, market-based price adjustments in term supply agreements tend to reduce the buyer's cost of hedging since future prices are generally higher than spot and year-ahead prices. In addition to base price adjustments, quality price adjustments are used to maintain the underlying economics of the agreement on a dollar per million British thermal unit ("BTU") basis when the shipment quality varies from guaranteed quality specifications. Other price adjustments can occur due to governmental imposition (e.g., federal or state agencies levy taxes or change rules that increase the cost of mining or production) or the payment of damages.

Q16. What was the delivered cost of coal consumed[2] by NIPSCO's generating stations for the twelve (12) months ending September 30, 2025 and for the Reconciliation Period?

[2] Starting with FAC 129, NIPSCO now reports the delivered cost of coal consumed during the Reconciliation Period. This methodology is comparable to the cost of coal consumed for power generation projected for the forecast period.

A16. The delivered cost of coal consumed for the twelve (12) months ending September 30, 2025 was $76.41 per ton or $3.707 per million BTU. The cost of coal consumed during the Reconciliation Period was $65.74 per ton or $3.285 per million BTU.

Q17. What factors affected NIPSCO's delivered cost of coal consumed during the Reconciliation Period when compared to the prior quarter?

A17. As stated above, NIPSCO's delivered cost of coal consumed during the Reconciliation Period was $65.74 per ton or $3.285 per million BTU. The system delivered cost of coal consumed during the prior Reconciliation Period was $82.61 per ton, and $3.985 per million BTU. When compared to the prior Reconciliation Period, the delivered cost of coal consumed decreased by $16.87 per ton and $0.700 on a per million BTU basis.

The majority of the decrease is due to the change in the mix of coal consumed during the Reconciliation Period when compared to the prior quarter. Specifically, Schahfer consumed 35.3% of tonnage and Michigan City consumed 64.7% of total system tonnage during the Reconciliation Period. The mix contribution in the prior Reconciliation Period was 60.0% and 40.0% for Schahfer and Michigan City, respectively. The cost of ILB

coal used at Schahfer is higher than the mix of coal used at Michigan City. PRB coal delivered prices declined, which contributed to the decrease in the delivered cost of coal consumed. NAPP and ILB delivered costs and railroad fuel surcharges were modestly lower as well when compared to the prior Reconciliation Period and contributed to a portion of the decrease.

Q18. What was the average spot market price of coal during the Reconciliation Period?

A18. The average spot market price during the Reconciliation Period was $14.07 per ton for PRB coal (down $0.06) per ton when compared to the prior Reconciliation Period), $44.83 per ton for ILB coal (up $1.75 per ton when compared to the prior Reconciliation Period), and $56.58 per ton for NAPP coal (up $0.75 per ton when compared to the prior Reconciliation Period). NIPSCO tracks spot market prices through discussions with brokers and by reviewing various daily and weekly coal publications. These are average F.O.B. mine spot market prices only and do not include the cost of transportation and are only an indication of prices NIPSCO may pay if purchases were made during the Reconciliation Period. Requesting specific quality parameters and the relative illiquidity of coal markets can impact

actual purchase pricing.

Q19. What are the current market prices for spot coal?

A19. As of November 10, 2025, the estimated F.O.B. mine spot market prices for December 2025 delivery were approximately $15.00 per ton for PRB coal, $46.50 per ton for ILB coal, and $57.50 per ton for NAPP coal.

Q20. What are the market prices for coal during the Forecast Period?

A20. As of November 10, 2025, the estimated F.O.B. mine spot market prices for delivery during the Forecast Period were $15.00 per ton for PRB coal, $46.50 per ton for ILB, coal and $57.50 per ton for NAPP coal. Again, these prices do not include the cost of transportation.

Q21. What energy market trends and factors affected the market for coal and transportation and may continue to impact the market going forward?

A21. Wholesale, day-ahead electricity prices were roughly 22.9% higher during the Reconciliation Period when compared with the same period in 2024. Higher energy demand and higher natural gas pricing helped drive an increase in coal demand compared to the same quarter in 2024. The federal Energy Information Agency ("EIA") projects the U.S. electric energy supply

mix for 2025 and 2026 in its latest outlook[3] as follows:

- Renewable generation (including hydro) provided 23% of the nation's energy mix in 2024 and is expected to provide 24% and 26% in 2025 and 2026, respectively.

- Nuclear comprised 19% of electric generation in 2024 and is expected to provide 18% of the mix in 2025 and 2026.

- Natural gas-fired generation provided 42% of the mix and is expected to provide 40% in 2025 and 2026.

- Coal-fired generation provided 16% of the energy in 2024 and is expected to provide 17% of the mix in 2025 and 16% of the mix 2026.

- U.S. coal production[4] decreased by 11.4% in 2024 when compared with 2023 levels and is expected to increase 2.8% in 2025 and decline 3.3% in 2026.

[3] *EIA Short-Term Energy Outlook November 2025:* https://www.eia.gov/outlooks/steo/

[4] *Ibid (Table 6. U.S. Coal Supply, Consumption, and Inventories)*

Henery Hub spot pricing averaged $2.28 per MCF during 2024 and is expected to rebound to $3.60 in 2025 and increase to $4.17 in 2026.[5] Illinois Basin spot coal prices are up roughly 18%, PRB spot coal prices are up 7%, and NAPP spot coal prices are up 16% when compared to year-ago levels.[6] Despite increases in coal prices, relatively low natural gas prices and increasing renewable generation has kept coal-fired generation as the marginal energy source. However, stronger energy and natural gas prices resulted in increased coal demand that led to higher coal prices. The EIA also expects utilities will increase inventories by the end of 2026 that could lead to additional coal demand. In addition, several planned U.S. coal generation retirements have been delayed due to the President's executive orders issued in April 2025. Notwithstanding, near-term uncertainty and higher energy prices may allow coal pricing to increase, but long-term trends should limit price volatility. Coal demand will likely decline in the long run, driven by the age of the coal units, coal unit retirements, and/or

[5] *Ibid (Table 5b. Regional Natural Gas Prices)*

[6] *NIPSCO Proprietary Over-The-Counter price assessment*

decreased utilization, low natural gas prices, and increased renewable production.

The dynamics described above continued to keep prices soft in all energy markets during the Reconciliation Period. API 2 (coal delivered to Amsterdam, Rotterdam, and Antwerp) prices were roughly 18.3% lower year over year during the Reconciliation Period.[7] Coal producers and railroads have typically relied on strong international markets to offset the long-term decline in domestic demand and export markets have provided relatively steady sales opportunities during the year. The EIA reported coal exports reached 108.4 million tons in 2024 (five-year high). However, global coal demand has softened during 2025 and exports are expected to fall to 96.0 million tons this year and 99.2 million tons in 2026.[8] Overall, the outlook for global coal use is somewhat stable and export opportunities are expected to remain steady. The U.S. economy outlook assumed by EIA in their outlook assumes GDP will grow by 2.0% in 2025 and 2.2% in 2026.[9]

[7] *NIPSCO Proprietary Over-The-Counter price assessment (API2)*
[8] *EIA Short-Term Energy Outlook November 2025 (reference Table 6.)*
[9] *EIA Short-Term Energy Outlook November 2025*

For transportation, railroad performance continues to trend better than historical norms and has been consistent. Notwithstanding, reduced investment in coal production and coal transportation capacity, supplier bankruptcies, and mine closures over the last several years have caused coal supply chain constraints and these supply and capacity reductions may lead to market volatility if energy prices and demand rebound. In addition, variable coal demand impacts supply chain efficiency and can lead to unpredictable coal supplier and railroad performance.

Q22. What is NIPSCO's estimate for the cost of coal to be used for power generation during the Forecast Period?

A22. NIPSCO's cost of coal consumed for generation in the Forecast Period is estimated to be $49.91 per ton and $2.620 per million BTU.

Q23. What data and assumptions do the Fuel Supply group use to develop pricing estimates for the Forecast Period?

A23. In developing the estimate for the Forecast Period, NIPSCO's Fuel Supply group incorporates coal contract prices inclusive of any adjustments specified in the agreement, dust treatment costs, freeze conditioning costs (seasonal), railcar lease cost, railcar maintenance costs, estimates of contract

prices (fixed prices and indexed contract rates using forward LMP forecasts), transportation fuel surcharges using the monthly average price of U.S. On-Highway Diesel Fuel ("HDF"), Association of American Railroad's All-Inclusive Index Less Fuel ("AIILF") adjustments and estimates of future coal purchase prices. In addition, Fuel Supply also provides a forecast of beginning inventory values in dollars and quantities in tons for each of the generating stations. These assumptions are provided to NIPSCO's Energy Supply & Optimization group, which uses these assumptions to develop the forecast for the period.

Q24. Please describe the factors NIPSCO believes will impact coal supply, demand, and cost of the coal commodity to be purchased and shipped to its stations during the Forecast Period.

A24. The market dynamics described above appear to have kept coal demand somewhat stable globally and coal supply for utility generators in 2025 and into 2026 should be adequate. Given the uncertainty in the energy markets due to delayed coal generation retirements, projected increases in electricity demand due to the emergence of data centers, crypto mining, and other load growth drivers, there could be volatility in all energy commodity

prices that could impact supply. That said, there are multiple factors that typically impact coal supply and demand including, but not limited to, power prices, natural gas prices, railroad and coal supplier performance, generating unit performance, weather conditions, and labor disruptions which impact supply. Notwithstanding, NIPSCO's 2025 purchases are expected to meet forecasted coal delivery requirements and coal producers are obligated to perform under these agreements. NIPSCO has discussions with all its coal suppliers on a regular basis, and suppliers indicated they will meet NIPSCO's contracted coal supply requirements. Regarding the cost of coal, the price of coal used for the Forecast Period consists of fixed prices. If demand exceeds current coal supply obligations, NIPSCO may need to purchase additional tonnage, which may impact fuel costs during the Forecast Period.

Q25. What factors will impact coal transportation costs during the Forecast Period?

A25. There are two key factors that could impact coal transportation costs during the Forecast Period. One factor, power prices, may impact coal transportation costs under two transportation contracts that are indexed to

station LMPs. Contract transportation rates are forecasted using forward energy prices and have maximum rates that ultimately hedge price exposure. A second factor is the price of HDF. Two coal transportation agreements have mileage-based fuel surcharges (governed by each carrier's fuel surcharge tariff) that are calculated monthly using the average weekly spot price of HDF. Fuel surcharge estimates are included in rate projections used to develop comprehensive transportation costs for the Forecast Period. For reference, the spot price of HDF as of November 10, 2025 was $3.837 per gallon[10] (a 9.0% year-over-year increase). The EIA expects downward pressure on oil prices due to higher production and lower demand. Given these assumptions, the EIA expects HDF prices to decline modestly over the next two years and forecasts diesel prices will average $3.66 per gallon during 2025 and decrease to $3.50 in 2026.[11] Based on this outlook, fuel surcharges under NIPSCO's transportation agreements are expected to remain flat or trend modestly lower through the end of 2026.

Q26. What was the status of NIPSCO's railcar fleet during the Reconciliation Period?

[10] *EIA Gasoline and Diesel Fuel Update, November 12, 2025*: https://www.eia.gov/petroleum/gasdiesel/
[11] *Short-Term Energy Outlook November 2025 (Energy Prices Table 2.):*

A26. NIPSCO's fleet size was 641 railcars (five 125-car sets with 2.6% spares) at the end of the Reconciliation Period. The typical spare railcar pool ranges between 2% and 8%. During the Reconciliation Period, NIPSCO utilized 80% of the fleet in July and utilization averaged 67% during the Reconciliation Period. As mentioned in FAC-148, NIPSCO negotiated the early return of 125 railcars, and these cars were collected and released to the lessor in June. NIPSCO stored one to two sets at Schahfer the during the Reconciliation Period as operations required. One Michigan City set was stored at a third-party location August. Storage requirements varied during the Reconciliation Period as coal consumption fluctuated due to planned and forced unit outages and to control inventory ahead of Schahfer's retirement at the end of 2025. Consumption continues to trend below historical rates driven by periods of economic reserve (idle coal units) due to volatile and softening energy market conditions during the period, renewable production, much better-than-expected railroad performance, and planned and unplanned station maintenance outages. Coal unit consumption was only 46% of the system's maximum coal demand rate during the Reconciliation Period and railcar utilization exceeded station generation utilization rates. NIPSCO frequently evaluates

its railcar needs and considers demand/delivery requirements (forecasted, historical, and actual), railroad performance, station unloading performance, and the timing of lease expirations. NIPSCO will continue to use commercially reasonable efforts to manage its railcar fleet to ensure economic, and reliable coal deliveries.

Q27. Please describe NIPSCO's efforts to mitigate railcar costs incurred during periods of lower than anticipated train set utilization.

A27. To mitigate cost while balancing reliability, NIPSCO was able to reduce the fleet early with the return of 125 railcars in June as mentioned above. In addition, NIPSCO has plans to reduce the fleet by 229 railcars when Schahfer Units 17 and 18 retire at the end of 2025. NIPSCO also minimized storage costs during the Reconciliation Period by (1) storing one to two unit trains at Schahfer at no cost and (2) storing only one set of Michigan City's railcars at a third party storage in August as Michigan City's inventory increased during the latter half of the Reconciliation Period.

Notwithstanding, the availability of coal gondolas is extremely limited and relying on that market to obtain railcars for short-term needs can adversely impact coal supply reliability and is not prudent. In addition, the timing of

lease terms can preclude fleet size changes as leasing decisions are made on a forward-looking basis. The determination of fleet size is a multivariate analysis (NIPSCO's system set requirements can vary by two to three sets depending on consumption, railroad performance, and station unloading performance assumptions) and it can take several months to bring cars into the fleet, and it is an even longer process when returning cars. In addition, moving rail cars in and out of service is a costly process[12]. Therefore, the forward-looking nature of lease agreements and the time and costs required to place cars in and out of service make it difficult to make short-term changes to the size of the fleet and it is not prudent, practical, nor economic to dynamically change the fleet size when coal demand deviates from the forecast. In addition, railcars provide delivery reliability and can be invaluable if demand increases and/or railroad performance degrades.

NIPSCO also consults with industry experts and as discussed in my prior testimony, and as mentioned in prior filings, some large utilities continue to hold "excess" railcars out of concern that it may be difficult and/or more

[12] There are significant costs to *place* cars into service, including out of route transportation charges, locomotive charges, car mark stenciling costs, inspection costs and other costs. There are costs to *return* cars to lessors including out of route movements charges, locomotive release charges, shop costs, return maintenance costs, car mark stenciling costs, and other costs.

expensive to lease cars if demand improves. Through discussions with industry experts, I am aware that the market for coal cars is very tight, and lease rates have increased dramatically. Overall, the total number of railcars available in the market has decreased substantially over the last few years because scrap rates of coal railcars have been aggressive, and this dynamic has reduced railcar availability and caused lease rates to increase. One industry expert expects that utilities may need to build railcars as the age of the fleet approaches end of life and as coal railcars continue to attrite. Therefore, NIPSCO's fleet must have sufficient capacity to react to increases in demand or decreases in railroad performance without depending on the market for railcars. For reference, NIPSCO's fleet size at the end of the Reconciliation Period can provide 76% of NIPSCO's maximum coal unit demand and at average railroad cycle times.

Given the tight supply of railcars in the market and the uncertainty in demand and railroad performance, NIPSCO has taken a conservative approach to fleet management to ensure supply reliability.

Q28. Does NIPSCO have fuel supply concerns during the Forecast Period?

A28. No. NIPSCO is proactively administering coal and rail transportation

agreements to address any potential coal supply and/or coal transportation shipment issues. In addition, all anticipated coal supply requirements for 2025 should be met under current coal supply and transportation agreements. Coal market demand has softened significantly over the past two years and the stress on the coal supply chain has decreased. However, if coal demand increases, utilities may struggle to schedule deliveries as railroads and coal producers have rationalized assets, labor, and production, and it may take time for production and shipments to rise to meet any rapid increase in demand. Notwithstanding, NIPSCO continues to work closely with its rail carriers to ensure coal deliveries meet demand during the Forecast Period.

Q29. Please provide a summary of NIPSCO's coal inventory during the Reconciliation Period.

A29. The days of coal inventory supply[13] at Schahfer was approximately 16 days[14] (down seven days from the prior quarter) at the end of the Reconciliation Period. Michigan City's PRB coal inventory was 26 days[15]

[13] *Days of supply is calculated using the highest recorded daily consumption over the last 10 years.*
[14] *Schahfer's ILB coal inventory target is 40 days (+ or – 10)*
[15] *Michigan City's PRB coal inventory target is 25 days (+7,-5) and 30 days (+ or - 10) for NAPP coal*

and the NAPP inventory was at 40 days at the end of the Reconciliation Period.

Q30. In accordance with the Commission's Order in Cause No. 38706-FAC-125, please provide an update on the status of the Railroad Litigation and provide any substantive developments and/or determinations.

A30. On June 24, 2025, the judge granted the defendant railroads' motion for summary judgment and directed the court clerk to close the case. NIPSCO's Notice of Appeal was filed on July 24, 2025 in the U.S. Circuit Court of Appeals for the District of Columbia Circuit. NIPSCO's appeal was consolidated with similar appeals filed by other plaintiffs from the Railroad Litigation. Currently, NIPSCO's counsel is coordinating with the other plaintiff law firms in developing the arguments to be raised in the briefing before the appellate judges, which will occur in a consolidated manner. No briefing schedule has yet been established by the appellate court. NIPSCO Witness Krupa provides an update on the deferred costs associated with the Railroad Litigation.

Q31. Does NIPSCO currently anticipate utilizing decrement pricing?

A31. No, not at this time. NIPSCO will continue to update the Commission

about decrement pricing in future FAC filings.

Q32. Has NIPSCO made every reasonable effort to acquire fuel so as to provide electricity to its retail customers at the lowest fuel cost reasonably possible?

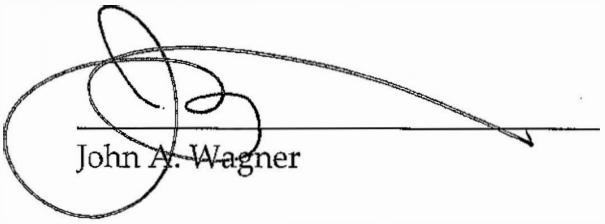
A32. Yes.

Q33. Does this complete your prepared direct testimony?

A33. Yes.

VERIFICATION

I, John A. Wagner, Manager, Fuel Supply for Northern Indiana Public Service Company LLC, affirm under penalties of perjury that the foregoing representations are true and correct to the best of my knowledge, information and belief.



John A. Wagner

Dated: November 19, 2025

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-25-12
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	))))	Order No. 202-25-13

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 19
NIPSCO CPCN Discovery Responses

OFFICIAL
EXHIBITS

IURC
JOINT - NIPSCO / CAC
EXHIBIT No. 6
7-11-24 AR
DATE REPORTER

Joint NIPSCO-CAC Exhibit 6

Witness Augustine

NIPSCO's Public Responses to CAC Data Requests 1-11, 1-12, 1-13, 1-14, 3-14, 3-15, 3-19, 5-2, 5-4, 6-5, 7-1, 10-1, 10-2, 10-3, 17-1, 23-1, 24-1, 25-2, 28-1, and 32-1

Cause No. 45947
Northern Indiana Public Service Company LLC's
Supplemental Responses to
Citizens Action Coalition of Indiana, Inc.'s First Set of Data Requests

CAC Request 1-011:

Re: NIPSCO Exhibit 7 (Direct Testimony of Augustine), page 28. With regards to the "latest information associated with MISO's seasonal resource adequacy construct":

(a) Please identify the referenced "time of the analysis"

(b) Please identify the seasonal capacity accreditation for intermittent resources used in the 2023 Portfolio Analysis.

(c) Please identify the seasonal planning reserve margin targets used in the 2023 Portfolio Analysis.

(d) Please state whether capacity accreditation under MISO's seasonal resource adequacy construct has changed since the values used in the 2023 Portfolio Analysis. If so, please identify how the values have changed.

(e) Please state whether seasonal planning reserve margin targets have changed since the targets used in the 2023 Portfolio Analysis. If so, please identify how the targets have changed.

Objections:

NIPSCO objects to this Request on the grounds and to the extent that this Request seeks information that is confidential, proprietary, and/or trade secret.

Response:

Subject to and without waiver of the foregoing general and specific objections, NIPSCO is providing the following response:

(a) The assumptions for the 2023 portfolio analysis were developed at the end of 2022 and finalized in January 2023.

(b) As in the 2021 IRP, NIPSCO's 2023 portfolio analysis evaluated seasonal capacity accreditation and seasonal reserve margin targets for MISO's summer and winter seasons. The summer and winter seasonal capacity accreditation assumptions used in the 2023 portfolio analysis for wind and solar resources are documented in the "Generic Capacity Credit" tab in Confidential Attachment 7-C to Mr. Augustine's direct testimony and are summarized as follows: NIPSCO assumed that wind resources would receive a winter capacity accreditation of 25% throughout the study period and a summer capacity accreditation of 16.3% throughout the study period. NIPSCO assumed that solar resources would

receive a winter capacity accreditation of 6.6% throughout the study period, with solar capacity accreditation changing over time in accordance with the table below:

Solar Capacity Credit Assumptions

2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
50.0%	47.9%	45.8%	43.8%	41.7%	39.6%	37.5%	35.4%	33.3%	31.3%

2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
29.2%	27.1%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%

(c) As in the 2021 IRP, NIPSCO's 2023 portfolio analysis evaluated seasonal capacity accreditation and seasonal reserve margin targets for MISO's summer and winter seasons. The assumed summer planning reserve margin target used in the 2023 portfolio analysis was 7.4%, and the assumed winter planning reserve margin target used in the 2023 portfolio analysis was 25.5%.

(d) Estimates of seasonal capacity accreditation remain dynamic at MISO, particularly regarding forward-looking views of the effective load carrying capability ("ELCC") for intermittent resources. MISO produced a Wind and Solar Capacity Report for Planning Year 2023-2024 in March 2023 (https://cdn.misoenergy.org/2023%20Wind%20and%20Solar%20Capacity%20Credit%20Report628118.pdf) and identified the following seasonal capacity accreditations for 2023-24:

	Summer	Winter
Solar	50%	5%
MISO-Wide Wind	18.1%	40.3%
Zone 6 Wind	13.8%	29.6%

In April 2023, MISO published assumptions documentation for its long-range transmission planning ("LRTP") analysis that included summer accreditation expectations for solar and wind over time. In this documentation, solar ELCC was projected to start at 50% in 2023, falling to 20% by 2037, while wind ELCC was projected to be constant at 16.6% over the whole study period. These assumptions are documented on page 4 in the following report:

https://cdn.misoenergy.org/20230308%20PAC%20Item%2008a%20Futures%20Refresh%20Assumptions%20Book628109.pdf.

While these two reports published at nearly the same time illustrate the dynamic nature of capacity accreditation assumptions at MISO right now, they also demonstrate that no significant accreditation changes have been made since NIPSCO developed the values used in the 2023 portfolio analysis.

(e) The latest summer and winter seasonal planning reserve margin targets remain at 7.4% and 25.5%, respectively, consistent with the assumptions used in the 2023 portfolio analysis. These targets were set in MISO's Loss of Load Expectation ("LOLE") Study Report for Planning Year 2023-2024, which can be found at the following location: https://cdn.misoenergy.org/PY%202023-2024%20LOLE%20Study%20Report626798.pdf. As part of this study, MISO performed some "outyear" analysis that provided perspectives on the potential change in seasonal reserve margins over time (See Section 10, Appendix E of the LOLE report referenced above). In these outyear projections, MISO suggested the potential for summer reserve margins to increase slightly, while winter reserve margins were projected to remain around 25%. NIPSCO will continue to track MISO analysis on this topic, including the next LOLE report, which will set the targets for next year's Planning Resource Auction.

Supplemental Response:

(e) See the supplemental direct testimony of Pat Augustine at Question / Answer 10.

Cause No. 45947
Northern Indiana Public Service Company LLC's
Objections and Responses to
Citizens Action Coalition of Indiana, Inc.'s First Set of Data Requests

CAC Request 1-012:
Please identify and produce for each of the following the most recent forecasts obtained, created, or reviewed by NIPSCO: (a) Natural gas prices (b) Coal prices (c) MISO energy prices (d) MISO capacity prices (e) NOx emission allowance prices
Objections:
NIPSCO objects to this Request on the grounds and to the extent that this Request seeks information that is confidential, proprietary, and/or trade secret.
Response:
Subject to and without waiver of the foregoing general and specific objections, NIPSCO is providing the following response: CRA's Fall 2023 commodity price update is provided as CAC Request Confidential 1-012 Attachment A. This includes the most recent market forecasts obtained and reviewed by NIPSCO for the requested fuel, MISO market, and emission allowance prices.

Cause No. 45947
Northern Indiana Public Service Company LLC's
Objections and Responses to
Citizens Action Coalition of Indiana, Inc.'s First Set of Data Requests

CAC Request 1-013:

Re: NIPSCO Exhibit 7 (Direct Testimony of Augustine) at page 32 line 11 to page 33 line 5. With regards to the evaluation of the potential conversion of one or two units at the Schahfer plant:

(a) Please identify and produce all NIPSCO analyses of the potential conversion, including all workpapers, modeling input and output files, and other supporting documents.

(b) Please state whether NIPSCO has analyzed the net present value revenue requirement ("NPVRR") of converting the Schahfer coal units to gas compared to the NPVRR of the Schahfer gas peaker plant proposed in this proceeding. If so, please produce such analysis and any supporting workpapers, modeling input and output files, or other documents. If not, please explain why not.

(c) Please identify how the fast-start, quick-ramping, and reliability characteristics of converted Schahfer coal units to gas would compare to those same characteristics for the proposed Schahfer gas peaker.

Objections:

NIPSCO objects to this Request on the grounds and to the extent that this Request seeks information that is confidential, proprietary and/or trade secret.

Response:

Subject to and without waiver of the foregoing general and specific objections, NIPSCO is providing the following response:

(a) NIPSCO's analysis of the potential conversion of one or two units at the Schahfer plant was conducted as part of its 2018 IRP, and all workpapers and summaries of modeling inputs and outputs can be found in CAC Request 1-013 Confidential Attachment A, which is Confidential Appendix D to the 2018 IRP. The following information was provided in the appendices:

- Coal-to-gas conversion portfolio details in the "Portfolio Legend" tab;
- Operational parameter assumptions for the Schahfer Unit conversion candidates on the "Existing Fleet Parameters" tab;

- Expectations for ongoing fixed operations and maintenance ("FOM") costs, coal-to-gas conversion capital costs, and ongoing capital expenditures for the conversion candidates on the "Unit FOM Capital – Retirements" tab within Portfolios 6b and 6c;
- Detailed annual revenue requirement projections and a summary of the projected net present value of revenue requirements ("NPVRR") for the two coal-to-gas conversion portfolios (Portfolios 6b and 6c) across all four IRP scenarios in the "Rev Req Components – Retirements" tab;
- Additional portfolio cost and financial output reports in the "Ret6b Summary," "Ret6c Summary," "Ret6b Contracts," "Ret6c Contracts," "Ret6b Resources," "Ret6c Resources," "DetailedFinOutputRetirements 6b," and "DetailedFinOutputRetirements 6c" tabs.

(b) NIPSCO has not additionally analyzed the net present value of revenue requirements ("NPVRR") of converting the Schahfer coal units to gas compared to the CT Project proposed in this proceeding because the gas peaker provides the load following generation and supporting reliability attributes needed and identified in the 2021 IRP and in NIPSCO's subsequent diligence associated with this application, including the Flexible Resource Analysis. The 2021 IRP analyzed a set of replacement portfolios across dispatchability and emissions criteria. Based on that analysis, the portfolio with a new gas peaker scored the highest and provides required flexibility to the NIPSCO fleet.

(c) The proposed CT Project is anticipated to have a start time as low as 11 minutes and a ramp rate of approximately 140 MWs per minute. Final performance data is dependent on the results of the competitive RFP for the CT equipment. Converting the existing units to natural gas would have start and ramp times similar to their current status as coal-fired generation with ramp rates of 3 MWs per minute, and a start up target of 22 hours after a 1 hour notice. The attributes associated with either the coal-fired or natural gas-fired thermal steam units are attuned to base load units operating over long periods of time with little variability in the energy produced. The attributes of the combustion turbines, specifically the very fast start up times and very quick ramp rates, are supportive of energy sources working in conjunction with renewable energy sources to "fill in the gap" related to the intermediate nature of renewable energy resources. As such, converting the existing Schahfer units to natural gas will not follow the load and provide the flexibility attributes that NIPSCO requires.

Cause No. 45947
Northern Indiana Public Service Company LLC's
Objections and Responses to
Citizens Action Coalition of Indiana, Inc.'s First Set of Data Requests

CAC Request 1-014:

Re: NIPSCO Exhibit 7 (Direct Testimony of Augustine) at page 35. With regards to the effective load carrying capability ("ELCC") discussed therein:

(a) Please identify for each of the years 2023 through 2052 the ELCC for four-hour duration storage resources assumed in the 2023 Portfolio Analysis.

(b) Please identify and produce any analysis, study, or other document supporting the assumption that the ELCC for four-hour duration storage resources would decline to 70% by 2040.

(c) Please explain the basis for the contention that a gas peaker "is likely to have a stable ELCC around 95%," and identify and produce any analysis, study, or other document supporting that contention.

(d) Please state whether the ELCC values for four-hour duration storage and a new gas peaker plant assumed in the 2023 Portfolio Analysis are consistent with MISO's most recent Seasonal Accredited Capacity values for those resources. If not, please explain how use of MISO's most recent values would impact the results of the 2023 Portfolio Analysis.

Objections:

NIPSCO objects to this Request on the grounds and to the extent that this Request seeks information that is confidential, proprietary, and/or trade secret.

Response:

Subject to and without waiver of the foregoing general and specific objections, NIPSCO is providing the following response:

(a) NIPSCO's 2023 portfolio analysis included a fundamental dispatch analysis that was conducted for the years 2023-2042, followed by an additional ten years of extrapolation and revenue requirement calculations. The ELCC assumption for four-hour duration storage resources for the 2023-2042 time period is provided below and also summarized in the "Generic Capacity Credit" tab of Confidential Attachment 7-C to Mr. Augustine's direct testimony. Given the extrapolation methodology used beyond 2042, the analysis implicitly assumes the ELCC values remain constant beyond 2042.

2023	88%
2024	87%
2025	86%
2026	85%
2027	84%
2028	83%
2029	82%
2030	81%
2031	79%
2032	78%
2033	77%
2034	76%
2035	75%
2036	74%
2037	73%
2038	72%
2039	71%
2040	70%
2041	70%
2042	70%

(b) MISO has produced recent analysis supportive of the assumption that the ELCC for four-hour duration storage could decline to 70% by 2040. For example, MISO's April 2023 assumptions documentation for its long-range transmission planning ("LRTP") analysis includes an expectation for storage ELCC to decline to 75% by 2037, quite close to the assumption of 73% by 2037 in NIPSCO's 2023 portfolio analysis. This is documented on page 4 of the assumptions found here: https://cdn.misoenergy.org/20230308%20PAC%20Item%2008a%20Futures%20Refresh%20Assumptions%20Book628109.pdf. In addition, MISO's Renewable Integration Impact Assessment report projected a decline in storage ELCC to 64% with 30 GW (ICAP) of storage capacity in the system, declining to as low as 19% with 100 GW (ICAP) of storage capacity. This is documented in Figure RA-32 here: https://cdn.misoenergy.org/RIIA%20Summary%20Report520051.pdf. In addition, research across the industry and in other ISOs suggests that the capacity credit for storage would be expected to drop over time as a result of increasing renewable and storage penetration and when the width of the peak

net load period exceeds the hours of storage duration. See, for example, an NREL study on dynamic storage capacity valuation here: https://www.nrel.gov/docs/fy18osti/71462.pdf.

(c) As a dispatchable thermal resource without duration limitations, a gas peaker unit's ELCC is likely to be influenced most directly by its forced outage rate and not the changing net load profiles in the MISO market over time. In MISO's 2023-2024 Loss of Load Expectation ("LOLE") Study, used to set planning reserve margin targets, forced outage rates and planned maintenance factors were calculated over a five-year (2017-2021) period for thermal units. For combustion turbines greater than 50 MW, the unit type representing the new gas peaker NIPSCO requests approval for in this Cause, MISO identified a 4.07% forced outage rate, which would imply an approximate 96% ELCC. Over the last six MISO LOLE studies, the forced outage rate for this unit type averaged 4.87%, implying an ELCC value just above 95%. See Section 3.2.1 in the 2023-2024 LOLE study here: https://cdn.misoenergy.org/PY%202023-2024%20LOLE%20Study%20Report626798.pdf.

(d) Estimates for seasonal capacity accreditation remain dynamic at MISO, particularly regarding forward-looking views of the effective load carrying capability ("ELCC") for resources like storage. Last year, in June, 2022, The "Managing Reliability Risk in the MISO Footprint" report (https://cdn.misoenergy.org/20220616%20Board%20of%20Directors%20Item%2008a%20Reliability%20Imperative625168.pdf) produced an estimate of an 87.5% capacity credit for battery storage, consistent with the starting point assumed in NIPSCO's 2023 portfolio analysis. And as noted in subpart (b) to this request, MISO's assumptions document for the LRTP analysis documented one potential outlook for storage ELCC, although a lack of operating resources in the market has limited MISO's ability to publish any more recent class-average data. Thus, NIPSCO believes that the ELCC values assumed in the 2023 portfolio analysis remain consistent with the most recent information published by MISO.

CAC Request 3-014:

Please refer to Mr. Augustine's testimony at page 29, lines 5-9.

a. Please explain how the energy communities bonus adder was incorporated for renewable and battery storage projects.
b. Please explain if there was an assumed number of MWs eligible for the energy communities bonus adder or if the bonus adder was evaluated on a project by project basis.
c. If any projects modeled within Aurora qualify for the energy communities bonus adder, please provide the names of those projects as they were modeled in Aurora.

Objections:

Response:

(a) As part of the assumptions development process for the 2023 portfolio analysis, CRA reviewed bids from the 2022 RFP to identify the potential for energy community bonus qualification for new renewable and battery storage projects in the near-term. The near-term tax credit-eligible additions in the portfolios that NIPSCO evaluated included solar and wind PPAs (where the developer is assumed to incorporate any federal tax credit benefits within the PPA price) and new owned battery storage. No battery storage bids in the 2022 RFP were located in energy communities, although NIPSCO has identified the potential for utilizing remaining interconnection rights from Schahfer units 17 and 18 as potential sites for storage that would qualify for the bonus energy communities credit. (See NIPSCO's response to CAC Request 1-005.) Thus NIPSCO focused its modeling of bonus credits on the opportunity for a subset of near-term storage projects to be eligible for the 10% ITC adders.

(b) Although no bidders to NIPSCO's 2022 RFP offered storage projects located within energy communities, NIPSCO and CRA made the assumption that up to 150 MW of new battery storage could be located in an energy community, such as at the Schahfer site, and receive the 10% ITC bonus and a 40% ITC for the total project cost. All near-term solar and wind additions in the portfolios that were evaluated (up to 200 MW of new solar and up to 400 MW

of new wind) were modeled as PPAs with no separate analysis of tax credit eligibility. All long-term generic solar additions were common across the three portfolios NIPSCO evaluated in the 2023 portfolio analysis, with tax credit eligibility assuming prevailing wage and apprenticeship requirements are met and no bonus credit.

(c) The 150 MW of four-hour battery storage in 2026 incorporated in Portfolios 1 and 2 were assumed to qualify for the energy communities 10% ITC bonus adder. In addition, the 125 MW of 4-hour battery storage in 2028 incorporated in Portfolio 3 was assumed to qualify for the same bonus credit. These projects are named "Storage A1_2026" and "Generic 4-Hour Storage_Ref_2028" in the Aurora input database workpapers provided in NIPSCO's supplemental response to CAC Request 1-010.

Cause No. 45947
Northern Indiana Public Service Company LLC's
Supplemental Response to
Citizens Action Coalition of Indiana, Inc.'s Third Set of Data Requests

CAC Request 3-015:
Please refer to the workbook "Gas Peaker_NIPSCO_Confidential Attachment 7-C_09122023", worksheets "Rev Req Components", "Portfolio 1", "Portfolio 2", and "Portfolio 3". Please provide versions of these worksheets that are not hardcoded values and show the supporting calculations, with all formulas and links intact.
Objections:
NIPSCO objects to this Request on the grounds and to the extent that this Request seeks information that is confidential, proprietary, and/or trade secret. The requested worksheets are proprietary information to Charles River Associates and are unavailable
Response:
Please see objections.
Supplemental Response:
CAC Request 3-015 Confidential Attachment A, which contains the requested workbooks with all formulas and links intact, has been provided to the CAC pursuant to terms of a nondisclosure agreement CAC executed with Charles River Associates. CAC Request 3-015 Confidential Attachment A can be provided to any party to this proceeding that executes a separate nondisclosure agreement with Charles River Associates.

Cause No. 45947
Northern Indiana Public Service Company LLC's
Objections and Responses to
Citizens Action Coalition of Indiana, Inc.'s Third Set of Data Requests

CAC Request 3-019:

Please refer to the Flexible Resource Analysis presented in "Gas Peaker_NIPSCO Confidential Attachment 7-D_09122023".

a. Please explain how the charge and discharge of battery storage resources was modeled in the flexible resource analysis.
b. Please explain if battery resources were assumed to only be charged from NIPSCO resources.
c. Please explain if the discharge of battery storage resources was assumed to be a four hour consecutive period limited.
d. Please explain how any cycle limitations were implemented for battery storage resources.

Objections:

Response:

(a) The Flexible Resource Analysis was designed to evaluate and quantify the frequency and duration of NIPSCO's potential future net load exposure based on uncertainty in sub-hourly load, wind output, and solar output. The Flexible Resource Analysis was not designed to evaluate dispatch of individual units. As such, the key outputs were summaries of net load and net load ramps, including evaluations of the frequency and duration of net load exposure events. Thus, the methodology used in the Flexible Resource Analysis did not require NIPSCO to model the charge and discharge of battery resources.

(b) See part (a).

(c) See part (a).

(d) See part (a).

Cause No. 45947
Northern Indiana Public Service Company LLC's
Objections and Responses to
Citizens Action Coalition of Indiana, Inc.'s Fifth Set of Data Requests
[Denotes Confidential Information]

CAC Request 5-002:

Re: NIPSCO response to data request CAC 3-001(a) ("The Flexible Resource Analysis (Confidential Attachment 7-D to Mr. Augustine's direct testimony) specifically pointed to the need for a gas-peaking asset in conjunction with the diverse portfolio of assets NIPSCO is constructing to include existing natural gas, wind, solar, battery storage, and flexible natural gas resources"): Please give a pinpoint citation to the part of NIPSCO's Conf. Attachment 7-D that establishes the need for a gas-peaking asset.

Objections:

NIPSCO objects to this Request on the grounds and to the extent that this Request seeks information that is confidential, proprietary, and/or trade secret.

Response:

Subject to and without waiver of the foregoing general and specific objections, NIPSCO is providing the following response:

The Flexible Resource Analysis was not intended to identify a single resource or set of resources, but rather assess how much flexible capacity NIPSCO would require to maintain reliability and mitigate against market risk as dispatchable generation retires and is replaced largely by non-dispatchable generation.

As stated on page 19 of Mr. Augustine's direct testimony, the Flexible Resource Analysis was intended to: "more fully assess the energy adequacy and flexibility characteristics of the IRP's preferred portfolio and to analyze the potential market exposure that could result from increasing reliance on renewable generation. The flexibility study was designed to (i) assess the portfolio's flexibility needs on an inter-hour and intra-hour basis, given the variability and intermittency of renewable resources; and (ii) perform sub-hourly analysis to provide insights into the type of market exposure NIPSCO could face as its portfolio evolves. The flexibility study was conducted to evaluate the risks associated with times of resource unavailability and market purchase exposure."

NIPSCO's Preferred Portfolio F from the 2021 IRP included a new natural gas peaking plant based on NIPSCO's integrated scorecard summary of a range of key planning objectives, as documented in Section 9.3 of the IRP. In that section of the 2021 IRP on p. 257, NIPSCO also noted that "the quantities and characteristics of storage and gas peaking resource additions require further study to confirm reliability can be

maintained and to understand the value of each resource type given ongoing and potential market and policy changes." The Flexible Resource Analysis was one means of performing further study of each resource type, with one major conclusion affirming that long-duration dispatchable resources provide value that shorter-duration resources cannot. Please see slide 8 of Confidential Attachment 7-D, with further detail provided on slide 12.

CAC Request 5-004:

Re: NIPSCO response to data request CAC 1.011(b).

(a) Please explain NIPSCO's or Mr. Augustine's basis for assuming wind will have a 25% winter capacity accreditation throughout the study period.

(b) Please explain NIPSCO's or Mr. Augustine's basis for assuming wind will have a 16.3% summer capacity accreditation throughout the study period

(c) Please explain NIPSCO's or Mr. Augustine's basis for assuming solar will have a winter capacity accreditation of 6.6% throughout the study period.

(d) Regarding the chart at the end of your response to CAC 1.011(b):

(i) Please confirm if the phrase "solar capacity accreditation changing over time" was intended to say "**summer** capacity accreditation changing over time."

(ii) Please explain NIPSCO's or Mr. Augustine's basis for assuming the year-by-year summer capacity accreditations for solar shown in the chart.

Objections:

Response:

(a) NIPSCO initially developed the wind winter capacity accreditation assumption of 25% during the 2021 IRP process, as documented in the "Generic Capacity Credit" tab of Appendix D to NIPSCO's 2021 IRP. As of the time of the 2021 IRP analysis, MISO had been indicating that winter capacity accreditation for wind would likely be higher than prevailing summer accreditation, and NIPSCO relied on multiple MISO data sources for guidance. For example, the MISO Resource Adequacy Subcommittee meeting in February, 2021 indicated a 20% winter capacity accreditation (see slide 22 here: https://cdn.misoenergy.org/20210203%20RASC%20Item%2004a%20Subannual%20Construct%20Presentation%20(RASC010,%20011,%20012)517859.pdf), while MISO reviews of intermediate seasonal accredited capacity based on historical wind resource performance for planning years 2019-20 and 2020-21, (as well as 2021-22 and 2022-23) generally averaged around 25% (see slide 41 here: https://cdn.misoenergy.org/20220824%20RASC%20Item%2007c%20Non-

Thermal%20Accreditation%20Presentation%20(RASC-2019-2%202020-4)626036.pdf). Although MISO's Renewable Integration Impact Assessment report contemplates modestly declining capacity accreditation for wind over time, the 25% assumption was used as representative of the likely long-term expectation for wind resources.

(b) NIPSCO initially developed the wind summer capacity accreditation assumption of 16.3% during the 2021 IRP process, as documented in the "Generic Capacity Credit" tab of Appendix D to NIPSCO's 2021 IRP. The assumption was developed based on MISO's most recent Wind and Solar Capacity Credit report as of the time of the analysis. That report included a MISO-wide assumption of 16.3% for wind resources, as documented here: https://cdn.misoenergy.org/DRAFT%202021%20Wind%20&%20Solar%20Capacity%20Credit%20Report503411.pdf. Although MISO's Renewable Integration Impact Assessment report contemplates modestly declining capacity accreditation for wind over time (see for example, Figure RA-20 here: https://cdn.misoenergy.org/RIIA%20Summary%20Report520051.pdf) and although Zone 6 has historically had lower capacity accreditation than MISO as a whole, the 16.3% assumption was used as representative of the likely long-term expectation for wind resources in NIPSCO's portfolio. This remains broadly consistent with MISO expectations. For example, the latest long-range transmission planning ("LRTP") assumptions include an assumed flat 16.6% wind accreditation over the forecast horizon. See page 4 here: https://cdn.misoenergy.org/20230308%20PAC%20Item%2008a%20Futures%20Refresh%20Assumptions%20Book628109.pdf

(c) NIPSCO initially developed the solar winter capacity accreditation assumption of 6.6% during the 2021 IRP process. This was discussed in detail with stakeholders during the May 20, 2021 public advisory meeting and documented in the meeting minutes in Appendix A to NIPSCO's 2021 IRP. See p. 260 of Appendix A, which includes the following comments from the public advisory meeting: *"Based on NIPSCO's preliminary analysis of the coincidence of solar output with its coincident winter peak loads, the IRP analysis is planning to use 6.6% for the winter solar capacity credit. This number will be further reviewed based on hourly solar shapes that NIPSCO has from its planned solar projects and any future data received in the 2021 RFP. To arrive at the preliminary 6.6% number, CRA looked at the top 10-20 winter peak hours and noted that those tend to occur during the early morning and evening hours. On average, the solar*

output during those hours was approximately 6.6% of nameplate capacity. While geographic diversity could help improve that number in aggregate, and while different projects are likely to have different ratings, this is the general range for what will be used for the winter credit in this IRP." The 6.6% assumption was also consistent with MISO's assumptions for solar accreditation at the time of the analysis of approximately 5% during the winter months (See for example, slide 22 from the MISO Resource Adequacy Subcommittee meeting in February, 2021: https://cdn.misoenergy.org/20210203%20RASC%20Item%2004a%20Subannual%20Construct%20Presentation%20(RASC010,%20011,%20012)517859.pdf)

(d)

(i) Confirmed. The table of numbers at the end of the response to CAC 1-011(b) shows the assumed solar capacity accreditation for the summer season, and the phrase was intended to say "**summer** capacity accreditation changing over time in accordance with the table below."

(ii) NIPSCO initially developed the solar summer capacity accreditation assumptions during the 2021 IRP process, relying largely on information produced by MISO in its Renewable Integration Impact Assessment. The assumptions and associated rationale were documented with stakeholders during NIPSCO's May 20, 2021 public advisory meeting. See in particular slide 21 from the May meeting, which can also be found on page 140 of Appendix A to NIPSCO's 2021 IRP. Recent MISO documentation has remained supportive of this general summer capacity accreditation trajectory. For example, MISO's April 2023 assumptions documentation for its long-range transmission planning ("LRTP") analysis includes an expectation for solar ELCC to decline to 26% by 2035 and 20% by 2037, quite close to the assumption of 25% by 2035 in NIPSCO's 2021 IRP and subsequent 2023 portfolio analysis. This is documented on page 4 of the assumptions found here: https://cdn.misoenergy.org/20230308%20PAC%20Item%2008a%20Futures%20Refresh%20Assumptions%20Book628109.pdf.

Cause No. 45947
Northern Indiana Public Service Company LLC's
Objections and Responses to
Citizens Action Coalition of Indiana, Inc.'s Sixth Set of Data Requests
[denotes confidential]

CAC Request 6-005:

Re: Direct Testimony of Walter at page 29, lines 5-9 ("NIPSCO currently projects capacity factors below 20%, except in the initial months of operation. During these initial months, based on the proposed GHG Rules, either the capacity factors must be limited to 20% or the CTs must achieve the Intermediate Load emission limitations"); NIPSCO response to data request CAC 1.19 (including Conf. Att. A).

(a) Why did NIPSCO's 2021 IRP and 2023 portfolio analysis project [redacted] for the new gas CTs compared to [redacted]?
(b) If the proposed new CTs were limited to no more than 20% capacity factor in the initial months of operation due to federal greenhouse gas emissions rules, how would NIPSCO obtain alternate energy and capacity to meet its retail load requirements? Please provide all analyses, proposals, and documents in NIPSCO's possession used to answer the question.

Objections:

NIPSCO objects to this Request on the grounds and to the extent that this Request seeks information that is confidential, proprietary and/or trade secret.

Response:

Subject to and without waiver of the foregoing general and specific objections, NIPSCO is providing the following response:

(a) NIPSCO's 2023 portfolio analysis projects higher capacity factors in 2026 and 2027 as a result of declining reserve margins in the wider MISO market as coal capacity retires and before significant replacement wind, solar, and other capacity is added to the broader system. The Reference Case in NIPSCO's 2021 IRP did not project higher capacity factors for the new peaker in 2026 and 2027 relative to other years, although the Status Quo Extended scenario did project higher capacity factors in 2026 relative to other years (See the "F Resources" tab in Appendix D to NIPSCO's 2021 IRP, which documents capacity factor projections for all resources across the four IRP scenarios). The different projections affirm the fact that multiple factors, including the gas peaker's heat rate, future natural gas prices, regional load growth trends, regional retirement

and expansion activity, and others will determine future capacity factors for the gas peaker plant. Note that even though NIPSCO's 2023 portfolio analysis projected a capacity factor higher than 20% for the partial year of 2026 (which is heavily influenced by the higher capacity factor summer months), annual capacity factors in 2027 and beyond were all projected to be lower than 20%.

(b) NIPSCO would not expect a limit on capacity factors to materially impact accredited capacity for the plant, especially if a change in operations were able to limit run hours during times of energy surplus within the wider MISO market. Even if capacity were derated, NIPSCO expects to have sufficient capacity to meet peak load requirements once the peaker is operational and while the Michigan City coal plant and existing older vintage Schahfer peaking units are operational. This was demonstrated on pages 37 and 38 of Mr. Augustine's direct testimony. As a member of MISO, NIPSCO is able to buy energy from the market as needed and sell energy when generation exceeds retail demand. In 2026 and 2027, NIPSCO expects to maintain a significant energy long position relative to retail load requirements, so minor adjustments in the gas peaker's output would not materially impact NIPSCO's energy position and only marginally lower the net sales position. This was shown on page 38 of Mr. Augustine's direct testimony, with aggregate portfolio generation projections also provided in the "Gen Mix by Portf – Cancellation" tab in Confidential Attachment 7-C to Mr. Augustine's direct testimony.

Cause No. 45947
Northern Indiana Public Service Company LLC's
Supplemental Responses to
Citizens Action Coalition of Indiana, Inc.'s Seventh Set of Data Requests

CAC Request 7-001:

Please refer to the figure labeled "Summer Supply-Demand Balance" at page 37 and the figure labeled "Winter Supply-Demand Balance" at page 38 in Witness Augustine's testimony.

a. Please provide the supporting workbooks, with all formulas and links intact, used to develop each figure.
b. For the reported planning reserve margin, please explain if a coincidence factor was applied to determine the planning reserve margin.
    i. If a coincidence factor was applied, please identify the summer and winter coincidence factors and explain the basis for those factors.
    ii. If a coincidence factor was not applied, please explain why not.
c. If not already included in the supporting workbook used to develop the figures on pages 37-38, please provide the summer and winter resource accreditation for each individual resource within the portfolio.

Objections:

NIPSCO objects to this Request on the grounds and to the extent that this Request seeks information that is confidential, proprietary and/or trade secret.

Response:

Subject to and without waiver of the foregoing general and specific objections, NIPSCO is providing the following response:

a. Please find the supporting workbook as CAC Request 7-001 Confidential Attachment A. The "S-D Balance" tab contains referenced figures from Mr. Augustine's testimony. Cells B1 and B2 on this tab allow the user to toggle by portfolio and by summer and winter season.
b. Yes, a coincidence factor was applied to NIPSCO's native peak load forecast to arrive at a peak load estimate coincident with the MISO peak for planning reserve margin calculation purposes. These factors are based on NIPSCO's internal analysis of internal peak relative to the system peak based on historical data. Thus, the peak load in the "Load" tab of CAC Request 7-001 Confidential Attachment A contains load that has already been adjusted by the

coincidence factor and will be lower than the NIPSCO system peak load reported in Chapter 3 of NIPSCO's 2021 IRP. NIPSCO's coincidence factor for summer and winter are included in the "Load" tab of CAC Request 7-001 Confidential Attachment A.

c. The summer and winter resource accreditations are included in CAC Request 7-001 Confidential Attachment A in the "New Resource ELCC" tab.

Supplemental Response:

For sub-parts (a) through (c), refer to the confidential workpaper to Mr. Augustine's supplemental direct testimony which contains NIPSCO's latest summer and winter supply-demand balances, inclusive of the updated MISO PRMR and capacity accreditation information along with the capacity purchases already made by NIPSCO.

Cause No. 45947
Northern Indiana Public Service Company LLC's
Objections and Responses to
Citizens Action Coalition of Indiana, Inc.'s Tenth Set of Data Requests

CAC Request 10-001:
Please provide the forecast of total peak load by each of the four seasons and by year through 2030.
Objections:
NIPSCO objects to this Request on the grounds and to the extent that this Request seeks information that is confidential, proprietary, and/or trade secret.
Response:
Subject to and without waiver of the foregoing general and specific objections, NIPSCO is providing the following response: Please refer to the "Demand Monthly Peak" tab in CAC Request 1-010 Confidential Attachment B for NIPSCO's peak load forecast by month. A summary of the forecast of total peak load by each of the four MISO planning seasons by year through 2030 is provided in CAC Request 10-001 Confidential Attachment A. Note that winter includes January, February, and December; spring includes March, April, and May; summer includes June, July, and August; and fall includes September, October, and November.

Cause No. 45947
Northern Indiana Public Service Company LLC's
Objections and Responses to
Citizens Action Coalition of Indiana, Inc.'s Tenth Set of Data Requests

CAC Request 10-002:
Please confirm the portion of 2022 peak load by sector (residential, commercial, and industrial) for each of the four seasons, and if available, by year through 2030.
Objections:
NIPSCO objects to this Request on the grounds and to the extent that this Request solicits an analysis, calculation or compilation which has not already been performed and which NIPSCO objects to performing. NIPSCO is not currently able to track historical peak loads by class, so this data is not available for historical years like 2022. The forecast, however, did develop peaks by class using sample customer load factor information, which is the same forecast used for the 2021 IRP. NIPSCO further objects to this Request on the separate and independent grounds and to the extent that this Request seeks information that is confidential, proprietary and/or trade secret.
Response:
Subject to and without waiver of the foregoing general and specific objections, NIPSCO is providing the following response: NIPSCO's forecast of peak load for the residential, commercial, and industrial sectors for each of the four MISO planning seasons by year through 2030 is provided in CAC Request 10-002 Confidential Attachment A. Note that winter includes January, February, and December; spring includes March, April, and May; summer includes June, July, and August; and fall includes September, October, and November. Note that the industrial sector includes firm load served by NIPSCO, including Tier 1 load on the 831/531 rate. Tier 2 and 3 load on the 831/531 rate is not served by NIPSCO and is excluded. Note that the individual monthly peaks by sector may not align, so the seasonal peaks summarized in CAC Request 10-002 Confidential Attachment A are not necessarily coincident. Note that this summary excludes railroad, street lighting, public authority, and company use load. Note that this summary also excludes the gross-up factor for losses that is incorporated when evaluating NIPSCO's system-wide peak for reserve margin planning purposes.

Cause No. 45947
Northern Indiana Public Service Company LLC's
Objections and Responses to
Citizens Action Coalition of Indiana, Inc.'s Tenth Set of Data Requests

CAC Request 10-003:
Please confirm the portion of 2022 peak load by rate class for each of the four seasons, and if available, by year through 2030.
Objections:
NIPSCO objects to this Request on the grounds and to the extent that this Request solicits an analysis, calculation or compilation which has not already been performed and which NIPSCO objects to performing. NIPSCO is not currently able to track historical peak loads by class, so this data is not available for historical years like 2022. The forecast, however, did develop peaks by class using sample customer load factor information, which is the same forecast used for the 2021 IRP. NIPSCO further objects to this Request on the separate and independent grounds and to the extent that this Request seeks information that is confidential, proprietary and/or trade secret.
Response:
Subject to and without waiver of the foregoing general and specific objections, NIPSCO is providing the following response: NIPSCO's forecast of peak load at the most granular level available for each of the four MISO planning seasons by year through 2030 is provided in CAC Request 10-003 Confidential Attachment A. Note that winter includes January, February, and December; spring includes March, April, and May; summer includes June, July, and August; and fall includes September, October, and November. Note that the industrial sector includes firm load served by NIPSCO, including Tier 1 load on the 831/531 rate. Tier 2 and 3 load on the 831/531 rate is not served by NIPSCO and is excluded. Note that the individual monthly peaks by rate class may not align, so the seasonal peaks summarized in CAC Request 10-003 Confidential Attachment A are not necessarily coincident. For example, different rate classes may peak in different months within each season, so the sum of the individual industrial rate class components provided in CAC Request 10-003 Confidential Attachment A may not equal the aggregate industrial sector seasonal peak provided in CAC Request 10-002 Confidential Attachment A for certain seasons. Note that this summary also excludes the gross-up factor for losses that is incorporated when evaluating NIPSCO's system-wide peak for reserve margin planning purposes.

Cause No. 45947
Northern Indiana Public Service Company LLC's
Objections and Responses to
Citizens Action Coalition of Indiana, Inc.'s Seventeenth Set of Data Requests
[Denotes Confidential Information]

CAC Request 17-001:

Refer to page 17 of Confidential Attachment A to your response to CAC 1-010. With regards to the statement "[redacted]":

a. Please state whether that statement is referring only to the decision of when between 2026 and 2028 to retire Michigan City 12, or whether it suggests a potential that NIPSCO would retire Michigan City 12 sometime after 2028.
b. Please state whether NIPSCO is currently considering a retirement date for Michigan City 12 after 2028.
    i. If so, please identify any such post-2028 retirement date(s) that is being considered, and explain what factors could lead to selection of such a later retirement date rather than 2028.
    ii. If not, please explain why not.

Objections:

NIPSCO objects to this Request on the grounds and to the extent that this Request seeks information that is confidential, proprietary, and/or trade secret.

Response:

Subject to and without waiver of the foregoing general and specific objections, NIPSCO is providing the following response:

a. The statement "[redacted]" refers only to the decision to retire Michigan City 12 between 2026 and 2028.
b. NIPSCO is not currently considering a retirement date for Michigan City 12 after 2028. NIPSCO is currently operating within the action plan parameters of its 2021 IRP.

Note: NIPSCO made all language in the *request* PUBLIC.

Cause No. 45947
Northern Indiana Public Service Company LLC's
Objections and Responses to
Citizens Action Coalition of Indiana, Inc.'s Twenty-Third Set of Data Requests
[Denotes confidential information]

CAC Request 23-001:

Re: NIPSCO Confidential Attachment 7-D (Flexible Resource Analysis):

(a) Please confirm that the system analysis described on slides 54-69 includes the Commonwealth Edison transmission region of Illinois. For anything other than an unequivocal confirmation, please explain in detail.
(b) For the Flexible Resource Analysis, what generation expansion assumptions were used for the Commonwealth Edison transmission region?
(c) For the Flexible Resource Analysis, what load forecast assumptions or methodologies were used for the Commonwealth Edison transmission region?
(d) For the Flexible Resource Analysis, how did Charles River Associates or NIPSCO integrate the wind and solar power buildout requirements contained in the Illinois Power Agency Act as modified by the Climate and Equitable Jobs Act of 2021 (Illinois Public Act 102-0662), codified at 20 ILCS 3855/1-75(c)(1)(C)(i)?
(e) For the Flexible Resource Analysis, how did Charles River Associates or NIPSCO integrate energy efficiency requirements contained in the Illinois Public Utilities Act as modified by the Climate and Equitable Jobs Act of 2021 (Illinois Public Act 102-0662), codified at 220 ILCS 5/8-103B?

Objections:

NIPSCO objects to this Request on the grounds and to the extent that this Request seeks information that is confidential, proprietary, and/or trade secret.

Response:

Subject to and without waiver of the foregoing general and specific objections, NIPSCO is providing the following response:

(a) Slides 54-69 include a number of key metrics associated with the Flexible Resource Analysis that were done for both the NIPSCO zone and the broader region. The key findings summarized in slides 7-12 and in slides and graphics labeled "NIPSCO" throughout slides 54-69 of Confidential Attachment 7-D were based *only on analysis performed for NIPSCO's zone.* The separate system analysis, which is summarized in certain graphics and slides labeled "system", included the Commonwealth Edison ("ComEd") zone of PJM in Illinois.

(b) CRA used its regional Eastern Interconnect Aurora model database for the four scenarios NIPSCO developed in its 2021 IRP to develop estimates for future installed capacity in the ComEd zone for the single study year (2030) that was evaluated in the Flexible Resource Analysis. The table below shows the installed capacity assumptions for the ComEd zone in MW for each resource type across the four scenarios.



(c) CRA used PJM's load forecast at the time of the analysis for the ComEd zone for the single study year (2030) that was evaluated in the Flexible Resource Analysis. The table below provides a summary of the monthly energy and peak load assumptions that were used for the ComEd zone.

Month	Energy (MWh)	Peak (MW)
1	8,450,352	14,621
2	7,346,976	13,930
3	7,515,144	12,768
4	6,832,800	12,009
5	7,300,872	15,220
6	8,465,760	20,049
7	9,727,056	20,876
8	9,425,736	20,500
9	7,737,840	17,629
10	7,155,792	12,797
11	7,164,720	12,614
12	8,035,944	14,177

(d) CRA's scenario analysis evaluated a range of renewable buildouts for the ComEd region, ranging to over 3,000 MW of solar and over 13,000 MW of wind by 2030, as documented in subsection (b) to this response. CRA's analysis did not assume any specific targets from Illinois' Climate and Equitable Jobs Act of 2021 for the ComEd zone, given uncertainty in locational siting of projects in ComEd versus the rest of the state (which was not modeled in the Flexible Resource Analysis) and uncertainty associated with specific procurement plans as of the time of the analysis. Given that procurement activities currently lag well behind targets, the approach and assumptions remain reasonable. The Illinois Power Agency's ("IPA") 2024 Long-Term Renewable Resources Procurement Plan report filed with the Illinois Commerce Commission in October 2023 acknowledges that current procurements are currently falling well short of target, and even with successful procurements over the next few years, the IPA acknowledges that the 2030 goal is unlikely to be met (The full report, including the procurement summary in Figure 3-2, can be found here: https://ipa.illinois.gov/content/dam/soi/en/web/ipa/documents/2024-long-term-plan-20-oct-2023-.pdf)

(e) CRA's analysis incorporated PJM's load forecast for the ComEd zone, which is inclusive of energy efficiency assumptions. CRA did not separately adjust the forecast for energy efficiency targets or requirements from Illinois' Climate and Equitable Jobs Act of 2021.

Cause No. 45947
Northern Indiana Public Service Company LLC's
Objections and Responses to
Citizens Action Coalition of Indiana, Inc.'s Twenty-Fourth Set of Data Requests
[Denotes confidential information]

CAC Request 24-001:

Re: NIPSCO Confidential Attachment 7-D (Flexible Resource Analysis).

(a) On slides 19-22 ("[redacted]"), what type of [redacted] NIPSCO's system in this modeling?

(b) If the answer to part (a) is gas combustion turbine generating capacity, does the analysis on slides 19-22 consider [redacted] shown on page 5-6 of the Simple Cycle Gas Turbine Engineering Study (NIPSCO Conf. Att. 4-A)?

(c) If the answer to part (a) is not gas combustion turbine generating capacity, how does the analysis incorporate [redacted]?

(d) On slides 23-24 ("Analysis of Duration of Short Events"), does the analysis consider [redacted] shown on page 5-6 of the Engineering Study?

Objections:

NIPSCO objects to this Request on the grounds and to the extent that this Request seeks information that is confidential, proprietary, and/or trade secret.

Response:

Subject to and without waiver of the foregoing general and specific objections, NIPSCO is providing the following response:

(a) Slides 19-22 of Confidential Attachment 7-D evaluated the change in market exposure risk associated with the addition of *any* flexible, dispatchable capacity. As explained in NIPSCO Witness Augustine's direct and rebuttal testimonies, the Flexible Resource Analysis was designed to assess the energy adequacy and flexibility characteristics of NIPSCO's portfolio from the 2021 IRP and characterize risks associated with potential market exposure. The analysis did not assess specific resource additions beyond the 2021 IRP's preferred portfolio, but instead identified the characteristics of new resource additions that could

help mitigate market exposure risk. See Witness Augustine's direct testimony at Q&A 24 and Witness Augustine's rebuttal testimony at Q&A 16 for additional explanation.

(b) See response to part (a). No resource-specific analysis was performed. Slides 19-22 identified the impacts associated with adding additional MW of any flexible, dispatchable capacity to the portfolio without evaluation of seasonal performance variations.

(c) See response to part (a). No resource-specific analysis was performed. Slides 19-22 identified the impacts associated with adding additional MW of any flexible, dispatchable capacity to the portfolio without evaluation of seasonal performance variations.

(d) The Flexible Resource Analysis considered seasonal capacity ratings and operational assumptions for NIPSCO's existing fleet of resources, including Sugar Creek, and generic assumptions for the 300 MW new peaking facility identified in the 2021 IRP. Since the analysis was designed to assess the 2021 IRP's preferred portfolio and characterize market exposure risks (including the duration of such exposure risks as outlined on slides 23-24 of Confidential Attachment 7-D), it did not consider seasonal performance variation of gas combustion turbines from the referenced Engineering Study, which was conducted after the Flexible Resource Analysis was performed.

Cause No. 45947
Northern Indiana Public Service Company LLC's
Objections and Responses to
Citizens Action Coalition of Indiana, Inc.'s Twenty-Fifth Set of Data Requests
[Denotes confidential information]

CAC Request 25-002:

(a) Regarding "PJM's load forecast at the time of the analysis for the ComEd zone" as referenced in response to data request CAC 23.01(c): Admit that the relevant PJM load forecast at the time of the Flexible Resource Analysis was the 2023 PJM Load Forecast Report dated January 2023, available at https://www.pjm.com/-/media/library/reports-notices/load-forecast/2023-load-report.ashx. For anything other than admission, please explain.

(b) Regarding the 2023 PJM Load Forecast Report referenced in part (a), admit that the Distributed Solar Adjustment to Summer Peak Load for 2030 assumed in the report for the ComEd zone is 701 megawatts, as shown on page 54 of the report. For anything other than admission, please explain.

(c) Regarding the Illinois Power Agency's 2024 Long-Term Renewable Resources Procurement Plan ("LTRRPP") filed with the Illinois Commerce Commission in October 2023, as referenced by NIPSCO in response to data request CAC 23.01(d): admit that at page 149, the Illinois Power Agency states that the Adjustable Block Program encoded in Illinois law at Section 1-75(c)(1)(C) of the Illinois Power Agency Act "targets approximately 12,375,000 RECs delivered annually [...] by 2030 [...] necessitating perhaps up to 7,000 megawatts of new distributed generation and community solar capacity."

(d) Admit that the Adjustable Block Program referenced in Sections 1-75(c)(1)(C)(i) and 1-75(c)(1)(K) of the Illinois Power Agency Act covers RECs from distributed solar and community solar projects and is separate from utility-scale renewable generation REC procurements referenced in Sections 1-75(c)(1)(C)(i), (c)(1)(G)(i), (c)(1)(G)(ii), (c)(1)(G)(iii), and 1-75(c)(1)(G)(v) of the Illinois Power Agency Act.

(e) Admit that, according to page 150 of the Illinois Power Agency's 2024 LTRRPP, "Illinois Shines" is an alternate name for the Adjustable Block Program.

(f) Admit that at page 148 of the Illinois Power Agency's 2024 LTRRPP, the Illinois Power Agency states that the Adjustable Block Program initially opened in January 2019.

(g) Admit that at page 150 of the Illinois Power Agency's 2024 LTRRPP, the Illinois Power Agency states that the Adjustable Block Program has led "to the energized or planned development of over 1,600 MW of new solar generation in Illinois thus far."

(h) Admit that at page 157 of the Illinois Power Agency's 2024 LTRRPP, the Illinois Power Agency states that the Adjustable Block Program has procured, to date since 2019, new solar projects' RECs totaling approximately 4.1 million annual RECs.

(i) Admit that according to pages 153 (including footnote 293) and 154 of the Illinois Power Agency's 2024 LTRRPP, the Illinois Power Agency has, in program years prior to the 2024-2025 program year, reserved 70% of Adjustable Block Program capacity for distributed and community solar projects in what it calls "Group B," covering Commonwealth Edison transmission territory.

(j) Admit that according to pages 168 and 177 of the Illinois Power Agency's 2024 LTRRPP, the "Public Schools" and "Equity Eligible Contractor" project categories of the Adjustable Block Program both include distributed solar and community solar projects.

(k) Admit that that according to page 158 of the Illinois Power Agency's 2024 LTRRPP, the Illinois Power Agency is reserving, in the Adjustable Block Program, 286 MW combined of community solar and distributed solar project capacity in the Commonwealth Edison transmission region for each of program years 2024-2025 and 2025-2026, plus a separate 391 MW combined of statewide distributed generation and community solar project capacity in each of those two program years.

(l) Admit that according to page 154 of the Illinois Power Agency's 2024 LTRRPP, the annual Adjustable Block Program total statewide capacity was set at 667 MW for program years prior to 2024-2025, and is increasing to 800 MW for program year 2024-2025, because, according to the Illinois Power Agency, "The solar market in Illinois is currently exhibiting immense growth, but the Program's categories [were] not appropriately sized to provide for stable growth within the Program."

Objections:

NIPSCO objects to this Request on the grounds and to the extent that this Request seeks documents or information that are not relevant to the subject matter of this proceeding and are therefore not reasonably calculated to lead to the discovery of admissible evidence.

NIPSCO further objects to subparts (c), (d), (e) – (l) of this Request on the separate and independent grounds and to the extent that this Request seeks publicly available information.

Response:

Subject to and without waiver of the foregoing general and specific objections, NIPSCO is providing the following response:

As noted in NIPSCO's response to CAC Request 23-001, the key findings summarized in slides 7-12 of Confidential Attachment 7-D and those used to support the major conclusions from the Flexible Resource Analysis offered in NIPSCO Witness Augustine's testimony were based on the NIPSCO zonal analysis, which evaluated the frequency, magnitude, and duration of NIPSCO's exposure to the market. The additional system level analysis referred to in CAC Request 23-001 included a broader market-level review, including assumptions for the PJM-ComEd zone in the year 2030.

(a) The market models used for the analysis were consistent with those used to develop market scenarios for NIPSCO's 2021 IRP. As such, PJM's load forecast from 2020 was used for the ComEd Zone. The report can be downloaded here: https://www.pjm.com/-/media/planning/res-adeq/load-forecast/previous-load-forecast-reports.ashx.

(b) As noted in NIPSCO's response to subpart (a) of this request, PJM's load forecast from 2020 was used for the Distributed Solar Adjustment. The relevant Distributed Solar Adjustment can be found on p. 56 of the 2020 load forecast report referenced in NIPSCO's response to subpart (a).

(c) See objections. The document speaks for itself.

(d) The scope and meaning of Illinois law is not relevant. Please see objections.

(e) through (l) See objections. The document speaks for itself.

CAC Request 28-001:

(a) At page 11, lines 9-11 of his rebuttal testimony (NIPSCO Ex. 7-R), Mr. Augustine states that "For modeling purposes, in order to ensure an 'apples-to-apples' comparison with other potential resource options, only the direct costs of the project were included in my analysis."

i. Please confirm that this means that Mr. Augustine's cost modeling as described on page 39 of this direct testimony (NIPSCO Ex. 7) did not include the $83,638,000 of indirect costs contained in NIPSCO Attachment 5-A. If "only the direct costs" (and, by implication, indirect) costs refer to some other amount, identify that amount and the document in which it is located.

ii. In Mr. Augustine's experience, what indirect costs are typically needed for other technology types including wind, solar, and battery storage? Please provide any documents that support your response.

(b) At page 27, lines 3-4 of his rebuttal testimony, Mr. Augustine states that aeroderivative turbines have "faster ramping" than battery storage. Please provide all the documents, with pinpoint citations, that support your position.

Objections:

Response:

(a)

i. Mr. Augustine's direct testimony on page 39 noted that "Based on bids received in the 2022 RFP, the thermal peaker resource incorporated in the preferred portfolio from the 2023 portfolio analysis had an assumed all-in direct capital cost of $1,440/kW." This value of $1,440/kW was used in the 2023 portfolio analysis presented in Mr. Augustine's direct testimony. In addition, on pages 39-40, Mr. Augustine's direct testimony compared this modeling assumption to the direct cost estimate of the CT Project and confirmed consistency, while noting that, "The direct cost estimate, inclusive of AFUDC, for the CT Project is currently estimated to be $560,053,449, which is $1,400/kW for approximately 400 MW." The capital costs used for the new gas peaker capacity in the 2023 portfolio analysis were detailed in CAC Request 3-015 Confidential Attachment A. The capital cost assumptions for new technology additions were

documented in the "Portfolio Inputs -->" tabs. Note that these were presented in 2021$/kW, with the "Inflation" tab providing inflation factors for nominal costs.

ii. As noted in Mr. Augustine's rebuttal testimony at p. 11, "indirect costs are generally ancillary to the core project components and incorporate overheads and other internal allocations." Overheads associated with labor and administrative costs not occurring at the specific project site may be necessary for any resource type, including wind, solar, and battery storage.

(b) This is an inaccurate representation of Mr. Augustine's statement. In referencing CAC Witness Sommer's evaluation of the CT Project relative to battery storage additions, Mr. Augustine's statement at page 27 argues that Witness Sommer should not have relied solely on an ancillary services analysis of frame combustion turbines relative to battery storage when NIPSCO's CT Project includes both frame combustion turbines and aeroderivative turbines. The full context of Mr. Augustine's statement at page 27 from lines 1-4 stated that Witness Sommer's "comparisons with gas peaking technology are based only on the frame combustion turbine technology evaluated in NIPSCO's 2021 IRP without consideration for potential additional value associated with faster ramping and more flexible aeroderivative turbines." Thus, Mr. Augustine's statement noted that aeroderivative turbines are faster ramping *than frame combustion turbines* and did not indicate that aeroderivative turbines are faster ramping than battery storage. In fact, Mr. Augustine acknowledged that "Witness Sommer reasonably points to the potential for greater ancillary services value for battery storage resources" on p. 26 of his direct testimony and would acknowledge that battery storage resources have such potential value as a result of flexibility and fast ramping attributes.

Cause No. 45947
Northern Indiana Public Service Company LLC's
Objections and Responses to
Citizens Action Coalition of Indiana, Inc.'s Thirty-Second Set of Data Requests

CAC Request 32-001:
Re: NIPSCO response to data request CAC 28.01 NIPSCO's response to CAC 28.01(a)(ii) states: "As noted in Mr. Augustine's rebuttal testimony at p. 11, 'indirect costs are generally ancillary to the core project components and incorporate overheads and other internal allocations.' Overheads associated with labor and administrative costs not occurring at the specific project site may be necessary for any resource type, including wind, solar, and battery storage." Please provide specific examples, including all supporting documents, of any indirect costs that Mr. Augustine has not previously included in any prior modeling on NIPSCO's behalf.
Objections:
Response:
In other prior modeling done on NIPSCO's behalf, including the 2018 and 2021 IRPs and the various CPCN applications referenced on p. 3 of Mr. Augustine's direct testimony, capital cost assumptions for new resources were developed from bids received by third-party developers of assets for sale to NIPSCO via Build Transfer Agreements. These capital cost assumptions included only direct costs, and Mr. Augustine's modeling analyses did not include additional indirect cost adders associated with NIPSCO overhead costs and other internal allocations, such as those documented by NIPSCO Witness Baacke in his rebuttal testimony on pages 22 and 23.

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-25-12
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	))))	Order No. 202-25-13

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 20
IURC Schahfer Gas Plant Order

ORIGINAL

Commissioner	Yes	No	Not Participating
Huston	√		
Bennett	√		
Freeman	√		
Veleta	√		
Ziegner	√		

STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

VERIFIED PETITION OF NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC FOR (1) ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY ("CPCN") PURSUANT TO IND. CODE CH. 8-1-8.5 TO CONSTRUCT AN APPROXIMATELY 400 MEGAWATT NATURAL GAS COMBUSTION TURBINE ("CT") PEAKING PLANT ("CT PROJECT"); (2) APPROVAL OF THE CT PROJECT AS A CLEAN ENERGY PROJECT AND AUTHORIZATION FOR FINANCIAL INCENTIVES INCLUDING TIMELY COST RECOVERY THROUGH CONSTRUCTION WORK IN PROGRESS RATEMAKING UNDER IND. CODE CH. 8-1-8.8; (3) AUTHORITY TO RECOVER COSTS INCURRED IN CONNECTION WITH THE CT PROJECT; (4) APPROVAL OF THE BEST ESTIMATE OF COSTS OF CONSTRUCTION ASSOCIATED WITH THE CT PROJECT; (5) AUTHORITY TO IMPLEMENT A GENERATION COST TRACKER MECHANISM ("GCT MECHANISM"); (6) APPROVAL OF CHANGES TO NIPSCO'S ELECTRIC SERVICE TARIFF RELATING TO THE PROPOSED GCT MECHANISM; (7) APPROVAL OF SPECIFIC RATEMAKING AND ACCOUNTING TREATMENT FOR THE CT PROJECT; AND (8) ONGOING REVIEW OF THE CT PROJECT, ALL PURSUANT TO IND. CODE CH. 8-1-8.5 AND 8-1-8.8, AND IND. CODE §§ 8-1-2-0.6 AND 8-1-2-23.	**CAUSE NO. 45947** **APPROVED: OCT 16 2024**

ORDER OF THE COMMISSION

Presiding Officers:
James F. Huston, Chairman
Kristin E. Kresge, Administrative Law Judge

On September 12, 2023, Northern Indiana Public Service Company LLC ("Petitioner" or "NIPSCO") filed its Verified Petition with the Indiana Utility Regulatory Commission ("Commission") seeking, among other relief, a certificate of public convenience and necessity ("CPCN") to construct an approximately 400 megawatt ("MW") natural gas combustion turbine ("CT") peaking plant ("CT Project") pursuant to Ind. Code ch. 8-1-8.5, and associated ratemaking and accounting treatment for the CT Project pursuant to Ind. Code ch. 8-1-8.8.[1]

[1] On August 11, 2023, NIPSCO provided its notice of intent to file an application for a CPCN in accordance with the Commission's General Administrative Order 2023-03.

Also on September 12, 2023, Petitioner filed the testimony and attachments of the following (all of whom are employees of Petitioner except as otherwise noted): Alison M. Becker, Manager of Regulatory Policy (Petitioner's Exhibit 1); David T. Walter, Vice President of Power Delivery (Petitioner's Exhibit 2); David Austin, Director of Transmission (Petitioner's Exhibit 3); Steven Warren, Senior Manager, Sargent & Lundy ("S&L") (Petitioner's Exhibit 4); Greg Baacke, Senior Director of Major Projects (Petitioner's Exhibit 5); Karl E. Stanley, Vice President of Supply & Optimization for NiSource Inc. (Petitioner's Exhibit 6);[2] Patrick N. Augustine, Vice President of Charles River Associates' Energy Practice, Charles River Associates ("CRA") (Petitioner's Exhibit 7); and Kevin J. Blissmer, Manager of Regulatory, NiSource Corporate Services Company ("NCSC") (Petitioner's Exhibit 8).

Petitions to intervene were filed by the Citizens Action Coalition of Indiana, Inc. ("CAC"); NIPSCO Industrial Group ("IG"); United Steel, Paper and Forestry, Rubber, Manufacturing, Energy, Allied Industrial and Service Workers International Union AFL-CIO/CLC and its Locals 12775 and 13796 ("USW"); and Primary Energy Recycling Holdings LLC ("Primary Energy"), all of which were granted.

On December 18, 2023, Petitioner filed an Agreed Modification to Procedural Schedule, which was granted by docket entry dated January 25, 2024.

On January 16, 2024, Petitioner filed the supplemental testimony and attachments of Ms. Becker (Petitioner's Exhibit 1-S), Mr. Walter (Petitioner's Exhibit 2-S), Mr. Baacke (Petitioner's Exhibit 5-S), Mr. Stanley (Petitioner's Exhibit 6-S), Mr. Augustine (Petitioners Exhibit 7-S), and Mr. Blissmer (Petitioner's Exhibit 8-S). The supplemental testimony reflected a one-year delay of the in-service date of the proposed CT Project.

On February 9, 2024, Petitioner filed an Agreed Modification to Procedural Schedule, which was granted by docket entry dated February 20, 2024.

A public field hearing was held in LaPorte, Indiana on March 14, 2024, during which members of the public presented testimony related to the relief sought in this Cause.

On April 16, 2024, the Indiana Office of Utility Consumer Counselor ("OUCC") filed the testimony and attachments of its witnesses, all of whom are employees of the OUCC's Electric Division: Cynthia M. Armstrong, Assistant Director (Public's Exhibit 1); John W. Hanks, Utility Analyst (Public's Exhibit 2); Roopali Sanka, Utility Analyst (Public's Exhibit 3); Gregory L. Krieger, Utility Analyst (Public's Exhibit 4); and Brittany L. Baker, Utility Analyst (Public's Exhibit 5). Also on that date, intervenors filed the testimony and attachments of their witnesses, including the following: Michael P. Gorman, Managing Principal, Brubaker and Associates, Inc. (IG Exhibit 1); Anna Sommer, Principal, Energy Futures Group (CAC's Exhibit 1); Robert G. James, Managing Director, Lumen Project Management Consultants (CAC's Exhibit 2); and Benjamin Inskeep, Program Director of CAC (CAC's Exhibit 3). USW did not file testimony. Primary Energy intervened after the deadline for intervenor testimony; therefore, Primary Energy

[2] Petitioner originally prefiled the Verified Direct Testimony of Andrew S. Campbell. NIPSCO filed a Notice of Substitution of Witness on January 16, 2024.

was precluded from filing testimony.

The OUCC also filed written consumer comments on April 19, 2024 (Public's Exhibit 6).

On May 21, 2024, NIPSCO filed the rebuttal testimony and attachments of Ms. Becker (Petitioner's Exhibit 1-R),[3] Mr. Warren (Petitioner's Exhibit 4-R), Mr. Baacke (Petitioner's Exhibit 5-R), Mr. Stanley (Petitioner's Exhibit 6-R), Mr. Augustine (Petitioner's Exhibit 7-R), Mr. Blissmer (Petitioner's Exhibit 8-R), and Stephen Holcomb, Director of Environmental Policy & Sustainability, NCSC, (Petitioner's Exhibit 9-R).

On June 17, 2024, NIPSCO filed revisions to reflect the marking of various confidential information in its case-in-chief, supplemental direct testimony, and rebuttal testimony from confidential to highly confidential.

On July 8, 2024, the Presiding Officers issued a docket entry question, to which NIPSCO responded on July 8, 2024.

The evidentiary hearing in this matter commenced on July 11, 2024, at 9:30 a.m. in Room 222 of the PNC Center, 101 W. Washington Street, Indianapolis, Indiana, at which time evidence was offered by NIPSCO, the OUCC, CAC, and IG without objection. Among the evidence offered at the hearing were certain stipulations between Petitioner and various intervenors with respect to certain facts and admissibility of specific exhibits, all of which were prefiled before the evidentiary hearing.

Based upon the applicable law and the evidence of record, the Commission finds:

1. Notice and Commission Jurisdiction. Due, legal, and timely notice of the public field hearing and evidentiary hearing in this Cause was given and published as required by law. NIPSCO is a "public utility" as defined in Ind. Code § 8-1-2-1(a) and Ind. Code § 8-1-8.5-1, an "energy utility" as defined in Ind. Code § 8-1-8.4-3, and an "eligible business" as defined in Ind. Code § 8-1-8.8-6. Pursuant to Ind. Code chs. 8-1-8.4 and 8-1-8.5, Petitioner may seek Commission approval of the CPCN requested in this Cause. Under applicable law, the Commission has jurisdiction over Petitioner and the relief sought by Petitioner in this Cause.

2. Petitioner's Characteristics. NIPSCO is a public utility with its principal office and place of business at 801 East 86th Avenue, Merrillville, Indiana. NIPSCO provides electric utility service to the public in all or part of Benton, Carroll, DeKalb, Elkhart, Fulton, Jasper, Kosciusko, LaGrange, Lake, LaPorte, Marshall, Newton, Noble, Porter, Pulaski, Saint Joseph, Starke, Steuben, Warren and White Counties in northern Indiana.

NIPSCO owns, operates, manages, and controls electric generating, transmission and distribution plant and equipment and related facilities, which are used and useful in the production, transmission, distribution and furnishing of electric energy, heat, light and power to the public.

[3] Petitioner originally prefiled the Verified Rebuttal Testimony of Robert C. Sears. NIPSCO filed a Notice of Substitution of Witness on May 29, 2024.

3. Relief Requested. In this Cause, NIPSCO requests the Commission (1) issue a CPCN pursuant to Ind. Code ch. 8-1-8.5 to construct the CT Project; (2) approve the CT Project as a clean energy project and authorize financial incentives, including timely cost recovery through construction work in progress ("CWIP") ratemaking under Ind. Code Ch. 8-1-8.8; (3) authorize recovery of costs incurred in connection with the CT Project; (4) approve the best estimate of costs of construction associated with the CT Project; (5) authorize implementation of a Generation Cost Tracker ("GCT") Mechanism; (6) approve changes to NIPSCO's Electric Service Tariff relating to the proposed GCT Mechanism; (7) approve specific ratemaking and accounting treatment for the CT Project; and (8) approve ongoing review of the CT Project, all pursuant to Ind. Code ch. 8-1-8.5 and 8-1-8.8, and Ind. Code §§ 8-1-2-0.6 and 8-1-2-23.

4. The Parties' Evidence.[4]

A. Petitioner's 2021 IRP and 2023 Portfolio Analysis. Mr. Augustine provided an overview of NIPSCO's resource planning process and reviewed the conclusions from the last several years, particularly its most recent the Integrated Resource Plan ("IRP") submitted November 15, 2021 (the "2021 IRP"). He also reviewed major market developments since the 2021 IRP and summarized the portfolio analysis that CRA and NIPSCO performed in 2023 based on these major market developments (the "2023 portfolio analysis"). Mr. Augustine stated the CT Project is consistent with the Short-Term Action Plan identified in the 2021 IRP and supported by additional analyses NIPSCO has performed.

Mr. Augustine testified the operational and cost characteristics of the CT Project are fully consistent with the assumptions for new peaking thermal resources used in the 2023 portfolio analysis, which developed a preferred portfolio with between 400 MW and 442 MW of new nameplate thermal peaking capacity additions in the near-term. He stated NIPSCO's Flexible Resource Analysis concluded that increasing the amount of long-duration dispatchable capacity above the 300 MW identified in NIPSCO's 2021 IRP will contribute to risk mitigation for customers, and the 2023 portfolio analysis demonstrated NIPSCO can achieve cost savings for customers relative to the 2021 IRP's preferred portfolio by pivoting towards a larger-sized, cost-effective thermal resource as compared to expensive storage additions.

Mr. Augustine testified that overall, the addition of the CT Project to NIPSCO's portfolio is fully supported by and consistent with the conclusions of the Flexible Resource Analysis, the 2023 portfolio analysis, and the flexibility embedded in the short-term action plan from NIPSCO's 2021 IRP.

In his supplemental testimony, Mr. Augustine presented updated information from Midcontinent Independent System Operator ("MISO") related to planning reserve margin requirements ("PRMR"), capacity accreditation, and NIPSCO's supply and demand balance. He explained that while the 2021 IRP and the 2023 portfolio analysis both incorporated the assumption that new gas peaking capacity would be in service in 2026, NIPSCO's 2021 IRP explicitly called for the procurement of short-term capacity as needed from the MISO market, and

[4] Unless otherwise noted, the summary below reflects updated information included in NIPSCO's supplemental testimony and attachments of Ms. Becker (Petitioner's Exhibit 1-S), Mr. Walter (Petitioner's Exhibit 2-S), Mr. Baacke (Petitioner's Exhibit 5-S), Mr. Stanley (Petitioner's Exhibit 6-S), Mr. Augustine (Petitioners Exhibit 7-S), and Mr. Blissmer (Petitioner's Exhibit 8-S) filed January 16, 2024.

the 2023 portfolio analysis included an expectation that short-term capacity purchase opportunities would be pursued through 2027. Therefore, a 2027 in-service date for the CT Project, accommodated by capacity market purchases to meet reserve margin requirements, remains consistent with NIPSCO's most recent resource planning conclusions. Mr. Augustine testified the change in in-service date does not impact the operational and cost characteristics of the CT Project, which were shown to be fully consistent with the assumptions for new peaking thermal resources used in the 2023 portfolio analysis. He explained that based on the latest information from MISO regarding PRMR and capacity accreditation, the capacity purchase requirements through 2027 should be manageable and in line with historical levels, although NIPSCO will need to continue to actively monitor market conditions and evolving MISO rules as part of its ongoing capacity procurement plans. Mr. Augustine concluded the addition of the CT Project to NIPSCO's portfolio continues to be fully supported by and consistent with the conclusions of NIPSCO's Flexible Resource Analysis, the 2023 portfolio analysis, and the flexibility embedded in the short-term action plan from NIPSCO's 2021 IRP.

OUCC witness Mr. Hanks had concerns that NIPSCO's incorporation of misaligned results of an all-source request for proposal ("RFP") – together with an RFP that solicited bids for a particular technology configuration – inflates the cost of the thermal peaking resource incorporated into the 2023 portfolio analysis, which could potentially to distort the results of the resource selection process used within the IRP. Mr. Hanks argued the costs used for new generic peaking capacity in the 2023 portfolio analysis were artificially inflated, making NIPSCO's estimate for the CT Project appear more reasonable, and that NIPSCO inappropriately combined the results of an all-source RFP and a technology and configuration restricted RFP. Mr. Hanks also suggested that the $1,400/kW metric for capital costs for the CT Project used in NIPSCO's analysis understated the costs of the project by excluding $83.68 million in indirect costs. Mr. Hanks testified that the $/kW metric is more accurately reflected as $1,609/kW.

CAC witness Ms. Sommer noted the Flexible Resource Analysis did not quantify the cost of NIPSCO's potential market price risk exposure or compare the costs of resources that could reduce the net load exposure. Ms. Sommer argued there was no evaluation of an alternative approach to mitigate potential risks identified in the Flexible Resource Analysis, such as a portfolio with battery storage and more demand response. Ms. Sommer suggested that under the proposed direct loss of load ("DLOL") structure, battery resources will have stronger capacity accreditation than natural gas peaker resources. Ms. Sommer stated NIPSCO's capacity calculations overstate both summer and winter accreditation for the proposed natural gas peaker resource, while understating the value of battery storage resources. Ms. Sommer performed a levelized cost analysis to compare the costs of NIPSCO's proposed CT Project with potential battery storage capacity at the existing Schahfer site to suggest that new battery additions would be lower cost than NIPSCO's proposed CT Project.

IG witness Mr. Gorman stated that, instead of relying on a complete, or updated IRP, NIPSCO based the request for a 400 MW CT on a Flexible Resource Study. Mr. Gorman suggested NIPSCO failed to consider the introduction of MISO's seasonal resource construct and that NIPSCO has not fully evaluated its resource obligations at various times of the year. Mr. Gorman testified that NIPSCO failed to account for the expected changes in Rate 531 Tier 1 demand and has therefore failed to "right size" the CT Project.

In rebuttal, Mr. Augustine testified that while the OUCC and intervenors directly and implicitly challenge the size and technology composition of NIPSCO's proposed CT Project, no one testified NIPSCO does not need this type of new capacity, which was identified in its 2021 IRP and in the subsequent analyses. Mr. Augustine addressed the OUCC and intervenors' testimonies in relation to the 2023 portfolio analysis, the Flexible Resource Analysis, NIPSCO's future supply-demand balance, and additional analysis and considerations that were introduced.

Mr. Gorman testified that instead of relying on a complete, or updated IRP, NIPSCO based the request for a 400 MW CT on a Flexible Resource Study, Mr. Augustine responded that Mr. Gorman provided an incomplete characterization of the analysis NIPSCO performed in support of its requested CPCN. He stated that the Flexible Resource Analysis was only one component of the further diligence NIPSCO performed on the preferred portfolio from its 2021 IRP. He said that although the conclusions from the Flexible Resource Analysis supported and contributed to NIPSCO's sizing decision for the CT Project, NIPSCO also performed a 2023 portfolio analysis to assess the performance of alternative portfolio options against updated market conditions and the latest available information.

Mr. Gorman suggested NIPSCO failed to consider the introduction of MISO's seasonal resource construct and that NIPSCO has not fully evaluated its resource obligations at various times of the year. Mr. Augustine responded that although MISO's seasonal construct was implemented after the submission of NIPSCO's 2021 IRP, NIPSCO anticipated this change and evaluated seasonal peak load forecasts and seasonal capacity ratings for resource options in its 2021 IRP to develop portfolios based on capacity requirements for both the summer and winter seasons. He also stated NIPSCO's 2023 portfolio analysis incorporated updated seasonal reserve margin targets and seasonal accredited capacity levels that were published after the Federal Energy Regulatory Commission ("FERC") approved MISO's seasonal construct. He testified higher winter reserve margin targets contributed to higher requirements for dispatchable thermal or storage capacity additions in the 2023 portfolio analysis relative to the levels evaluated in NIPSCO's 2021 IRP, which was directly accounted for in the portfolio construction.

Ms. Sommer's testified she did not perform independent modeling in part due to concerns the portfolios that were examined included projects that NIPSCO has canceled. Mr. Augustine responded that while some of the portfolios did include projects that had been canceled, preferred Portfolio 3 was explicitly developed to incorporate the risk of project cancellations, specifically the potential loss of four out of ten or 700 MW of solar and 30 MW of storage of NIPSCO's current solar and solar plus storage projects. He stated that consistent with these assumptions, NIPSCO has since filed termination notices for these four projects and has used the 2023 portfolio analysis to support replacement of these projects with incremental wind and solar capacity,[5] as explicitly modeled in preferred Portfolio 3 and approved by the Commission.

Mr. Hanks argues the costs used for new peaking capacity in the 2023 portfolio analysis were artificially inflated and that NIPSCO inappropriately combined the results of an all-source RFP and a technology and configuration restricted RFP. Mr. Augustine responded that Mr. Hanks

[5] NIPSCO filed a CPCN for the 200 MW Appleseed solar project and the 200 MW Templeton wind project in Cause No. 45887 (approved September 13, 2023) and a CPCN for the 200 MW Carpenter wind project in Cause No. 45908 (approved October 18, 2023).

appeared to misunderstand what NIPSCO requested in the two RFPs that were issued in 2022, as well as the types of bids that were received. As a result, he argued the comparisons Mr. Hanks attempted to make are inappropriate. He stated that contrary to Mr. Hanks' claims, NIPSCO's Schahfer Development or Engineering, Procurement, and Construction ("EPC") RFP was not technology and configuration restricted. He explained while NIPSCO did require a dispatchable, blackstart-capable resource at the Schahfer site with several other performance criteria, no restrictions were placed on the technology and configurations that could be proposed by bidders, and bids into this RFP were used by NIPSCO and CRA to arrive at the $1,440/kW direct capital cost number presented in his direct testimony and in the 2023 portfolio analysis.

Mr. Augustine testified Mr. Hanks' criticism that the capital costs for the CT Project used in his analysis understate the costs of the project by excluding indirect costs is misplaced. He stated that for modeling purposes, to ensure an "apples-to-apples" comparison with other potential resource options, only the direct costs of the project were included in his analysis, which is both commonplace and appropriate. He explained that while NIPSCO includes indirect costs in the overall project cost estimate, these costs are generally ancillary to the core project components and incorporate overheads and other internal allocations. He testified that including these company-specific indirect costs in weighing resource options would serve only to skew the results and the purpose of the portfolio and revenue requirement modeling analysis he performed is primarily to compare costs of resource options; therefore, excluding indirect costs provides a direct cost comparison, which is a more meaningful and reasonable approach.

Ms. Sommer testified the Flexible Resource Analysis did not quantify the cost of NIPSCO's potential market price risk exposure or compare the costs of resources that could reduce the net load exposure. Mr. Augustine responded that the Flexible Resource Analysis was designed to assess the energy adequacy and flexibility characteristics of NIPSCO's preferred portfolio from the 2021 IRP and to analyze and characterize the potential for market exposure risk. He stated that as Ms. Sommer correctly points out, the Flexible Resource Analysis was not an economic assessment, but a means of assessing the magnitude, frequency, and duration of market exposure risk and the overall ability for NIPSCO's portfolio to be positioned to respond to evolving market conditions and bring its fair share of reliability attributes to the system in the face of uncertain MISO rules. Mr. Augustine testified although NIPSCO did not quantify the costs of market exposure risk in the Flexible Resource Analysis, the key outcomes are supportive of the fact that additions of long-duration dispatchable capacity like the CT Project will improve reliability and reduce market exposure cost risk for customers, which Ms. Sommer did not challenge.

Mr. Augustine testified Ms. Sommer's argument that there was no evaluation of an alternative approach to mitigate potential risks identified in the Flexible Resource Analysis is inaccurate. He stated that in addition to the resource attribute needs identified in the Flexible Resource Analysis, NIPSCO's 2023 portfolio analysis specifically evaluated a portfolio with additional battery storage resources and no new thermal peaking capacity to assess the economic tradeoffs relative to the portfolio that contained the new peaker, and that it concluded the portfolio with new peaking capacity was lower cost for customers. He noted NIPSCO's 2021 IRP did the same and concluded that the portfolio with new peaker capacity performed similarly or better on cost-based metrics than a portfolio relying only on storage and best on the reliability metrics. Mr. Augustine testified NIPSCO has performed multiple evaluations to assess alternative approaches and arrive at its preferred portfolio with the CT Project.

Mr. Gorman testified NIPSCO has failed to account for the expected changes in Rate 531 Tier 1 demand and has therefore failed to "right size" the CT Project. Mr. Augustine explained NIPSCO's 2021 IRP did evaluate a scenario with the exact reduction in Tier 1 demand commitments suggested by Mr. Gorman. Mr. Augustine noted NIPSCO incorporated the potential for additional industrial load migration to the new industrial rate service structure. The scenario incorporated a reduction of firm industrial load in Rate 831 down to 70 MW. He further explained that NIPSCO's 2021 IRP shows its preferred portfolio performed well under these assumptions.

Ms. Sommer proposes battery storage and demand response resources be deployed because these resources can be added quicker than the CT project can be built. Mr. Augustine testified while development and deployment timelines will vary by resource, NIPSCO's preferred portfolio from its 2021 IRP and 2023 portfolio analysis contemplated new battery storage and demand side management resource additions by 2028, and he expects additional capacity additions will be identified as NIPSCO continues its ongoing resource planning activities in 2024 and beyond. He explained the resource is expected to be in service by the end of 2027, in advance of the 2028/29 planning year when the MISO rules are due to change, and the resource offers a firm, dispatchable addition to NIPSCO's portfolio that will help fill the existing and emerging capacity gap.

Mr. Augustine disagreed with Ms. Sommer's suggestion that battery resources will have stronger capacity accreditation than natural gas peaker resources and her statement that NIPSCO's capacity calculations overstate summer and winter accreditation for the proposed natural gas peaker resource, while understating the value of battery storage resources. He testified future capacity accreditations under D-LOL remain too uncertain to definitively make such a claim, and the forward-looking information published by MISO is supportive of the assumptions used in NIPSCO's 2023 portfolio analysis, which included stable accreditation for gas resources and declining accreditations for four-hour battery storage resources over time.

In response to Ms. Sommer's levelized cost analysis, which compared the costs of NIPSCO's proposed CT Project with potential battery storage capacity at the existing Schahfer site and suggested that new battery additions would be lower cost than NIPSCO's proposed CT Project, Mr. Augustine opined that while levelized cost analysis can be a useful way of comparing resource options, Ms. Sommer's calculations were not performed correctly, nor do they replace the 2023 portfolio analysis performed by NIPSCO and CRA, which aimed to provide a more holistic comparison of NIPSCO's preferred portfolio concept versus one that relies primarily on new storage additions. Mr. Augustine described a significant calculation error and several limitations relative to the 2023 portfolio analysis in Ms. Sommer's analysis.

Mr. Hanks' and Ms. Sommer's oppose NIPSCO's application in part because of the cost of the aeroderivative turbine component, and Mr. Hanks' argues NIPSCO has not established that the benefits of aeroderivative units are worth the higher cost relative to industrial frame units. Mr. Augustine testified NIPSCO's 2021 IRP and Flexible Resource Analysis are supportive of resource additions with the attributes of the aeroderivative turbines. He explained in NIPSCO's 2021 IRP, the ancillary services valuation and the reliability assessment highlighted the need for certain attributes like fast ramping capability, particularly as the MISO markets evolve, and that NIPSCO's Flexible Resource Analysis identified growing 3-hour and 10-minute ramping requirements by 2030.

B. <u>CT Project</u>. In her direct testimony, Ms. Becker explained how NIPSCO supported, through sufficient evidence, the statutory requirements for the issuance of a CPCN, including financial incentives, under Ind. Code §§ 8-1-8.5-4, 8-1-8.5-5, and 8-1-8.8-11. She sponsored Attachment 1-A showing each element of Ind. Code §§ 8-1-8.5-4, 8-1-8.5-5, and ch. 8-1-8.8 and identified the NIPSCO witness with supporting testimony.

Ms. Becker explained how NIPSCO supported the requirements set out in Ind. Code § 8-1-2-0.6. She sponsored Attachment 1-C showing each of the Five Pillars, which includes reliability, affordability, resiliency, stability, and environmental sustainability. and identified the NIPSCO witness with supporting testimony. She also explained how NIPSCO has addressed the guidelines for additional evidence to be provided pursuant to IURC GAO 2022-01. She sponsored Attachment 1-D providing the required information as it pertains to NIPSCO's request for approval under Ind. Code chs. 8-1-8.5 and 8-1-8.8 in this Cause. She also sponsored Attachment 1-G, which is the Affidavit of Andy Witmeier, Director of Resource Utilization for MISO, providing a qualitative assessment regarding the new generation, including NIPSCO's request to MISO. In her supplemental testimony, Ms. Becker described NIPSCO's follow-up contact with MISO considering the shift in the in-service date.

Ms. Becker testified NIPSCO followed the guidelines applicable to applications for a CPCN established in the Commission's General Administrative Order 2023-03 ("GAO 2023-03"). She sponsored NIPSCO's notice of its intent to file an application for a CPCN as Attachment 1-E. She also testified NIPSCO met to discuss its filing with the Commission on May 8, 2023, the OUCC on May 24, 2023, and CAC on July 12, 2023. She sponsored an index of issues and identification of the witness(es) addressing each of the issues as Attachment 1-F.

As it relates to the statutory requirements set out in Ind. Code § 8-1-8.5-4, Ms. Becker addressed the requirement to consider conservation and load management. She testified that based on her experience with NIPSCO's energy efficiency ("EE") initiatives, NIPSCO could not derive sufficient energy savings from EE to replace Schahfer. She said NIPSCO is committed to the development of demand response programs for all customer groups but concluded that demand response would not eliminate the need for the CT Project, and, based on how such plants are constructed, would likely not reduce the size of the project.

Mr. Walter described NIPSCO's current generation fleet and explained the ultimate portfolio NIPSCO currently expects to have in place to serve its customers after its coal-fired generating units are retired over the next five years. He opined the CT Project is a clean energy project as that term is defined in Ind. Code § 8-1-8.8-2. He addressed how the proposed construction of the CT Project relates to the Five Pillars outlined in Ind. Code § 8-1-2-0.6.

Mr. Austin explained NIPSCO's gas distribution system as it relates to the CT Project, the quick-start, fast-ramping, and other important capabilities of the CT Project at the Schahfer site, and the CT Project's contribution to NIPSCO's system reliability.

Mr. Warren sponsored the Engineering Study prepared by S&L, which set forth the Class 3 cost estimate for NIPSCO's proposed simple cycle gas turbine project that was used by NIPSCO to develop its best estimate of the costs of the proposed CT Project. He presented information regarding the engineering work completed by S&L in support of NIPSCO's request for approval

of a new peaker power plant to be located at the Schahfer site.

Mr. Baacke explained the CT Project, including key specifications and characteristics, the approach to configuration selection and the contracting strategy for the CT Project. He also provided the project schedule and the best estimate of costs of construction. He explained the CT Project is planned to be approximately 400 MW, consisting of one larger industrial frame unit with three smaller aeroderivative or similarly sized industrial frame units (dependent on the results of the CT original equipment manufacturer ("OEM") bid event). Finally, he discussed how the CT Project satisfies Ind. Code § 8-1-8.5-5(e).

Mr. Stanley discussed: (1) how the CT Project will interconnect into the MISO market through the replacement generation interconnection process, (2) NIPSCO's need for capacity from a peaking unit, and (3) how NIPSCO will procure gas supply for the Project at the lowest reasonable cost. Finally, he discussed how the CT Project is consistent with the resource alternatives that must be evaluated under Ind. Code § 8-1-8.4-4.

i. Best Estimate. In his direct testimony, Mr. Baacke stated NIPSCO employed S&L to help develop a scope of work to obtain preliminary quotes for major equipment during the engineering study phase to support the cost estimate shown in Appendix 20 of the Engineering Study (Highly Confidential Attachment 4-A). He stated S&L then supported NIPSCO by drafting technical specifications for the EPC RFP. He said the cost estimated by S&L was compared to the costs for gas-fired projects bid into the EPC RFP. He explained that after NIPSCO elected to move forward with the self-build option to capture cost savings and other advantages, S&L developed technical specifications to support a competitive bid event for the procurement of turbines for the CT Project that occurred in June 2023 (the "turbine equipment RFP") with bids received August 7, 2023. He indicated that similar competitive bid events are planned to be completed for other major equipment as well as major construction contracts.

Mr. Baacke testified the EPC RFP was issued in Fall 2022, seeking bids for projects between 370 MW to 450 MW. He stated technical specifications for the EPC RFP were drafted because of the work previously performed in collaboration with S&L during the engineering study phase. He testified bidders were requested to provide proposals with a combination of industrial frame and aeroderivative combustion turbines meeting specific performance criteria. He explained the performance criteria included desired machine sizing, cold start timing, ramp rates, minimum emission compliant loads, emission limits, remote start and operational capabilities, and other reliability capabilities.

Mr. Baacke described the results of the proposals were received from three bidders. One bid did not meet the performance criteria of the technical specifications and provided less than five pages of information and was not evaluated for further consideration. A second bid provided a proposal that consisted of ten refurbished aeroderivative turbines which did not align with the RFP criteria or the performance criteria of the technical specifications. A third bid aligned with the technical specifications however, the proposal price was $100 million more than the self-build option costs of construction. He testified NIPSCO ultimately chose the self-build option, which is in the best interest of NIPSCO and its customers.

Mr. Baacke described the procurement and bid process NIPSCO is using to purchase equipment for the CT Project. He stated NIPSCO plans to utilize a multi-prime contracting strategy for the CT Project, which is different from an engineering, procurement, and construction contracting strategy in which a single entity would be utilized to perform all engineering, procurement, construction, and start up and commissioning activities to complete the project. He stated NIPSCO plans to hold competitive bid events whenever practical for major equipment such as generator step-up transformers, unit auxiliary transformers, generator circuit breakers, switchgear, and other associated auxiliary equipment and to procure smaller equipment and materials through preferred suppliers that were identified through prior strategic sourcing events.

Mr. Baacke testified NIPSCO's multi-prime contracting strategy applies to construction on the CT Project as well. He stated NIPSCO plans to develop bid packages to competitively bid the three major scopes of construction in 2024: (1) site preparation/civil construction contract, (2) general works construction contract, and (3) an electrical installation contract. Mr. Baacke testified that under this planned construction and bid process, NIPSCO will have allowed third parties to submit firm and binding bids for the construction of the CT Project on NIPSCO's behalf that meet all the technical, commercial and other specifications so as to enable ownership of the CT Project to vest with NIPSCO not later than the date the facility becomes commercially available.

Mr. Baacke testified the best estimate of the total cost of construction for the CT Project is $641,223,000, which includes indirect costs but excludes allowance for funds used during construction ("AFUDC"). He explained NIPSCO will accrue AFUDC associated with the CT Project costs based upon the amounts at the time such costs or charges are incurred. He stated that based upon estimates of AFUDC at the time of this filing, the total estimated cost, including AFUDC of $2,468,449, is $643,691,449.[6] Mr. Baacke stated the cost estimate was developed with the support of S&L. Mr. Baacke sponsored the best estimate of cost summary in Attachment 5-A as well as a more detailed estimate of cost summary in Confidential Attachment 5-B.

In his supplemental direct testimony, Mr. Baacke discussed supply chain challenges that affected the project schedule and how NIPSCO's election to self-build utilizing a multi-prime contracting strategy has allowed NIPSCO to pivot in the face of these challenges without a presently anticipated impact to the best estimate. He sponsored an updated CT Project schedule and best estimate of costs of construction.

Mr. Baacke stated NIPSCO's originally estimated in-service date for end of year 2026 was with the understanding the CT Project must be in service no-later-than end of year 2027 due to planned retirements in 2028. He explained this timeline included some flexibility as is typical for significant construction projects, especially given supply chain challenges are more commonplace since COVID-19. He stated that based on the expectation that the combustion turbines and generation step-up transformers would be the longest lead time equipment, NIPSCO went out for bid on these components before filing its request for a CPCN and noted NIPSCO was still evaluating the information received from the bid events, including ongoing conversations with suppliers. Mr. Baacke testified NIPSCO's election to self-build with a multi-prime contracting

[6] NIPSCO Witness Mr. Blissmer testified that if NIPSCO's proposed CWIP ratemaking is approved, AFUDC is projected to be very limited, and would include only actual AFUDC accrued to date and through the effective date of the GCT Mechanism, expected to be in October 2024.

strategy was beneficial in the face of these supply chain challenges because it allowed NIPSCO to pivot without a presently anticipated impact to the best estimate. He noted other contracting structures, such as with an EPC contractor, would likely have required the execution of a change order to shift the in-service date to end of year 2027 and increased costs as a result. Additionally, he stated NIPSCO was able to secure a favorable procurement timeframe for generator step-up transformers due to its vendor relationship.

In his supplemental testimony, Mr. Baacke testified the best estimate of the total cost of construction for the CT Project remains at $641,223,000, which includes indirect costs but excludes AFUDC. He explained NIPSCO will accrue AFUDC associated with the CT Project costs based upon the amounts at the time such costs or charges are incurred. Based upon estimates of AFUDC at the time of this supplemental filing, Mr. Baacke testified the total estimated cost, including AFUDC of $1,531,039, is $642,754,039.

OUCC witness Ms. Armstrong recommended costs associated with certain pollution control technology be removed from the CT Project best estimate. Ms. Armstrong stated NIPSCO can seek approval of any future pollution control costs as federally mandated costs under the Federal Mandate Statute at Ind. Code ch. 8-1-8.4. Ms. Armstrong stated the OUCC does not consider NIPSCO's request for the CT Project, as currently proposed, to be affordable.

OUCC witness Mr. Hanks stated NIPSCO's best estimate potentially double counts indirect costs. Mr. Hanks stated NIPSCO did not justify a 5% escalation factor and recommended its proposed escalation be reduced to 3% to match its electric Transmission, Distribution, and Storage System Improvement Charge ("TDSIC") Plan. Mr. Hanks compared the cost of NIPSCO's proposed CT Project to average technology costs from the U.S. Energy Information Administration's ("EIA") Annual Energy Outlook of 2023 and to the cost of CEI South's CTs.

OUCC witness Mr. Krieger stated the OUCC is concerned with NIPSCO's estimated owner's costs. He believed NIPSCO's application of a simple nine percent is not supported or justified for a complex project. Mr. Krieger believed the owner's costs would be significantly less when an EPC contractor is hired.

IG witness Mr. Gorman stated NIPSCO's cost estimate should be rejected because it is not based on firm pricing because of competitive bids received from contractors, but rather on preliminary market analysis of the expected costs.

CAC witness Ms. Sommer argued for prejudgment of the prudency of certain actions and prospective disallowance of costs. Ms. Sommer argues for a cost cap on project costs. Ms. Sommer recommended denial of NIPSCO's request based on the cost of the aeroderivative turbines. Ms. Sommer recommended that costs to serve customers in order to accommodate a delay in the online date of the CT Project be disallowed including but not limited to capacity and energy costs.

Mr. Baacke disagreed with CAC witness Mr. James' assertion that a self-build approach is not in customers' best interests and adds significant risk to the Project cost. He testified NIPSCO has experience with both EPC and multi-prime contracts and provided some of NIPSCO's history of successfully executing on large and complex projects below.

In response to several witnesses claims that entering an EPC contract can mitigate cost risk and multi-prime contracting may translate into additional ratepayer costs, Mr. Baacke testified that while EPC contracts can provide some benefits, the parties fail to appreciate that, to create certainty, an EPC contractor is paid for risks that could potentially be avoided, mitigated, or not occur at all. Mr. Baacke testified that both contracting strategies have benefits and the potential for increased costs; however, for the CT Project, and after careful consideration, NIPSCO determined the multi-prime contracting strategy offers a greater potential for savings on the overall cost of the project, especially when managed effectively and scoped accurately.

OUCC witness Mr. Krieger and CAC witness Mr. James claim NIPSCO does not have experience building gas-fired generation projects of this scale and are concerned NIPSCO lacks large project management experience. Mr. Baacke explained NIPSCO is leveraging engineering firms including S&L, construction contractors, and suppliers, including the original equipment manufacturer ("OEM"), who have completed comparable projects. He testified NIPSCO's Major Projects team has completed a number of projects of varying complexity, including several projects that are first of their kind or one-of-a-kind projects and at the time of completion, within the industry.

Mr. Baacke testified Mr. Krieger's review of the accuracy as a percentage of budget for each project that he has served a major role is not a fair and complete picture of his project management experience. This review only shows the project variances in absolute dollars, which ignores the variances on these projects have been both higher and lower than the original budgets. He stated that in relative dollars, NIPSCO's original budgets versus actual costs for the referenced projects shows that, on an overall original budget of $1.41 billion, projects that have been completed under Mr. Baacke's direction and supervision reflect a negative variance of approximately -2.4%. This data reflects NIPSCO's commitment to manage the construction of the CT Project such that the Project is executed on time and on budget.

Mr. Baacke clarified S&L's scope of work in the CT Project. He stated S&L has also been contracted by NIPSCO to complete the detailed design for the CT Project. He testified NIPSCO plans to contract with S&L to provide onsite support during construction, start up and testing to provide quality assurance and quality control during installation. Mr. Baacke testified the costs associated with these additional services is included in NIPSCO's best estimate.

Mr. Baacke sponsored Attachment 5-R-A and Confidential Attachment 5-R-B showing the best estimate of the total cost of construction for the CT Project remains at $641,223,000, which includes indirect costs but excludes AFUDC. He explained NIPSCO will accrue AFUDC associated with the CT Project costs based upon the amounts at the time such costs or charges are incurred and that based upon estimates of AFUDC at the time of this rebuttal filing, the total estimated cost, including AFUDC of $2,680,234, is $643,903,234.

Mr. Baacke emphasized NIPSCO's best estimate although reasonable, is still an estimate; customers will pay the actual costs of the CT Project. He testified that prices for practically all products and materials in the U.S. are increasing, including the key equipment needed to construct the CT Project; this is an undeniable macroeconomic fact, which is beyond NIPSCO's control. He testified NIPSCO ran a competitive RFP, engaged S&L to assist with engineering and cost estimation, chose a multi-prime contracting approach which was $100 million lower in cost than

any viable EPC option, and brought a reasonable, best estimate to the Commission to support a finding of best estimate of costs in this proceeding.

ii. Configuration and Competitive Procurement. Mr. Baacke testified the CT Project is expected to consist of one larger industrial frame unit with three smaller aeroderivative or similarly sized industrial frame units. He explained NIPSCO is targeting an F Class combustion turbine for the larger industrial frame turbine, which has been on the market for over 30 years and has a proven history of solid, reliable performance. General Electric's F Class combustion turbine has been upgraded to its 7FA.05 model with power output and heat rate values at ISO conditions of approximately 239 MWs and 8,871 btu/kWh (LHV) and shorter start times to as little as 11 minutes and ramp rates as high as 50 MWs per minute. Similar performance exists for Siemens Energy's SGT6-5000F combustion turbine. Larger industrial frame units typically have a lower capital cost per kilowatt to install, require fewer machines, and generally have longer intervals between maintenance when compared to aeroderivative turbines.

He explained NIPSCO is including three smaller aeroderivative or similarly sized industrial frame turbines in the CT Project. Aeroderivative turbines are typically more efficient, start faster and frequently, and fluctuate power generation faster to meet demand when compared to larger industrial frame turbines. These features, along with market import capabilities, allow a utility to install large volumes of renewable energy and still maintain the ability to reliably and efficiently serve a heavy industrial customer base, as well as commercial and residential load, when the intermittent renewable resources are not available for short or prolonged periods of time.

Mr. Baacke testified NIPSCO chose the preferred configuration to maximize benefits to NIPSCO and its customers. This preferred configuration was needed to conduct an RFP to seek proposals for the EPC RFP. NIPSCO and S&L developed a decision matrix to select the equipment configuration that would be used for purposes of the EPC RFP. This evaluation included performance criteria to align with the Flexible Resource Analysis, operational factors, costs, environmental factors, and schedule.

Mr. Baacke explained the benefits to constructing the CT Project on the Schahfer site. He stated NIPSCO already owns the property. He said constructing the CT Project on this site provides cost savings and advantages for NIPSCO, its customers, and the local economy.

As discussed by NIPSCO witness Mr. Stanley, NIPSCO holds interconnection rights at the Schahfer site related to Units 17 and 18 that will be retiring by the end of 2025. The MISO grid interconnection rights can be transferred from existing coal units to the CT for up to three years after retirement.

OUCC witness Mr. Hanks claims the EPC RFP prevented bidders from proposing less expensive all industrial frame configurations, Mr. Baacke testified EPC RFP bidders were not prevented from proposing all industrial frame configurations. He testified the technical specifications for the EPC RFP, which are over two hundred pages, were provided to the parties in discovery and shows that the EPC RFP asked bidders to select a combination of industrial frame and aeroderivative CTs and optionally, reciprocating internal combustion engines that could meet certain defined constraints, including (1) total net output between 370 MW and 450 MW; (2) maximum machine size of 275 MW; (3) at least one machine 150 MW or larger; (4) 10-minute

cold start capability for 150 MW or more; (5) 50 MW/minute minimum ramp rate for at least 150 MW of the Facility's machines; and (6) at least one machine with a minimum emission compliant load less than or equal to approximately 25 MW. He testified the defined constraints were assembled to provide potential bidders with enough information to know the type of project that would fit the needs identified by NIPSCO and CRA through the Flexible Resource Analysis, but freely allowed potential bidders to provide bids that would include one larger industrial frame machine and multiple smaller aeroderivative or industrial frame units.

Mr. Baacke noted that while Mr. Hanks claims NIPSCO "self-selected" its preferred configuration and required bidders to offer aeroderivative units, CAC witness Mr. James claims the quality of NIPSCO's EPC RFP was wanting insofar as it relies upon a project that needs more definition and planning. Mr. Baacke testified that while the OUCC and CAC appear to disagree on the appropriate level of detail needed in the RFP, NIPSCO's balanced approach falls reasonably between the two.

Mr. Baacke testified NIPSCO's internal EPC RFP bid evaluation scorecard and related documentation were provided in discovery and show NIPSCO properly vetted the EPC RFP bids. He stated given the EPC RFP bid results and NIPSCO's history with successful project execution, NIPSCO made the prudent decision to pursue a multi-prime contracting strategy.

OUCC witness Ms. Sanka's claims NIPSCO failed to evaluate the configuration with one large industrial frame and smaller industrial frame, similarly sized to the aeroderivative turbines, in the decision matrix of S&L's Engineering Study. Mr. Baacke testified this criticism is misplaced. He explained smaller industrial frame machines provide similar performance when compared to smaller aeroderivative machines; therefore, it was not necessary to perform a separate analysis for a large industrial frame with smaller industrial frame machines.

NIPSCO witnesses Mr. Augustine and Mr. Holcomb explain in their rebuttal testimony that the U.S. Environmental Protection Agency released greenhouse gas emission rules for the power sector on April 24, 2024, which lay out the best system of emission reduction standards for new natural gas-fired facilities based on their capacity factor. Mr. Holcomb explained that based on the expected operational characteristics of NIPSCO's proposed units, the overall CT Project will be able to operate within the standards of the rule. Furthermore, given their higher efficiencies, the aeroderivative turbines will be able to more easily achieve the 1,170 lb. CO2/MWh standard than the frame turbine, offering more flexibility and optionality for NIPSCO to operate the units at higher capacity factors should conditions within the MISO market make such operations beneficial for its customers.

OUCC witness Ms. Sanka claims that, base load plants come at a lower initial cost and have lower operations and maintenance costs compared to a peaker plant containing aeroderivative units, making them more financially viable. Therefore, in a 30-year lifespan, the cost-effectiveness of using a configurated base load plant outweighs the benefits of using a configuration containing aeroderivative technology for peaker plants. Mr. Augustine explained Ms. Sanka's framing of the cost-effectiveness evaluation is incomplete, particularly as resource planning questions become more complex.

5. Commission Discussion and Findings. Since the issuance of its 2021 IRP, NIPSCO has continued to evaluate and analyze its generation needs considering ongoing changes in market rules, supply chain, and other broader market changes. NIPSCO's most current analysis identifies a need for a gas-fired resource between 400 MW and 442 MW. Based on the needs associated with the retirement of most of NIPSCO's coal-fired generation by the end of 2025 and the addition of renewable resources, NIPSCO seeks to construct and operate the CT Project as a part of its overall, diverse portfolio of generation assets. Once operational, the facility will be a central part of NIPSCO's electric generating fleet, because it will provide key reliability attributes and additional capacity, particularly in the winter season.

NIPSCO's Flexible Resource Analysis concluded increasing the amount of long-duration dispatchable capacity above the 300 MW identified in NIPSCO's 2021 IRP will contribute to risk mitigation for customers, and the 2023 portfolio analysis demonstrated NIPSCO can achieve cost savings for customers relative to the 2021 IRP's preferred portfolio by pivoting towards a larger-sized thermal resource as compared to more expensive storage additions. The Flexible Resource Analysis identified potential reliability issues resulting from the relatively large share of planned renewable generation in NIPSCO's preferred portfolio and assessed flexibility needs on an inter-hour and intra-hour basis. The analysis also evaluated how NIPSCO's mix of resources is likely to perform in 2030 compared to 2021 and identified that the 10-minute ramp requirements are increasing by 150 MW. NIPSCO's EPC RFP specifications for the proposed CT Project included requirements of a 10-minute ramp cold start capability for 150 MW or more and a 50 MW/minute ramp rate for at least 150 MW. The OUCC agrees NIPSCO needs load-following generation. We conclude that the CT Project is an economical decision that will aid in reliability; therefore, the Commission grants the requested CPCN for the CT Project.

A. CPCN for CT Project Under Ind. Code § 8-1-8.5-5. Ind. Code § 8-1-8.5-2 states that a public utility must obtain a CPCN from the Commission prior to constructing, purchasing, or leasing a facility for the generation of electricity. Ind. Code § 8-1-8.5-5 sets forth the criteria for approving a utility-specific generation proposal. In granting a CPCN, the Commission must make findings on the best estimate of the project's cost based on the record, whether the proposal is consistent with our statewide analysis or a utility-specific proposal, and whether public convenience and necessity require the project. The Commission must also consider the items set forth in Ind. Code § 8-1-8.5-4. We address the required findings and review each factor in Ind. Code § 8-1-8.5-4 below.

i. Best Estimate of Costs. Under Ind. Code § 8-1-8.5-5(b)(1), a CPCN may be granted only if the Commission makes a finding "as to the best estimate of construction, purchase, or lease costs based on the evidence of record[.]"

Mr. Baacke explained the CT Project, including key specifications and characteristics, as well as NIPSCO's approach to configuration selection and contracting strategy. He provided the project schedule, the best estimate of costs of construction, and NIPSCO's request for ongoing review pursuant to Ind. Code § 8-1-8.5-6. He explained the CT Project is planned to be approximately 400 MW, consisting of one larger industrial frame unit with three smaller aeroderivative or similarly sized industrial frame units. Mr. Walter explained NIPSCO's cost estimate is the best estimate currently available and will be updated as the project proceeds, consistent with the Commission's requirements and NIPSCO's request for ongoing review.

Mr. Walter testified NIPSCO began with a competitive EPC RFP and engaged the assistance of Sargent and Lundy. Based on available information in the market and the bids received, NIPSCO determined the best path is to self-build the CT Project, leveraging the available interconnection rights from retiring generation at Schahfer. NIPSCO issued its turbine equipment RFP in June 2023 and executed an agreement with its turbine manufacturer on March 29, 2024 to reserve the selected equipment. Mr. Baacke's supplemental direct testimony described unexpected supply chain challenges impacting NIPSCO's ability to timely procure breakers and generator step-up transformers, and explained that this caused NIPSCO to shift the expected in-service date for the CT Project to year-end 2027. Despite this change, the best estimate of the total cost of construction did not change.

Mr. Blissmer testified NIPSCO is currently carrying significant preliminary, survey, and investigation costs on its books that it will record to the cost of owned generating resources, a portion of which will be applied to the new CT Project. These preliminary, survey, and investigation costs were not challenged by any party and are included in NIPSCO's best estimate of the cost of construction for the CT Project.

NIPSCO's best estimate of the total cost of construction (excluding AFUDC) for the CT Project is $641,223,000. NIPSCO confirmed its cost estimate in its supplemental testimony based on updated supply chain information. Mr. Blissmer explained NIPSCO removed escalation and reduced the amount of contingency associated with owner's costs and certain equipment. The total estimated cost of the CT Project, including estimated AFUDC of $2,680,234, is $643,903,234. This AFUDC estimate assumes NIPSCO's proposed forward looking GCT Mechanism is approved.

The following discussion details the challenges to NIPSCO's best estimate.

a. <u>Configuration of CT Project</u>. CAC witness Mr. James opined NIPSCO and S&L progressed through project initiation with less than adequate attention to current best practices for early project definition, namely a Front-End Engineering and Design ("FEED") study, and that NIPSCO's process to reach a final investment decision remains questionable. Based on the evidence presented, we find that NIPSCO and S&L's design and engineering process was thorough, consistent with industry standards, including the Association for the Advancement of Cost Engineering cost classification, and rigorous in evaluating three different configurations for the design of the CT Project. Mr. Warren explained FEED studies evaluate whether a project should move forward at each step or stage and is unnecessary because of the IRP process and S&L's Engineering Study. The process NIPSCO used to develop its CT Project is like processes we have seen used by other utilities for which we have approved CPCNs. While FEED studies have been used for other projects in Indiana, we have only seen them in connection with novel technologies, such as coal gasification or carbon capture. In designing and engineering the CT Project, NIPSCO leveraged S&L's extensive power industry expertise. S&L's Engineering Study provided NIPSCO with the level of information needed to determine the technology and configuration that best meet the simple cycle gas turbine requirements.

Based on the evidence of record, we find NIPSCO's CT Project was properly scoped, designed, and engineered and that NIPSCO and S&L's up-front design activities reasonably align with the intended purpose of CAC witness Mr. James' recommended design process. As such,

NIPSCO is not required to complete any further front-end engineering and design diligence.

The OUCC and CAC took issue with NIPSCO's EPC RFP. The OUCC asserts that NIPSCO's EPC RFP was too narrow. CAC witness Mr. James alleges that a lack of detail contributed to the poor response rate to the RFP. The OUCC and CAC both challenge the aeroderivative turbines due to their cost. OUCC witnesses Ms. Sanka and Mr. Hanks assert that operational characteristics of the aeroderivative units do not justify the higher overall expenditure when compared to a configuration comprised of only industrial frame turbines. CAC witness Ms. Sommer recommended denial of the CT Project due to the three aeroderivative turbines and suggested reducing the cost of the CT Project by replacing the aeroderivative turbines with a second industrial frame machine.

Three of the Five Pillars we are charged with evaluating in the context of a CPCN for new generation are reliability, resiliency, and stability. We observe that before us is a request for new generation that is specifically designed with load-following characteristics to support NIPSCO's evolving generation fleet. NIPSCO's 2021 IRP Short-Term Action Plan identified a need for a thermal peaking option to mitigate the energy adequacy and flexibility characteristics of the IRP's largely renewable, and therefore intermittent, preferred portfolio. NIPSCO conducted further diligence through its Flexible Resource Analysis, which evaluated the risks associated with times of resource unavailability and market purchase exposure. Informed by these analyses, in its EPC RFP, NIPSCO sought bids for projects between 370 MW and 450 MW with certain performance criteria. This analysis further refined the need by noting that there is a significant growth in the need for faster ramping resources. The analysis shows that 150 MW with a ramp rate of 10 minutes is needed by 2030. As such, the EPC RFP specification included, among other things, 10-minute cold start capability for 150 MW or more and 50 MW/minute minimum ramp rate for at least 150 MW of the facility's machines. NIPSCO witness Mr. Baacke pointed out the Engineering Study recognized that smaller industrial frame machines provide similar performance when compared to smaller aeroderivative machines, rendering a separate evaluation of an all-industrial frame configuration unnecessary. The technical specifications for NIPSCO's turbine equipment were appropriately driven by the key performance criteria identified in the Flexible Resource Analysis. The cost of the CT Project here is below the $1,440/kW in direct capital cost that was assumed in the 2023 portfolio analysis, which was based on the responses to NIPSCO's 2022 RFP.

The OUCC seeks to reduce the best estimate to remove the aeroderivative configuration. Mr. Krieger provides the reduction in cost as a range of $30-40 million; he does not provide the methodology to arrive at this amount. Ms. Sanka compared the cost of three aeroderivative units to the cost of a single larger frame unit using data pulled from Public Exhibit No. 3 Confidential Attachment RS-3, and her comparison produces a difference of $37.6 million. The single larger frame unit, which Ms. Sanka used for comparison, does not possess the same 10-minute cold start and ramp rates that the smaller industrial units or aeroderivative units. Ms. Sanka stated her objection is that NIPSCO did not evaluate a configuration with three smaller industrial frame units sized to match the aeroderivative units. However, the OUCC's proposed reduction is based upon a peaker unit that would not possess the start time and ramping rates that NIPSCO requires.

The OUCC's and CAC's evidence fails to counter the fact that aeroderivative turbines provide several attributes that complement NIPSCO's largely renewable portfolio, including fast start capability, the ability to start and stop multiple times per day without impacting maintenance

cycles, and high efficiency. The fast-ramping capability of the aeroderivative turbines provides functionality that will satisfy reliability needs within NIPSCO's service territory and the MISO footprint.

CAC witness Ms. Sommer testifies that, if certain MISO market reforms are implemented, NIPSCO will likely need more capacity starting in 2028, even if the proposed CT Project enters into service. It is this capacity potential that unlocks the unique customer benefit of the aeroderivative turbines. NIPSCO's rebuttal evidence establishes that the aeroderivative units provide NIPSCO with flexibility to qualify as an intermediate load unit and potentially operate at greater capacity factors than an industrial frame unit, while remaining compliant with the Rule's emissions limits. Absent adequate capacity, to manage resource adequacy, NIPSCO will have to purchase capacity on the market. It is this rationale that drives us to decline CAC's invitation to prejudge NIPSCO's proactive capacity purchases as described by NIPSCO witness Mr. Stanley.

OUCC witness Hanks' testimony raises general arguments about the cost of the CT Project, intimating that its cost per kilowatt should not exceed the cost of CEI South's CTs approved in Cause No. 45564 or the average cost per kilowatt located in the EIA 2023 Energy Outlook. We reject comparison between the CT Project and the average cost per kW figures in the EIA's 2023 Outlook, as EIA's own Administrator plainly stated that the Outlook is not intended to provide estimates or predictions. Mr. Hanks did not attempt to reconcile the many factors that could impact – positively or negatively – the installed cost per kW of various technologies. As to Cause No. 45564, we note that NIPSCO and CEI South operate under different generation constraints and customer composition. CEI South's project was designed three years ago within a different market. There is substantial record evidence describing the current high demand for critical equipment and contractors within the power industry. CEI South's CTs were designed before the escalation in demand for CTs occurred, which has created a more competitive construction market. The OUCC did not include the estimated $27.3 million in annual expense CEI South will incur to receive gas supply from a new 24-mile pipeline. The estimated cost of NIPSCO's gas interconnection (which is under $1.5 million) was discussed by NIPSCO witness Mr. Austin in his direct testimony and was included within the best estimate for the CT Project.

The technical specifications for the combustion turbine equipment were sufficiently defined, appropriately developed to address the needs of NIPSCO's renewable portfolio without limiting bidders to a specific kind of technology, and consistent with industry standards. We find NIPSCO's preferred configuration of one industrial frame turbine and three aeroderivative turbines is appropriately informed by the results of the bid event and will provide critical, stable, load-following generation. Finally, given the substantial evidence on the important, load-following attributes the aeroderivative turbines provide, we find the aeroderivative turbines are cost-justified and appropriately included in NIPSCO's preferred configuration for the CT Project.

b. <u>Contracting Strategy for CT Project</u>. The OUCC and the CAC challenged NIPSCO's decision to self-build the CT Project, as opposed to utilizing an EPC contractor. OUCC witness Mr. Krieger testified the OUCC is concerned with NIPSCO's self-build project management approach including its ability to properly manage construction, as well as its ability to manage and mitigate financial challenges. CAC witness Mr. James testified NIPSCO lacks experience constructing power plants and NIPSCO's contracting strategy is similar to one of the strategies Duke Energy Indiana attempted to employ during the construction of the

Edwardsport Integrated Gasification Combined Cycle project.

The record contains evidence regarding the results of NIPSCO's EPC RFP bid. Mr. Baacke's direct testimony stated NIPSCO received three EPC bids – one that was $100 million more than the self-build option, and two bids that were inconsistent with technical specifications. NIPSCO conducted extensive due diligence to evaluate each bid received to determine whether its technical specifications could be met at a reasonable cost, and ultimately chose to self-build the CT Project.

The OUCC and CAC express general concerns that, without an EPC contractor, the risk of ratepayer-borne cost overruns from the construction of the CT Project has increased. This criticism ignores the fact that NIPSCO solicited bids from the EPC market and received only one bid that would have met its technical requirements, which we found were appropriately defined and reasonably driven by system needs, at a price that is $100 million more than NIPSCO's best estimate of construction in this Cause. While an EPC contract is a valid way to execute a generation project, it is not a requirement to receive a CPCN in Indiana nor is it a guarantee against project cost overruns.

OUCC witness Mr. Krieger and CAC witnesses Ms. Sommer and Mr. James claimed NIPSCO does not have experience building gas-fired generation projects of this scale and are concerned NIPSCO lacks large project management experience. The evidence in this Cause establishes that NIPSCO conducted diligence in both resource planning decisions and project design, engineering, and contracting. The evidence in this proceeding demonstrates that NIPSCO's team has sufficient experience to handle this project.

This is NIPSCO's first time overseeing construction of a new gas-fired generation project. The CT Project has undergone extensive upfront design and engineering. It will be built on an existing NIPSCO-owned site. No land acquisition will be needed and there is only the need for a 1,500-foot lateral pipeline to access NIPSCO's natural gas system. NIPSCO has prudently extended its runway to complete the CT Project through year-end 2027 and given the substantial reservation payment to the turbine equipment manufacturer, the evidence supports NIPSCO has a project plan in place enabling the CT Project to be constructed on time and on budget within reasonable constraints. The multi-prime strategy selected by NIPSCO produces a best estimate of costs that is $100 million less than the cost that would be produced under the only responsive EPC bid NIPSCO received.

CAC and NIPSCO agree demand for EPC contractors in the power industry is high. NIPSCO witness Mr. Warren testified this high level of demand has shifted EPC contractors' interest to larger projects that maximize their potential profits. We do not believe it would be prudent to require NIPSCO to pursue an EPC contract that could exceed the cost of NIPSCO's multi-prime contracting strategy by $100 million.

S&L has experience executing gas-fired generation projects. Based upon the evidence of record, we conclude NIPSCO selected a competent partner in S&L, and that this collaboration will continue throughout construction and start-up/commissioning of the CTs.

NIPSCO has availed itself of ongoing review of the CT Project pursuant to Ind. Code § 8-1-8.5-6. In issuing a CPCN, we approve the best estimate of costs. To the extent the utility incurs costs more than the best estimate that we approve, the utility will have the burden of demonstrating that the additional cost is reasonable. If other parties believe that the increase should be rejected, they retain the right to take such a position. The CAC and OUCC's fears over risk and escalation are all appropriately mitigated through ongoing review, which can serve to protect ratepayers from unnecessary costs and project mismanagement.

NIPSCO contends choosing the self-build option will decrease costs by $100 million. Due to the expected cost savings, the Commission approves NIPSCO choosing this option. The Commission emphasizes the importance of the estimated $100 million savings being realized. These savings shall be reflected in the updated cost estimates in the semi-annual filings discussed later in this order.

c. Best Estimate Cost Components. OUCC witnesses Mr. Hanks and Mr. Krieger challenged NIPSCO's indirect costs, alleging they lacked support and were potentially double counted in S&L's cost estimate. However, Mr. Baacke's rebuttal testimony explained that the confidential version of the best estimate shows one line item for "Indirects," which represents NIPSCO's indirect costs while S&L's indirect costs are reflected as "Misc Inside the Fence," "Misc Electric Interconnect," "Misc Gas Interconnect," and "Misc Water Interconnect" in NIPSCO's best estimate. He stated NIPSCO explained each cost category and how they were estimated in response to CAC discovery and that the itemization of S&L's indirect costs in Section 10.2.3 of the Engineering Study confirms these costs do not duplicate NIPSCO's indirect costs. We agree. NIPSCO's internal indirect costs are capital overhead and stores, freight, and handling while S&L's indirect costs are associated with construction management and start-up and commissioning support. These line items are separate and distinct, and we find that NIPSCO's evidence supports concluding no indirect costs were double counted.

Mr. Hanks challenged NIPSCO's proposed 5% escalation factor and recommended it be reduced to 3%, as was approved in NIPSCO's electric TDSIC Plan. We are convinced by NIPSCO's evidence that a 5% escalation factor is appropriate. NIPSCO's supplemental testimony describes the global supply chain uncertainty, which prompted the shift in the CT Project's in-service date to end of year 2027. Mr. Baacke's rebuttal testimony provides specific detail on the 70% cost increase for 345kV breakers, which NIPSCO has witnessed in a few months in late 2023. Given that NIPSCO's electric TDSIC Plan was approved before the COVID-19 pandemic and its resulting supply chain issues, we conclude reducing NIPSCO's escalation factor to what was approved in that proceeding is not appropriate. Accordingly, we find NIPSCO's 5% escalation factor is reasonable and approved.

Mr. Krieger opposed NIPSCO's 9% estimate for owner's costs, arguing it is too simple for a high-cost capital project and that owner's costs would be lower under an EPC contract. Based on updated cost information from executed contracts with certain suppliers, NIPSCO updated the 9% owner's cost estimate to $41,210,000 in Mr. Baacke's rebuttal testimony. We addressed the parties' concern with NIPSCO's contracting strategy above and found NIPSCO's self-build, multi-prime approach will reduce the cost of the CT Project for the benefit of customers. Based on the evidence provided, we conclude NIPSCO's estimated owner's costs are informed by executed contracts and are approved.

d. Pollution Control Technology. OUCC Witness Armstrong testified the Selective Catalytic Reduction units are not needed for the CT Project to meet current environmental requirements and that if they are required in the future, NIPSCO could seek recovery of any future pollution control costs through the Federally Mandated Cost Management ("FMCA") statute. Mr. Holcomb's rebuttal testimony confirmed the CT Project will comply with the final Greenhouse Gas ("GHG") Rule; therefore, NIPSCO updated the best estimate to reflect removal of the Selective Catalytic Reduction units. We approve this revision to the scope of the CT Project and recognize that as federal environmental regulations may change, Indiana law offers options utilities may consider for recovering compliance costs, including the FMCA statute.

e. Conclusion on Best Estimate. We find NIPSCO has submitted sufficient evidence supporting its best estimate on the cost to construct the CT Project, which is driven by its preferred configuration and contracting strategy along with its projected $100 million savings due to utilizing the self-build option. NIPSCO's best estimate is based on a detailed engineering analysis, information from turbine manufacturers and contractor bid events from which capital costs, operating costs, performance characteristics, and construction schedules were determined. The best estimate reasonably reflects the current market, industry trends, and the potential cost impact of project risk and factors beyond NIPSCO's control. The CT Project is reasonably designed to manage industry and economic challenges while facilitating the capacity and energy resources required by NIPSCO to meet its customers' ongoing need for electricity. Based on the evidence, we find that $641,223,000 (excluding AFUDC) is the best estimate of the cost of construction of the CT Project.

ii. Consistency with Petitioner's 2021 and 2023 Portfolio Analysis. Ind. Code § 8-1-8.5-5(b)(2) provides that a CPCN shall be granted only if the Commission has made a finding that either:

> (A) the construction, purchase, or lease will be consistent with the commission's analysis (or such part of the analysis as may then be developed, if any) for expansion of electric generating capacity; or
>
> (B) the construction, purchase, or lease is consistent with a utility specific proposal submitted under [Ind. Code § 8-1-8.5-3(e)(1)] and approved under subsection (d).

Ind. Code § 8-1-8.5-3(e)(1) provides that a public utility may submit "a current or updated integrated resource plan as part of a utility specific proposal as to the future needs for electricity to serve the people of the state or the area served by the utility[.]" Mr. Augustine sponsored Petitioner's 2021 IRP as Petitioner's Highly Confidential Attachment 7-B and a summary of the key inputs and outputs associated with the 2023 portfolio analysis as Petitioner's Highly Confidential Attachment 7-C. Thus, we find NIPSCO has submitted a utility-specific proposal under Ind. Code § 8-1-8.5-3(e)(1).

The record demonstrates that the CT Project is consistent with the Short-Term Action Plan identified in Petitioner's 2021 IRP.

We note at the outset that we have recently expressed support of NIPSCO's 2021 IRP process, stating that "NIPSCO's 2021 IRP process, which occurred in concert with the 2022 RFP, was robust and well developed, ultimately resulting in the Short-Term Action Plan on which the

proposed Appleseed and Templeton PPAs are based." *N. Ind. Pub. Serv. Co.*, Cause No. 45926 (IURC Nov. 22, 2023) at 20 citing *N. Ind. Pub. Serv. Co.*, Cause No. 45587 (IURC Sept. 13, 2023). IRPs are created at a point in time and use modeled scenarios to show how resources perform over a variety of alternative future conditions. NIPSCO performed the 2021 IRP analysis and has appropriately responded to changes in the electric industry and the broader market and now seeks approval of generation additions based on the same foundation we have repeatedly found was sufficient. NIPSCO's 2021 IRP did not rely on a single set of assumptions that could later be invalidated by evolving market conditions. Since the 2021 IRP was issued, the timeline for implementation of the Short-Term Action Plan identified in the 2021 IRP has been three years (2022–2024), and NIPSCO's proposed CT Project is consistent with this timeline.

NIPSCO's 2021 IRP performed a retirement analysis to assess different retirement dates for different elements of the existing fleet. The 2021 IRP continued to affirm earlier retirement of coal capacity resulted in lower costs for customers. The 2021 IRP concluded new additions should be predominantly renewable resources, supplemented by a diverse mix of other technologies, including an uprate to NIPSCO's existing Sugar Creek combined cycle, new thermal peaking capacity, new energy storage capacity, new distributed energy resources, and additional demand side management programs. These conclusions were informed by review of all metrics on NIPSCO's integrated scorecard, including cost to customer, scenario and stochastic-based cost risk, carbon emissions, resource optionality, impacts on the local economy, and a comprehensive quantitative reliability assessment, which included analysis of ancillary services, blackstart requirements, dispatchability, and other technical reliability parameters. Given evolving MISO market rules related to intermittent resource accreditation, seasonal reserve margin planning, and other reliability planning considerations, relative to NIPSCO's 2018 IRP, the 2021 IRP concluded that additional dispatchable resources like thermal peaking capacity and storage were necessary additions to the portfolio.

NIPSCO conducted an additional technical reliability assessment to ensure the non-economic implications of various portfolio options, particularly regarding compliance with MISO market rules and North American Electric Reliability Corporation ("NERC") standards, were accounted for. As part of the assessment, eight reliability criteria were identified, and different portfolio options were evaluated against each of them. The reliability criteria included blackstart capability, energy adequacy, dispatchability and automatic generation control, operational flexibility and frequency support, volt-ampere reactive ("VAR") support or reactive power, geographic location relative to load, predictability and firmness of supply, and short-circuit strength sufficiency. NIPSCO's analysis concluded portfolios that included new thermal resources (natural gas-fired peakers and combined cycles, including those with hydrogen enablement) scored better on the reliability criteria than portfolios reliant only on new renewables and storage and no new incremental thermal capacity.

The record demonstrates the 2023 portfolio analysis accounted for NIPSCO's ongoing resource planning and other market conditions and developments that have occurred since the 2021 IRP was completed, including, among other things, updated pricing from NIPSCO's 2022 RFP, changes to the MISO resource adequacy construct, commodity pricing updates, and changes to federal law.

We have previously concluded that, "[i]nherently, integrated resource plans are performed at a point in time and use modeled scenarios to show how resources perform over a variety of alternative future conditions." *Northern Indiana Public Service Co., LLC*, Cause No. 45462, at 62 (May 5, 2021). The Commission has previously found that utilities should utilize "an array of best practices, including basing model inputs on its 2022 RFP, which allow[s] for an informed forecast at that time." *Southern Indiana Gas & Elec. Co.*, Cause No. 45501, at 29 (Oct. 27, 2021). The evidence demonstrates that NIPSCO has utilized best practices for an informed forecast.

IG witness Mr. Gorman recommended denial of NIPSCO's requested CPCN based on his belief that NIPSCO had not updated its 2021 IRP and had not analyzed several material developments since the completion of the 2021 IRP including: (1) the introduction of MISO's seasonal resource adequacy construct; (2) the enactment of the Inflation Reduction Act; (3) the presence of supply chain constraints, tariff uncertainty and inflationary cost pressure; and (4) additional RFPs with Charles River Associates to assess the latest market data for new resources. His claims are contradicted by evidence in the record. Mr. Augustine explained Mr. Gorman's testimony does not acknowledge or reference NIPSCO's 2023 portfolio analysis. As discussed, this analysis used the preferred portfolio themes from NIPSCO's 2021 IRP and updated their composition according to the latest market information, which resulted in additional wind capacity, less solar capacity, and more thermal peaking or storage capacity. Mr. Augustine's direct testimony discussed how NIPSCO anticipated MISO's seasonal construct in its 2021 IRP, which evaluated seasonal peak load forecasts and seasonal capacity ratings for resource options to develop portfolios based on capacity requirements for both the summer and winter seasons, and that its 2023 portfolio analysis incorporated updated seasonal reserve margin targets and seasonal accredited capacity levels that were published after FERC approved MISO's seasonal construct. NIPSCO's 2023 portfolio analysis has been relied upon to support approval of other generation projects.[7] As such, we find NIPSCO's resource planning and selection process to select its Short Term Action Plan, including the CT Project, is consistent with its 2021 IRP, and is therefore consistent with NIPSCO's utility-specific proposal under Ind. Code § 8-1-8.5-3(e)(1).

Mr. Gorman testified NIPSCO's evaluation of the proposed CT Project was deficient because it failed to consider planned changes to its future Rate 531 Tier 1 load and instead relied on its future supply demand positions based on its 2021 IRP without modifying any assumptions associated with expected reductions in Rate 531 Tier 1 load. Mr. Augustine's rebuttal testimony outlined three reasons why this criticism is invalid: (1) the Rate 831/531 Modification Agreement approved in Cause No. 45772 recognizes Tier 1 commitments may decline over time, but that no firm declarations of commitment reductions have been made by any Rate 531 customer, and it is not certain that all seven current Rate 531 customers would elect to reduce their demand to the tariff minimum as outlined by Mr. Gorman; (2) even if the proposed CT Project is approved and all seven Rate 531 customers reduce their commitments over a multi-year period through 2033 as outlined in the Rate 831/531 Modification Agreement, NIPSCO will likely still require additional capacity purchases or other capacity additions to meet current seasonal MISO planning requirements as well as potential future changes associated with resource accreditation rules at MISO to meet potential future demand growth; and (3) NIPSCO's 2021 IRP did evaluate a

[7] Cause No. 45926 (Gibson Solar), Cause No. 45887 (Appleseed Solar and Templeton Wind), Cause No. 45908 (Carpenter Wind), and in NIPSCO requests for changes in cost and ownership structure for various solar and solar plus storage projects in Cause Nos. 45936, 46028, and 46032, the latter two of which are still pending.

scenario with the exact reduction in Tier 1 demand commitments suggested by Mr. Gorman, and NIPSCO's preferred portfolio was found to perform well under such assumptions. Mr. Augustine explained NIPSCO was not required to "hard code" into its demand forecast a reduction that may not come to fruition; instead, as it did, NIPSCO's 2021 IRP and 2023 portfolio analysis are based on probabilistic modeling which included numerous load scenarios, including the scenario Mr. Gorman advocated for.

The evidence of record demonstrates the CT Project is consistent with and supported by the 2021 IRP and 2023 portfolio analysis. The 2021 IRP concluded flexible thermal generation resources, additional solar capacity and a diverse mix of other resources including storage, emerging technologies, and market purchases/capacity were necessary additions to the portfolio for it to meet current and future load and reserve margin requirements. Moreover, as further discussed below, the CT Project is consistent with the Flexible Resource Analysis which found that flexible, dispatchable capacity resources are needed to complement NIPSCO's largely renewable portfolio – particularly resources that can meet specific ramp requirements.

We conclude NIPSCO's resource planning process is appropriate given the amount of uncertainty around timing and actual amounts of load reduction. Ms. Becker testified the Rate 531 customers may reduce their load, but they have not done so yet and NIPSCO cannot assume that they will. Furthermore, and as noted by CAC witness Ms. Sommer, NIPSCO likely will need an additional 400+ MW of capacity beginning in 2028, which could be partially addressed by further reductions of Rate 531 Tier 1 load. Based on the evidence, we find NIPSCO's 2021 IRP, as supplemented and supported by the 2023 portfolio analysis, is a valid basis for approval of the CT Project, and the CT Project is consistent with the 2021 IRP.

iii. Consistency with Commission's Energy Analysis. Ind. Code § 8-1-8.5-3(a) provides that "the commission shall develop, publicize, and keep current an analysis of the long-range needs for expansion facilities for generation of electricity." The Commission issued its 2018 Report on the Statewide Analysis of Future Resource Requirements for Electricity ("2018 Statewide Analysis") in October 2018.

The data and analysis underlying NIPSCO's proposal and the state of the overall electric industry have continued to develop since the 2018 Statewide Analysis. Mr. Walter's direct testimony noted that multiple IRPs have been completed since the most recent report. The record in this Cause demonstrates that MISO, MISO's Independent Market Monitor ("IMM"), and the NERC support the need for flexible, dispatchable resources to pair with increasing levels of renewable generation to ensure reliability.

Based on the evidence of record, we find NIPSCO's proposal to build the CT Project, which offers a flexible, dispatchable resource that will support NIPSCO's predominantly renewable generating portfolio and that of other Indiana electric utilities, is consistent with the Commission's energy analysis, including the 2018 Statewide Analysis and developments since that report was issued.

iv. Public Convenience and Necessity. Under Ind. Code § 8-1-8.5-5(b)(3), before granting a CPCN, the Commission must make "a finding that the public convenience and necessity require or will require the construction, purchase, or lease of the

facility[.]" "The public convenience and necessity criterion is common in public utility matters and generally concerns whether the proposal is fitted or suited to the public need." Indiana Michigan Power Co., Cause No. 44871, at 30 (March 26, 2018). NIPSCO contends that its preferred configuration of one industrial frame unit and three aeroderivative units is reasonable and appropriate given NIPSCO's fast-ramping, load-following needs. Based on the evidence of record, we agree, as explained further below.

Our determination of public convenience and necessity under Ind. Code § 8-1-8.5-5(b)(3) is also guided by Ind. Code § 8-1-8.5-4(b), which provides the factors that the Commission must consider in acting on any petition for the construction, purchase, or lease of any facility for the generation of electricity.[8]

a. Ind. Code § 8-1-8.5-4(b)(1). Mr. Stanley described NIPSCO's involvement in MISO, an independent system operator, and testified this portion of the statutory language predates the formation of MISO. He stated the statutory concepts of "interchange of power" and "pooling of facilities" would seem to be addressed through use of an independent system operator. Mr. Stanley explained that while the current MISO market effectively utilizes the existing capacity resources to meet the overall energy requirements of the region, including NIPSCO, NIPSCO's membership in MISO does not eliminate its need to meet the capacity requirements of its customers, including adding new capacity resources to address potential load growth and reliable load-following generation. As to the remaining elements of Subsection (b)(1), Mr. Stanley testified NIPSCO has conducted several all-source RFPs, and joint ownership and power purchases were not excluded by those RFPs to the extent other electric utilities were interested. Mr. Augustine testified NIPSCO's all-source RFPs, its IRP, and the 2023 portfolio analysis allowed for and considered numerous resource options, including solar, solar plus storage, storage, thermal, wind, hydrogen, and a range of structures that may include both energy and capacity.

The evidence of record shows NIPSCO's participation in MISO was specifically considered in the development of its Short Term Action Plan, including the proposed CT Project, which supports the conclusion that Petitioner's current and potential options for entering arrangements with other utilities related to the interchange of power, pooling of facilities, purchase of power, and joint ownership of facilities have been evaluated, and Ind. Code § 8-1-8.5-4(b)(1) has been satisfied.

b. Ind Code § 8-1-8.5-4(b)(2). While some of the parties challenged the size and technology composition of NIPSCO's proposed CT Project, which we addressed above, no party proposed an alternative to the CT Project or stated NIPSCO does not have a need for the type of new capacity that was identified in its 2021 IRP and in the subsequent analyses undertaken after the submission of the IRP. The OUCC "agrees that load-following replacement generation capacity is necessary to reliably serve NIPSCO's customers" and "recognizes that NIPSCO's IRP and updated analysis shows additional replacement capacity for retiring generation is needed to preserve reliability, resiliency, and stability." Pub. Ex. 1 at 3. The

[8] No party identified an applicable federal phaseout mandate for purposes of Ind. Code § 8-1-8.5-4(b)(3). Ind. Code § 8-1-8.5-4(b)(4) is discussed later in the order.

CAC points out if recent proposed MISO market reforms are implemented, "NIPSCO likely needs more capacity starting in 2028" even when assuming the proposed CT Project enters into service. CAC Ex. 1 at 21, 24. These statements affirm NIPSCO's requirement for incremental capacity, and the evidence of record supports NIPSCO's CT Project as a required addition that will help fill this need.

Regarding maintaining essential reliability services, NERC, in its 2022 Long-Term Reliability Assessment, states: "[r]etiring conventional generation is being replaced with large amounts of wind and solar; … As replacement resources are interconnected, these new resources should have the capability to support voltage, frequency, and dispatchability." *Id*. at 18-19.

Regarding "refurbishment of existing facilities," NIPSCO witness Mr. Augustine testified NIPSCO evaluated the potential conversion of one or two units at its Schahfer plant in its 2018 IRP and found conversion cost more than the alternatives. Section 4.10.5 of NIPSCO's 2018 IRP noted the analysis "showed that converting one unit would cost at least $230 million more than retirement and replacement with economically optimized selections from the 2022 RFP results and replacing both units would cost customers at least $540 million more." Mr. Augustine explained a refueled Unit 17 or 18 would not be a viable alternative to the CT Project as it would not possess the fast-start/quick-ramping and reliability characteristics of a peaking facility that the 2021 IRP and the 2023 portfolio analysis called for. No party challenged this evidence.

As to cogeneration, NIPSCO witness Mr. Stanley testified renewable generation has been a significant component of NIPSCO's generation portfolio transition since its 2018 IRP, and the CT Project is intended to complement the substantial renewable fleet NIPSCO has added and continues to add. He explained cogeneration, if available, would have been responsive to the 2022 RFPs. NIPSCO witness Ms. Becker testified on conservation and load management by describing NIPSCO's three demand response programs and its robust portfolio of demand side management/energy efficiency programs targeted towards residential, commercial and industrial customers. She explained NIPSCO carried out a lengthy analysis of demand side management/energy efficiency resources included in its IRP process, including completing a market potential study to determine the achievable amount of savings. Ms. Becker explained NIPSCO's 2021 IRP modeling demonstrates energy efficiency will be an important part of NIPSCO's resource options in the future and will be particularly important to help mitigate against the need to build new generation to serve incremental load; however, NIPSCO's modeling indicates the most economical option for customers over the long term is to execute on its preferred portfolio, including, but not limited to, adding the proposed CT Project, adding solar and wind resources, and retiring coal generation. She concluded, based on her experience with NIPSCO's energy efficiency initiatives, NIPSCO could not derive sufficient energy savings to replace this generation.

NIPSCO engaged in the 2022 RFP process to inform its planning activities. Multiple RFPs were issued in 2022 to identify costs and availability of resource options to fulfill the 2021 IRP's short-term action plan.

c. Conclusion. NIPSCO conducted the 2022 RFP to meet its capacity needs, and the RFP responses enabled NIPSCO to consider a variety of alternatives. Given the foregoing evidence, the Commission finds Petitioner has satisfied the requirement under

Ind. Code § 8-1-8.5-4(b)(2); it considers alternative methods for providing reliable, efficient, and economical electric service, including the refurbishment of existing facilities, conservation, load management, cogeneration, and renewable energy sources. NIPSCO's 2021 IRP and subsequent 2023 portfolio analysis show that the proposed construction of the CT Project at the Schahfer site is a reasonable, least-cost resource to support NIPSCO's Short Term Action Plan and meet its customers' needs for electricity. The CT Project is designed to reliably cycle in response to the MISO market and will displace the retiring Schahfer coal units with more efficient and controllable load-following capacity.

Based on the evidence of record, the Commission finds Petitioner has shown a need for the proposed CT Project and that public convenience and necessity require or will require Petitioner's construction of the CT Project.

v. Competitive Procurement. Ind. Code § 8-1-8.5-5(b)(5) requires us to make certain findings under Ind. Code § 8-1-8.5-5(e) if the proposed facility has a generating capacity of more than 80 MW, as is the case here:

> Before granting a certificate to the applicant, the commission:
>
> (1) must, in addition to the findings required under subsection (b), find that:
> (A) the estimated costs of the proposed facility are, to the extent commercially practicable, the result of competitively bid engineering, procurement, or construction contracts, as applicable; and
> (B) if the applicant is an electricity supplier (as defined in IC 8-1-37-6), the applicant allowed or will allow third parties to submit firm and binding bids for the construction of the proposed facility on behalf of the applicant that met or meet all of the technical, commercial, and other specifications required by the applicant for the proposed facility so as to enable ownership of the proposed facility to vest with the applicant not later than the date on which the proposed facility becomes commercially available; and
> (2) shall also consider the following factors:
> (A) Reliability.
> (B) Solicitation by the applicant of competitive bids to obtain purchased power capacity and energy from alternative suppliers.
>
> The applicant, including an affiliate of the applicant, may participate in competitive bidding described in this subsection.

There are two different requirements for a CPCN. The first, Ind. Code § 8-1-8.5-5(e)(1)(A), is to confirm the reasonableness and reliability of the cost estimate. The second, Ind. Code § 8-1-8.5-5(e)(1)(B), is to assure actual costs incurred are, to the extent commercially practicable, based on competitive procurement.

NIPSCO conducted multiple RFPs in 2022 to identify the costs and availability of resource options to fulfill the 2021 IRP's short-term action plan and to respond to changing market conditions, including an RFP for a gas-fired generation resource. The RFPs provided actionable

resource cost data that incorporated the latest policy, technology, and macroeconomic information. The RFPs provided information related to the latest costs of storage resources and the viability of alternative natural gas peaker options at the time they were solicited.

The statute requires the estimate to be the result, to the extent commercially practicable, of a competitively bid engineering, procurement or construction contract. Petitioner conducted the EPC RFP bid event and leveraged the information through that process to develop its best estimate for the cost to construct the CT Project through a multi-prime contracting strategy. NIPSCO's best estimate of construction reflects information received from equipment bid events for the CT original equipment manufacturer, generator step-up transformers, unit auxiliary transformers, and diesel generator. Accordingly, we find Ind. Code § 8-1-8.5-5(e)(1)(A) has been satisfied and that the cost estimates of the proposed facility are, to the extent commercially practicable, the result of competitively bid engineering, procurement, or construction contracts. Mr. Baacke described the construction and bid process NIPSCO will use through the multi-prime contracting strategy, whereby NIPSCO plans to develop competitive bids for all major scopes of construction. He testified that under the planned construction and bid process, NIPSCO will allow third parties to submit firm and binding bids for construction of the CT Project on NIPSCO's behalf that meet all of the technical, commercial, and other specifications so as to enable ownership of the CT Project to vest with NIPSCO no later than the date the facility becomes commercially available. This satisfies Ind. Code § 8-1-8.5-5(e)(1)(B).

Regarding Ind. Code § 8-1-8.5-5(e)(2), based on the evidence of record, we find the proposed CT Project is reliable. The record establishes Petitioner engaged in an All-Source RFP process to inform its overall generation transition plan. Thus, we find that the requirements of Ind. Code § 8-1-8.5-5(e) are satisfied.

vi. Conclusion on CPCN for CT Project. Based on the evidence of record, the Commission finds NIPSCO has met the requirements of Ind. Code ch. 8-1-8.5 and that the public convenience and necessity will be served construction of the CT Project. Therefore, we grant NIPSCO's request for a CPCN for its CT Project, subject to the findings and conditions of this order.

B. Ongoing Review of CT Project Under Ind. Code § 8-1-8.5-6(a). Ind. Code § 8-1-8.5-6(a) addresses the Commission's review of facilities under construction as follows:

> In addition to the review of the continuing need for the facility under construction . . . the commission shall, at the request of the public utility, maintain an ongoing review of such construction as it proceeds. The applicant shall submit each year during construction, or at such other periods as the commission and the public utility mutually agree, a progress report and any revisions in the cost estimates for the construction.

NIPSCO requested ongoing review of the CT Project, including review of progress reports and any revisions to the best estimate, as the construction proceeds, and associated ratemaking treatment consistent with such review. OUCC witness Mr. Krieger recommends the Commission require NIPSCO to submit quarterly progress reports providing construction status, and accounting updates including project to date spending and remaining balances of contingency, escalation, owner's costs and indirects. Ms. Becker testified Mr. Krieger's recommended quarterly reporting

requirements go beyond the yearly reporting required by the statute. She stated NIPSCO plans to file its GCT Mechanism semi-annually, which will provide the Commission and the parties an opportunity to review costs incurred to date and relevant project updates. She stated this cadence already exceeds the annual update requirement in the statute and that requiring quarterly reports from NIPSCO on top of this review is unnecessary and excessive. We find Ms. Becker's proposal reasonable given that it is more than contemplated by the statute.

We find NIPSCO shall report to the Commission a summary of the information related to the CT Project as contemplated under Ind. Code § 8-1-8.5-6(a), including any changes to scope, schedule, and the best estimate. In its initial report, NIPSCO is directed to include: (1) manufacturer, model number, and operational characteristics of the turbine generator and (2) anticipated total annual MW-hour ("MWh") output for the CT Project in each of its semi-annual GCT filing stylized as 45947 GCT XX. The initial report shall be filed on or before December 30, 2024 as a compliance filing in this Cause.

NIPSCO shall report semi-annually in this Cause to the Commission a summary of the information related to the CT Project, including safety, scope, schedule, and owner's cost contingency, as well as revisions to the cost estimate and update on the natural gas transportation and lateral pipeline. In addition, due to recent global supply chain issues that could potentially limit the availability of components necessary to build the CTs, Petitioner shall include in its semi-annual filings, an update on any supply-chain-related challenges and/or delays beginning on December 30, 2024.

The final project report shall contain the following information: (1) the actual total cost of construction; (2) the total MW output for the facility; and (3) the actual in-service (commercial operation) date for the facility. The final project report shall be filed in this Cause.

C. Clean Energy Project and Financial Incentives Under Ind. Code § 8-1-8.8-11. NIPSCO seeks approval of its CT Project as a clean energy project pursuant to Ind. Code § 8-1-8.8-11. Ind. Code § 8-1-8.8-11 provides that "[a]n eligible business must file an application to the commission for approval of a clean energy project" and that "[t]he commission shall encourage clean energy projects by creating financial incentives for clean energy projects, if the projects are found to be reasonable and necessary." An "eligible business" is an energy utility that "proposes to construct or repower a facility described in IC 8-1-37-4(a)(21)." Ind. Code § 8-1-8.8-6(5). A "clean energy project" similarly includes "[p]rojects to construct or repower a facility as described in IC 8-1-37-4(a)(21)" Ind. Code § 8-1-8.8-2(5). We have already found that NIPSCO is an "energy utility." The only disputed issue of applicability is whether the CT Project qualifies as a project under Ind. Code § 8-1-37-4(a)(21). That subsection includes in the definition of "clean energy resource . . . [e]lectricity that is generated from natural gas at a facility constructed or repowered in Indiana after July 1, 2011, which displaces electricity generation from an existing coal fired generation facility." NIPSCO witness Mr. Walter testified the CT Project will displace electricity generated from the coal-fired generating plants at Schahfer Units 17 and 18 and Michigan City Unit 12.

CAC witness Mr. Inskeep asserted Schahfer Units 17 and 18 are retiring in 2025 "regardless of the fate of the CT Project." Mr. Inskeep stated NIPSCO did not demonstrate the CT Project is displacing electricity generated from the coal-fired Schahfer Units 17 and 18 and

Michigan City Unit 12. NIPSCO witness Mr. Stanley's stated NIPSCO will be using the injection rights from the retiring Schahfer units for purposes of MISO interconnection. NIPSCO's 2021 IRP's Short Term Action Plan plainly shows NIPSCO's overall plan to retire Schahfer Units 17 and 18 and Michigan City Unit 12 are related to and dependent on the addition of several resources, including a gas peaking resource. NIPSCO witness Mr. Holcomb explained that along with increasing levels of zero-emission renewable energy in the electric system, the CT Project will keep NIPSCO and NiSource on track to achieve their target of a 90% reduction in Scope 1 GHG emissions by 2030, compared to 2005 levels.

Partial displacement of retiring coal-fired energy generation with a gas peaking resource has been a component of NIPSCO's IRP modeling and related CPCN regulatory filings since 2021. As such, we find the CT Project is being constructed to displace energy from an existing coal-fired generation facility and is therefore eligible for the relief provided in Ind. Code § 8-1-8.8-11.

i. <u>The Clean Energy Project is Just and Reasonable</u>. According to Ind. Code § 8-1-8.8-11, the Commission shall encourage clean energy projects by creating financial incentives for such projects, if found to be just and reasonable. While Chapter 8.8 does not set forth specific factors the Commission should consider in approving a clean energy project, the Commission has considered some of the factors outlined in Chapters 8.5 and 8.7 in other cases. Similarly, in determining the reasonableness and necessity for the CT Project, we find it appropriate to consider the principles reflected in the following Chapter 8.5 factors in our consideration: (1) the cost of the CT Project; (2) the consistency of the CT Project to NIPSCO's 2021 IRP; (3) the need for the CT Project; (4) and the competitive solicitation of the CT Project.

a. <u>The Cost of the CT Project</u>. The evidence in this Cause supports a finding that the energy to be generated by the CT Project is reasonably priced compared to other alternatives and provides material benefits. The best estimate of the costs is $100 million below the price for an EPC contract for a comparable facility and the cost is consistent with the costs assumed in the 2023 portfolio analysis.

b. <u>Consistency of the CT Project to NIPSCO's IRP</u>. The CT Project is consistent with NIPSCO's 2021 IRP (as updated in the 2023 portfolio analysis).

c. <u>The Need for the CT Project</u>. The CT Project fills the need for fast-start, quick-ramping generation that will complement NIPSCO's overall generation transition and follow the load. This evidence reflects that MISO, NIPSCO's grid operator, has indicated a system-wide need for controllable resources to ensure system reliability, particularly as more intermittent resources are added to the system. NIPSCO has demonstrated that the CT Project is necessary to assure reliability, resiliency, and stability of NIPSCO's supply of electricity.

d. <u>The Competitive Solicitation of the CT Project</u>. We have previously found and reiterate that NIPSCO's procurement of the CT Project has been and will continue to be through competitive solicitation.

Based on the evidence of record, we find the CT Project is a clean energy project under Ind. Code § 8-1-8.8-11 and is just reasonable. The record shows the addition of the CT Project to NIPSCO's resource mix will provide needed energy and capacity. We find the energy and capacity

provided through the CT Project are reasonable and necessary additions to NIPSCO's portfolio of generating resources to meet the need for electricity within NIPSCO's service area, while also mitigating the risk through the diversification and use of an economic mix of resources that provides flexibility.

ii. Cost Recovery. Having found the CT Project is a clean energy project and is eligible for the financial incentives pursuant to Ind. Code § 8-1-8.8-11 ("Section 11"), we turn now to NIPSCO's proposal to recover its costs during construction through the GCT Mechanism until such time as the project is included in base rates after being placed in service. Petitioner's witness Mr. Blissmer described the proposed GCT Mechanism and how it would work. NIPSCO anticipates these filings will be made by October 15 (reflecting the forward-looking period of March through August) and April 15 (reflecting the forward-looking period of September through February). NIPSCO anticipates a 120-day procedural schedule from filing to Commission order and rate implementation (on a bills rendered basis). Any variance between the forecasted tracker revenue requirement and the amounts collected will be compared to the actual revenue requirement based on the final books and records. The resulting variance would be captured in a reconciliation report within each tracker filing.

The revenue requirement for capital costs included in the GCT will be calculated by first computing the monthly average CWIP, or net plant in service when appropriate, over the forecasted six-month period. NIPSCO's direct testimony reflected NIPSCO would then multiply the weighted monthly average for the forecasted billing period by NIPSCO's monthly effective Weighted Average Cost of Capital ("WACC"). Up and until the CT Project is placed in service, there would be no depreciation expense. When and to the extent the CT Project is projected to be placed in service in a six-month forecast period, the GCT will commence the recovery of depreciation expense at NIPSCO's most recently approved depreciation rates (currently Cause No. 45772), which would be reconciled when actual depreciation expense is recognized in a future tracker. This avoids any deferral of depreciation expense. Similarly, forecasted property taxes will be included in the GCT and reconciled when actual property tax expense is recognized in a future tracker.

Mr. Blissmer testified NIPSCO proposes to allocate the costs associated with the CT Project based on NIPSCO's Commission approved demand allocators for the GCT Mechanism, whereby the demand allocators are based upon revenue attributable to each of NIPSCO's rate schedules used to establish NIPSCO's Commission approved electric base rates in Cause No. 45772. NIPSCO will adjust its allocation percentages to reflect the significant migration of customers amongst the various rates for each semi-annual tracker filing, as it does with other tracking mechanisms. This adjustment is appropriate to prevent any unintended consequences of the migration of customers between rates and to properly allocate their share of the revenue requirement. He described other changes to NIPSCO's electric service tariff relating to the proposed GCT Mechanism: (1) addition of Rider 595 – Generation Cost Tracker; (2) addition of Appendix L – Generation Cost Tracker Factors; (3) update to Appendix A to include Rider 595; and (4) update to the Table of Contents to add Rider 595 and Appendix L. NIPSCO anticipates its first GCT Mechanism filing would be October 15, 2024, or within 30 days of a final order in this Cause, whichever is later. As an additional financial incentive under Section 11, NIPSCO requests the operating income associated with the CT Project be included in the total electric Comparison of Electric Operating Income for purposes of the Ind. Code § 8-1-2-42(d) earnings test.

Mr. Blissmer explained how this proposed GCT Mechanism is authorized by new legislation. He testified House Enrolled Act 1421 ("HEA 1421"), among other things, amended the definition of "clean energy projects" in Ind. Code § 8-1-8.8-2 to include "[p]rojects to construct or repower a facility described in IC 8-1-37-4(a)(21)" and amended Section 11(a)(1) limiting when CWIP ratemaking can be authorized for a clean energy project as a financial incentive.

Mr. Blissmer testified NIPSCO's proposal satisfies the additional requirements relating to the authorization of CWIP ratemaking for a clean energy project as a financial incentive stating HEA 1421, among other things, amends Section 11(a) concerning financial incentives to provide:

> The commission may not approve a financial incentive under this subdivision unless the commission finds that the eligible business has demonstrated the timely recovery of costs and expenses incurred during the construction and operation of the project: (A) is just and reasonable; and (B) in the case of construction financing costs, will result in a gross financing savings over the life of the project.

Mr. Blissmer testified the construction financing costs will result in a gross financing savings over the life of the project. He explained the Summary tab includes the results from the data contained in the remaining tabs and presents two scenarios: (1) the top half presents the revenue requirement and financing costs portion of the revenue requirement under NIPSCO's proposed CWIP ratemaking treatment, and (2) the bottom half presents the same information under an alternative scenario where the asset is reflected in rates after being placed in service as part of a general rate case. He stated that under both scenarios, the CT is assumed to be placed in service in December 2027, the general rate case test year is assumed to be calendar year 2027, and the Step 2 rates in that general rate case are assumed to become effective on a bills rendered basis in March 2028. He explained that from that point forward, the sequence and timing of rate implementation under both scenarios is the same, as the CT Project under the GCT will have rolled into base rates and that the only difference from March 2028 over the remaining life of the project is the result of the higher accrued rate base (including regulatory asset) produced by the accrual of AFUDC and post-in service carrying costs ("PISCC") under the traditional model. He explained he has not included property taxes in the calculation because property taxes are not financing costs. He did include depreciation expense because the regulatory asset resulting from the deferral of depreciation expense would be reflected in rate base and thus depreciation does produce different financing costs under the two scenarios.

Mr. Blissmer concluded under NIPSCO's forward-looking GCT proposal, the total revenue from financing costs is $1,609,808,326, and under the traditional general rate case scenario, the total revenue from financing costs is $1,691,794,736, with the difference between these two amounts of $81,986,410 being the gross financing savings over the life of the CT Project. With a backward looking GCT Mechanism, the total gross financing savings over the life of the CT Project would be $48,019,573.

Mr. Blissmer testified NIPSCO's proposed financial incentive of CWIP ratemaking is just and reasonable. He stated the gross financing savings produces lower rates for customers. NIPSCO's proposal improves its cash flows and avoids rate shock to customers. He explained the primary benefit for a utility from CWIP ratemaking, from a financial health standpoint, is that it will provide NIPSCO cash flow during a potentially lengthy construction period. He testified CWIP ratemaking improves near term cash flow and mitigates the negative effects of the

significant additional debt taken on to construct the project.

In addition to CWIP ratemaking resulting in savings and producing lower rates for customers, Mr. Blissmer testified that it has long been recognized that CWIP ratemaking is a benefit to customers because it prevents so-called "rate shock." He explained that for large capital projects, waiting until the project enters service to include costs in rate base can lead to a significant one-time increase in the rate base and, in return, rates and that CWIP protects against that type of rate shock by phasing in the costs of the new facilities over the construction period.

Mr. Blissmer testified the exact estimated bill impact of the CT Project for an average residential customer will be dependent on several factors. However, assuming issuance of a CPCN for the CT Project and approval of the proposed GCT Mechanism as described above, NIPSCO currently estimates costs in the first GCT filing after approval would result in an incremental 2025 charge of approximately $0.56 to a 668 kWh per month residential bill, which is significantly lower than the $1.25/month impact based on a 2026 in-service date.

OUCC witness Ms. Baker objected to using the WACC in the calculation of CWIP ratemaking in the GCT. She contended NIPSCO should instead use project-specific financing costs or the cost of short-term debt.

IG witness Mr. Gorman testified the CWIP tracker is not just and reasonable simply because there are financial savings. Both IG witness Mr. Gorman and CAC witness Mr. Inskeep claimed the analysis of gross financing savings is inconsistent with Ind. Code § 8-1-8.8-11(a)(1)(B) in that it does not include net present value analysis. Mr. Inskeep also objected to the forward-looking version of the GCT Mechanism, alleging it was inconsistent with the verb tense of Ind. Code § 8-1-8.8-11(a)(1)and did not provide for "timely" recovery of costs.

In his rebuttal testimony, Mr. Blissmer testified NIPSCO is modifying its GCT proposal to remove WACC, and to apply its then current AFUDC rate. He stated he recalculated the gross financial savings from the use of CWIP ratemaking using both the forward-looking (NIPSCO's proposal) and backward-looking (NIPSCO's alternative proposal) using the estimated AFUDC rate instead of the WACC. He testified that (1) as shown in Petitioner's Exhibit 8-R Attachment 8-R-A, with the forward-looking GCT, the gross financial savings are now estimated to be over $9 million greater utilizing the estimated AFUDC rate than the savings calculated in his supplemental direct testimony using the WACC, and (2) as shown in Attachment 8-R-B, with the backward looking GCT, the gross financial savings are now estimated to be over $6 million greater utilizing the estimated AFUDC rate. He testified both alternatives continue to produce gross financial savings when compared to traditional ratemaking consistent with Ind. Code § 8-1-8.8-11(a)(1)(B), with the forward-looking version producing greater gross financial savings. Mr. Blissmer in his rebuttal testimony also responded to the contentions of Messrs. Gorman and Inskeep in opposition to the proposed GCT Mechanism. Mr. Inskeep claimed the delay of in-service date of the CT Project has caused an increase in total financing costs, which Mr. Blissmer explained fails to acknowledge his supplemental direct testimony that the one-year delay produces $65 million in customer savings through 2028.

Having found the CT Project is "clean energy project" under Ind. Code § 8-1-8.8-2(5) and having found the CT Project is just and reasonable, we are now required by Ind. Code § 8-1-8.8-11(a) to create financial incentives for the CT Project. Specifically, NIPSCO has requested we approve its proposed GCT Mechanism, which would provide for construction work in progress ratemaking as allowed by Ind. Code § 8-1-8.8-11(a)(1). Subsection 11(a)(1) provides that we may authorize "[t]he timely recovery of costs and expenses incurred during construction and operation of the project," but we may not do so "unless the commission finds the eligible business has demonstrated that the timely recovery of costs and expenses during the construction and operation of the project: (A) is just and reasonable; and (B) in the case of construction financing costs, will result in a gross financing cost savings over the life of the project."

Mr. Blissmer presented the calculation of his gross financial savings in his direct and supplemental direct testimony. Using the forward-looking GCT, Mr. Blissmer calculated the gross financial savings in direct testimony at $81,986,410 over the life of the CT Project. Using the more traditional backward looking GCT Mechanism, there would be reduced savings of $48,019,573. In rebuttal, Mr. Blissmer changed the financing cost rate to the AFUDC rate rather than the WACC in response to OUCC witness Mr. Baker. This change increased the gross financing cost savings by $9 million (total savings of approximately $91 million) for the forward-looking version and by $6 million (total savings of approximately $54 million) for the backward-looking version.

IG witness Mr. Gorman and CAC witness Mr. Inskeep objected to Mr. Blissmer's calculations on the grounds that they were not done on a present value basis. The statute, by its terms, does not require the calculation to be done based upon net present value. Instead, the statute requires the demonstration of gross financing cost savings over the life of the project. The Commission is a creature of statute with delegated authority from the Indiana General Assembly. When a statute does not require interpretation, and is unambiguous as Section 11 is, the Commission shall follow the law as written. Had the General Assembly intended the calculation to be done on a net present value basis as argued by Messrs. Gorman and Inskeep, it would not have used the word "gross" and would have instead used "net present value." We find that, as calculated by NIPSCO witness Mr. Blissmer, both the forward-looking and backward-looking versions of the proposed GCT Mechanism will generate "gross financing cost savings" over the life of the CT Project.

We are unpersuaded by Messrs. Gorman and Inskeep's assertion NIPSCO did not demonstrate the proposed GCT Mechanism as just and reasonable, particularly because neither witness responded substantively to Mr. Blissmer's direct testimony describing how the GCT benefits customers through the avoidance of so-called "rate shock" when a large construction project is reflected in rates in a single step. By recovering costs through the GCT Mechanism during the construction period, the rate impact from the CT Project will be reflected in steps over six-month increments. The ultimate cost to customers once the CT Project is fully reflected in rates will be lower because of the greatly reduced AFUDC.

The General Assembly has specifically directed affordability as one of the attributes to be considered in the context of generation transition. One of the tools provided by the General Assembly in the case of transition to clean energy projects is a CWIP tracker, which, as explained by Mr. Blissmer, produces the benefits of lower rates and smaller rate increases. We cannot simply ignore the benefits a CWIP tracker will contribute to affordability by lowering rates and smoothing

and mitigating rate increases during generation transition. NIPSCO's testimony on the overall benefits of CWIP ratemaking on credit quality, which ultimately informs the carrying charge applied to NIPSCO's investment and, therefore, customer rates, was effectively unrebutted. Mr. Inskeep asserted various other arguments against CWIP ratemaking generally, including that it creates generational inequities and erodes a utility's incentive to efficiently manage a project. These are not objections to whether this proposal meets the requirements of the statute, and they ignore the fact that the legislative decision has already been made to allow CWIP ratemaking. We find that, under Section 11, both the forward- and backward-looking versions of NIPSCO's proposed GCT Mechanism are just and reasonable.

We now move to the question of which method we should approve: the forward-looking or backward-looking GCT. As explained by Mr. Blissmer, NIPSCO has proposed the backward-looking GCT Mechanism in the alternative in the event we were not to approve the forward-looking version. With the forward-looking GCT, NIPSCO would reflect CWIP financing costs projected to occur over the next six-month billing period in each tracker filing. The projected CWIP financing costs would then be adjusted to the actual incurred costs and expenses by way of the reconciliation process. In this fashion, there would be no AFUDC reflected in the total cost of the CT Project except for the limited AFUDC that has already been accrued and expected to be accrued until rates take effect in March 2025 under the GCT Mechanism. In addition, there would be no depreciation to defer. The backward-looking GCT, in contrast, would reflect CWIP financing costs that had been incurred over the previous six-months. With the backward-looking GCT, there would be AFUDC accrued during each six-month period until the costs are reflected in the GCT. In addition, there would be depreciation deferred between the in-service date and reflection in rates. This AFUDC and deferred depreciation would increase the overall cost of the CT Project, which is why the backward-looking version of the GCT produces less gross financing cost savings.

Mr. Inskeep had two objections to the forward-looking version of the GCT. First, he claimed the statute uses past tense and that this precludes recovery of projected costs. Second, he claimed that because NIPSCO would be recovering financing costs before they have been incurred, the recovery would not be "timely" as the statute requires. We are unpersuaded by either argument. First, it is important to note that whether the tracker looks forward or backward will not change that NIPSCO will recover only its actual costs. With the reconciliation process inherent in the proposed tracker, NIPSCO's recovery will always be based upon its actual costs incurred. The statute requires that the mechanism provide for timely recovery of costs and expenses incurred during construction. With the forward-looking mechanism coupled with its reconciliation process, NIPSCO's proposal provides for recovery of the costs and expense that are actually "incurred," and this recovery begins during the same six-month period during which those costs are being incurred. The forward-looking GCT Mechanism would result in timely recovery consistent with the statute. In addition, given that the forward-looking GCT Mechanism produces approximately $37 million in gross financing cost savings ($91 million less $54 million) when compared to the backward-looking mechanism, it is the method that creates a more affordable result for customers. Further, Ind. Code § 8-1-8.8-11(a)(4) authorizes us to approve other financial measures we consider appropriate, and we consider the forward-looking GCT to be appropriate. The General Assembly has established an infrastructure policy "to use all practicable means and measures, including financial and technical assistance, in a manner calculated to create and maintain conditions under which utilities plan for and invest in infrastructure necessary for operation and

maintenance while protecting the affordability of utility services for present and future generations of Indiana citizens." Ind. Code § 8-1-2-0.5. Denying a utility the use of a forward-looking tracker that would produce an additional $37 million in gross financial savings for customers based upon verb tense would be inconsistent with this overall infrastructure policy and the pillar of affordability. Accordingly, we find NIPSCO's proposed forward-looking GCT Mechanism using the AFUDC rate as reflected on rebuttal should be approved.

We further approve Petitioner's request that the operating income associated with the CT Project recovered through the GCT Mechanism be included in the total electric Comparison of Electric Operating Income for purposes of the Ind. Code § 8-1-2-42(d) earnings test. This is an appropriate additional financial incentive under Section 11, and it is therefore approved.

D. <u>The Five Pillars</u>. In HEA 1007, the Indiana General Assembly declared it is the continuing policy of the State that decisions concerning Indiana's electric generation resource mix, energy infrastructure, and electric service ratemaking constructs must consider each of the five pillars of electric utility service. See also Ind. Code § 8-1-8.5-4(b)(4). Ind. Code § 8-1-2-0.6 codifies the five pillars of electric utility service: as reliability, affordability, resiliency, stability, and environmental sustainability. NIPSCO witness Ms. Becker's Petitioner's Exhibit No. 1 Attachment 1-C identifies the seven different NIPSCO witnesses who sponsored testimony supporting each of the Pillars.

We address the Five Pillars in the order in which they are listed in Ind. Code § 8-1-2-0.6, acknowledging that no one pillar takes precedence over the others and that each must be balanced against the others.

Based on the evidence of record and having considered the Five Pillars enumerated in Ind. Code § 8-1-2-0.6, the Commission finds NIPSCO's proposed CT Project and related proposals are consistent with and appropriately balance the legislative directive in this state policy statement.

i. <u>Reliability</u>. Reliability is ensuring customers have the power they need when they need it. We have recognized that in a dramatically shifting generation landscape the need for fast start/quick ramping resources is magnified. Southern Ind. Gas & Elec. Co., Cause No. 45564 (IURC 6/28/2022). NIPSCO witness Mr. Austin's testimony informs us this need is increasing. Evidence of record supports findings that the proposed CT Project addresses needs identified by key stakeholders, including MISO, NERC, the MISO IMM, and others, and addresses needed attributes to directly support NIPSCO's overall generation portfolio.

Both the NERC and MISO have warned stakeholders that, as the penetration of solar generation increases, the challenge of steeper ramping needs for the non-solar fleet magnifies. Mr. Austin cited numerous publications from NERC, MISO, and MISO's IMM discussing the need to install fast-starting, quick ramping generation to support the growing portfolio of renewable resources and maintain reliable service. NERC specifically recognizes the important role regulatory policy plays in ensuring a reliable grid. Mr. Austin explained that 2023 marked the first year, "energy policy" has been added as a risk profile to Electric Reliability Organization ("ERO") Priorities Report. Mr. Austin, quoted the ERO Priorities report stating: "[t]raditional resource adequacy approaches that assume the system is adequately planned if there is enough generation capacity during peak load hours have become insufficient given the accelerated changes in

resource mix, extreme weather events, and fuel dependencies." Petitioner's Exhibit No. 3. The 2022 Long-Term Reliability Assessment issued December 2022 states as follows:

> As more solar and wind generation is added, additional flexible resources are needed to offset these resources' variability, such as supporting solar down ramps when the sun goes down and complementing wind pattern changes. This can be accomplished by adding more flexible resources within committed portfolios or by removing system constraints to flexibility.

Further, NIPSCO witness Mr. Austin explained the proposed CT Project will help meet MISO's Resource Adequacy Requirements. The 2023 Organization of MISO States- MISO Survey Results (published July 14, 2023) reflect delayed retirements and capacity additions have resulted in a capacity surplus of 1,500 MW for the 2024/25 planning year. Id. Demand growth is projected to continue for five years across all four seasons at 0.8 GW or 0.68% per year on average across the MISO footprint and the results show a deterioration of MISO's current capacity surplus above the required capacity level, to a sizeable projected shortfall of 2,100 MW in summer 2025/26. This demonstrates a growing need for dispatchable resources to support system reliability within the MISO region, including Indiana.

NIPSCO witness Mr. Austin explained why batteries, inverter-based resources ("IBRs"), and energy storage resources ("ESR") do not meet system reliability needs. NERC and MISO's IMM reach similar conclusions, as the NERC highlights in its 2022 Long-Term Reliability Assessment and notes:

> … IBRs produce low amounts of fault currents based on control functions. Changing fault current magnitudes and characteristics in parts of the system with high penetrations of IBRs has the potential to invalidate current protection system designs, potentially leading to more protection system misoperation.

The IMM, in its 2022 State of the Market Report for the MISO Electricity Markets, concurs, stating that:

> Although ESRs can provide tremendous value in managing the fluctuations in intermittent output and maintaining reliability, ESRs are not fully substitutable for conventional generation. This is particularly true as the quantities of ESRs rise, which causes the marginal value of ESRs to fall.

NIPSCO witness Mr. Stanley explained MISO's interest in the significant transition of electric generation in the MISO region:

> MISO is focused on reliability, and that means it is focused on ensuring the resource portfolio has the necessary capability and attributes. Yet, due to decarbonization goals, economics and customer preferences, key existing resources will retire. Some plans to build new resources with the needed attributes are delayed or abandoned, and other technologies are not ready for broad deployment. Proposed replacement capacity has shown to be lacking key traits given current technologies. The gap between retirement capabilities and attributes is a growing reliability

concern.

Petitioner's Exhibit No. 6. The Executive Summary in the 2022 State of the Market Report goes on to outline different attributes or characteristics provided by different generation resource types and reflects that gas resources have a significant relative advantage over renewable resources in providing: (1) long duration energy at high output; (2) voltage stability; (3) ramp up capability; (4) rapid start-up; and (5) blackstart capability. It is these attributes that the CT Project will offer to NIPSCO's generation portfolio, for the benefit of all of its customers and the broader MISO region. In addition, while still in development and under review, NIPSCO witness Mr. Augustine cited from MISO's Resource Adequacy Subcommittee October 2022 presentation that noted the importance of key technical attributes like blackstart and detection of short circuit strength and prioritized a set of attributes associated with capacity, energy adequacy, flexibility, and essential reliability services. These priority attributes are consistent with the reliability criteria NIPSCO evaluated within the economic and non-economic assessments that were conducted during the 2021 IRP.

NIPSCO conducted extensive diligence on the reliability of the potential resource portfolios in its 2021 IRP. The Non-Economic Reliability Assessment evaluated each potential portfolio based on the following reliability criteria and metrics: (1) blackstart capability, (2) energy adequacy, (3) dispatchability, (4) operational flexibility and frequency support, (5) VAR support, (6) location, (7) predictability and firmness, and (8) short circuit strength. In 2023, NIPSCO conducted the Flexible Resource Analysis to assess the preferred portfolio's flexibility needs on an inter-hour and intra-hour basis, given the variability and intermittency of renewable resources and performed a sub-hourly analysis to provide insights into the type of market exposure NIPSCO could face as its portfolio evolves. The Flexible Resource Analysis showed the preferred portfolio of approximately 1,200 MW of flexible capacity by 2030 would be insufficient to meet net load and three-hour ramp requirements in extreme conditions without reliance on the market and revealed a 150 MW growth in NIPSCO's need for capacity with a 10-minute ramp rate by 2030. NIPSCO's CT Project in its preferred configuration is designed to fill this capacity gap ensuring service on NIPSCO's entire system is reliable.

Our review of the evidence of record regarding the attributes of the aeroderivative turbines leads us to conclude that their operational characteristics are a vital part of the CT Project's expected reliability. NIPSCO witness Mr. Baacke explained aeroderivative turbines are typically more efficient, start faster and more frequently, and fluctuate power generation faster to meet demand when compared to larger industrial frame turbines. We conclude it is these features that will allow NIPSCO to continue to install large volumes of renewable energy (which serves the environmental sustainability pillar discussed below) while still maintaining the ability to reliably and efficiently serve a heavy industrial customer base, as well as commercial and residential load, when intermittent renewable resources are not available for short or prolonged periods of time.

Finally, we note the CT Project's gas usage will be supported through NIPSCO's gas system, which already contains transportation rates, riders, and pooling options. NIPSCO's gas system is robust, with multiple interconnection points with seven interstate pipelines, which offer an uncommon level of supply diversity as natural gas generators are typically captive to only one interstate pipeline connection. This is an advantage for the CT Project, especially as compared to intermittent resources, and further bolsters its reliability and resiliency.

ii. Affordability. The addition of a large generation resource such as the CT Project will necessarily impact the cost of electric service NIPSCO provides to its customers. This illustrates the tension between the Five Pillars that naturally occurs as a utility invests to ensure the availability and delivery of reliable energy to its customers. The OUCC, IG, and CAC testimony each raised affordability concerns with NIPSCO's proposed CT Project and related cost recovery through the GCT Mechanism. The thrust of their varied concerns is the pillars of reliability, resiliency, and stability should not supplant meaningful consideration of the customer affordability of NIPSCO's request.

Although we are not approving rates as part of this proceeding, we are authorizing NIPSCO to construct a generation facility that will operate for many years and approving a recovery mechanism for costs associated with construction of the facility. Because a utility has limited control over nearly all the external factors that could impact its customers' ability to pay for utility service, the challenge for public utilities in the face of a highly consequential generation transition is to meet its customers' need for electric generation cost effectively. NIPSCO's evidence supports that its proposal for the CT Project does that.

The proposed CT Project originated from NIPSCO's 2021 IRP from which a preferred portfolio was selected as a lower cost option than alternatives. NIPSCO utilized a competitively bid EPC contract event and determined a multi-prime contracting strategy could save $100 million over the viable EPC bid it received. When NIPSCO determined supply chain constraints caused the originally contemplated in-service date to no longer be reasonably achievable, it reevaluated its approach and submitted supplemental direct testimony to shift the in-service date of the CT Project by one year to end of year 2027. This shift in in-service date produced an immediate savings for customers of $65 million over the course of the next five years through delayed rate implementation. In addition to these savings, NIPSCO's proposed GCT Mechanism will further produce gross financial cost savings of approximately $90 million over the life of the CT Project as compared to traditional ratemaking. Finally, the CT Project will not require additional pollution control technology to comply with GHG Rule and offers the flexibility to run as an intermediate load unit, which could serve to reduce NIPSCO's need to procure additional market capacity, which reduces exposure to price volatility to the benefit of NIPSCO's customers. Each of these facts demonstrate the steps NIPSCO took to address affordability as part of its overall project proposal.

While we acknowledge that a project of this size will inevitably lead to an increase in customers rates, we conclude that, when considered in totality, NIPSCO's CT Project supports the goal of utility service costs that are affordable and competitive across the customer classes.

iii. Resiliency. Resiliency is similar to reliability, and much of our discussion above regarding reliability is applicable here. Resiliency represents the distinct concept concerned with ensuring availability of electricity under changing or extraordinary system conditions. The fast start capabilities of the CT Project, especially given the configuration with aeroderivative units are a key component of resiliency. NIPSCO witness Mr. Walter testified NIPSCO has a need for additional winter capacity, and the CT Project will be a key part of ensuring the resiliency of NIPSCO's electric operations. Mr. Austin offered extensive confidential testimony that directly addressed how the CT Project will support resiliency.

In addition to the system's ability to respond to an acute system emergency or unexpected outage, longer-term resiliency can be considered based on evolving market rules, changing weather patterns, or climate-related phenomena. As outlined by NIPSCO witness Mr. Augustine, the 2023 portfolio analysis incorporated market shifts and changes that have occurred since the 2021 IRP, including the MISO seasonal resource adequacy construct. These changes point to an increased need for capacity-advantaged resources in NIPSCO's generation portfolio, a need which the CT Project directly fulfills.

iv. Stability. Stability is defined in the statute as the ability of the electric system to: (a) maintain a state of equilibrium during normal and abnormal conditions or disturbances and (b) deliver a stable source of electricity, in which frequency and voltage are maintained within defined parameters, consistent with industry standards. Stable sources of power provide a critical backbone to the grid, which is particularly vital during this dynamic time of significant generation transition. With renewable generation being a significant component of NIPSCO's generation portfolio transition since its 2018 IRP, NIPSCO conducted a Reliability Analysis as part of its 2021 IRP, which identified the need for longer-duration, flexible resources additions within its service territory. As gas turbines can operate continuously for extended durations, the CT Project clearly supports system stability. NIPSCO witness Mr. Stanley testified that gas resources have a significant advantage relative to inverter-based (e.g., renewable) resources, as gas resources can provide (1) long duration energy at high output; (2) voltage stability; (3) ramp up capability; (4) rapid start-up; and (5) blackstart capability. These characteristics, which were also discussed above in the Reliability discussion, are essential to a stable generation transition, and a stable generation transition drives value for utility customers. Evidence of record supports a finding that the CT Project offers these types of needed attributes and supports system stability for NIPSCO, Indiana, and the broader MISO region.

v. Environmental Stability. Environmental sustainability considers both the impact of regulations and the demand from customers for power from environmentally sustainable resources. The CT Project fits as part of NIPSCO's overall plan to retire all its coal-fired generation by 2028 and to reduce its carbon emissions from its electric operations by 90% measuring from a 2005 baseline. The CT Project will have the flexibility to run beyond its currently anticipated capacity factors and still maintain compliance with the newly adopted EPA GHG rule. The CT Project fits within an overall portfolio whereby NIPSCO has successfully transitioned away from a portfolio heavily reliant on coal to one that relies on a fleet of wind, solar, and battery energy storage resources. The intermittent capabilities of those renewable resources must be supported by the quick start/fast ramp capabilities of the CT Project.

OUCC witness Mr. Armstrong states that the determination of whether natural gas generation is environmentally sustainable is subjective. The CT Project supports increasing levels of renewable energy in the electric system and replaces capacity from NIPSCO's coal units that are planned to retire by 2025 and 2028. The retirement of coal generation and replacement with zero-emission generation and low/intermediate-load gas generation—such as the CT Project—keeps NIPSCO and NiSource on-track to achieve their target of a 90% reduction in Scope 1 GHG emissions by 2030, compared to 2005 levels. The efficiency of the aeroderivative turbines serves the environmental sustainability pillar. NIPSCO witness Mr. Holcomb explained that, at full load, the aeroderivative units are expected to meet the intermediate load emission standard in the EPA greenhouse gas rule and be allowed to operate at capacity factors up to 40%, as needed. The frame

unit is not expected to meet the intermediate load emission standard and would, therefore, be limited to a 20% capacity factor. This demonstrates how the proposed CT Project's configuration balances environmental sustainability while also supporting reliability, resiliency, and stability.

6. Confidentiality. NIPSCO filed a motion for protection and nondisclosure of confidential and proprietary information on September 12, 2023, January 16, 2024, and April 25, 2024. These motions related to information NIPSCO claimed to be trade secrets and protected from disclosure under Ind. Code §§ 8-1-2-29 and 5-14-3-4. Docket entries were issued on September 28, 2023, February 8, 2024, and March 13, 2024, finding such information to be preliminarily confidential and protected from disclosure under Ind. Code §§ 8-1-2-29 and 5-14-3-4. The confidential information was subsequently submitted under seal. The Commission finds the information that is the subject of these motions is confidential pursuant to Ind. Code § 8-1-2-29 and Ind. Code ch. 5-14-3, is exempt from public access and disclosure by Indiana law, and shall continue to be held by the Commission as confidential and protected from public access and disclosure.

IT IS THEREFORE ORDERED BY THE INDIANA UTILITY REGULATORY COMMISSION that:

1. NIPSCO is issued a certificate of public convenience and necessity under Ind. Code ch. 8-1-8.5 to construct an approximately 400 MW natural gas combustion turbine peaking plant to be located at NIPSCO's existing R.M. Schahfer site. This Order constitutes the certificate.

2. NIPSCO's estimated total cost of the CT Project in the amount of $641.2 million (excluding AFUDC) is approved as set forth herein.

3. NIPSCO's request for ongoing review of the CT Project is approved. NIPSCO shall file reports as described herein for the purpose of ongoing review in accordance with Ind. Code § 8-1-8.5-6.

4. The CT Project is approved as a clean energy project and NIPSCO's request for financial incentives, including timely cost recovery through construction work in progress ratemaking under Ind. Code Ch. 8-1-8.8 is approved.

5. NIPSCO is granted authority to recover costs incurred in connection with the CT Project through its Generation Cost Tracker Mechanism, as proposed, including approval of the specific ratemaking and accounting treatment approved herein. NIPSCO's proposed changes to its Electric Service Tariff relating to the GCT Mechanism are approved.

6. The Confidential Information submitted under seal in this Cause pursuant to the parties' requests for confidential treatment is determined to be confidential trade secret information as defined in Ind. Code § 24-2-3-2 and shall continue to be held as confidential and exempt from public access and disclosure under Ind. Code §§ 8-1-2-29 and 5-14-3-4.

7. This Order shall be effective on and after the date of its approval.

HUSTON, BENNETT, FREEMAN, VELETA, AND ZIEGNER CONCUR:

APPROVED: OCT 16 2024

I hereby certify that the above is a true and correct copy of the Order as approved.

_____

Dana Kosco
Secretary of the Commission

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

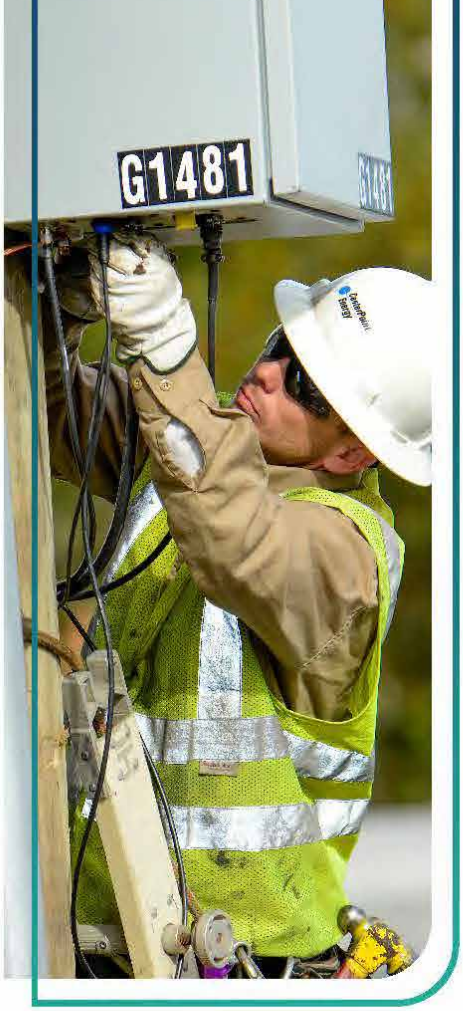
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-25-12
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	))))	Order No. 202-25-13

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 21
CenterPoint Indiana 2025 IRP







2025
Integrated Resource Plan

CenterPoint® Energy

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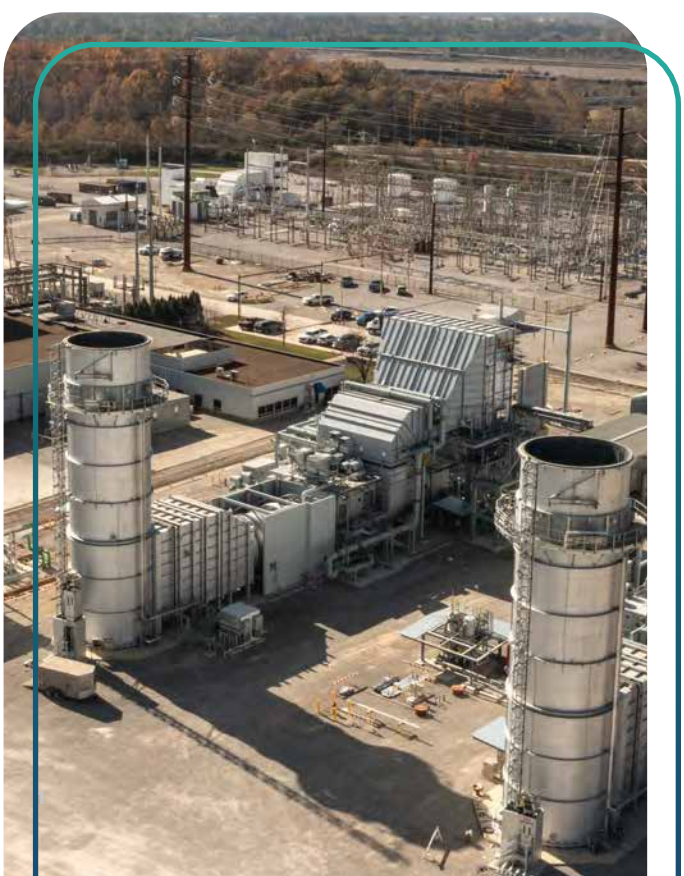
Executive Summary

(Non-Technical Summary)

Introduction

Southern Indiana Gas and Electric Company d/b/a CenterPoint Energy Indiana South's ("CEI South"/"CEIS") 2025 Integrated Resource Plan ("IRP") is the culmination of an extensive analysis of CEI South's optimal resources for ensuring the availability of electricity to its retail electric customers over a 20-year period at a low cost with consideration for future cost risks. CEI South has adhered to the requirements of the Indiana Utility Regulatory Commission ("IURC" or "Commission") and the guidance provided in the Commission's orders related to past Preferred Portfolios described in CEI South's previous IRPs both in the preparation of this IRP and the planning process that preceded the report.

CEI South conducts the IRP process every three years and each IRP, necessarily, builds on the IRP and the generation resource investments that have come before. CEI South's 2022/2023 IRP identified a Preferred Portfolio that included a generation transition with the conversion of F.B. Culley 3 from coal to natural gas, along with Demand Side Management ("DSM"), wind, and solar resources. CEI South began implementing the 2022/2023 IRP by filing two cases for which CEI South sought and received approval for (1) two signed purchase power agreements ("PPA") for wind facilities totaling 317 MWs, the Galesburg Wind Project and the Salt Creek Wind Project; and (2) approval for the 2025-2027 DSM Plan. Each of these filings were consistent with the 2022/2023 IRP, and as noted below, the IRP affirms the direction taken by CEI South. These renewable resources still qualify for Federal incentives, which dramatically lowered their cost relative to what could be acquired in the future, post elimination of Inflation Reduction Act ("IRA") tax incentives for wind and solar resources.



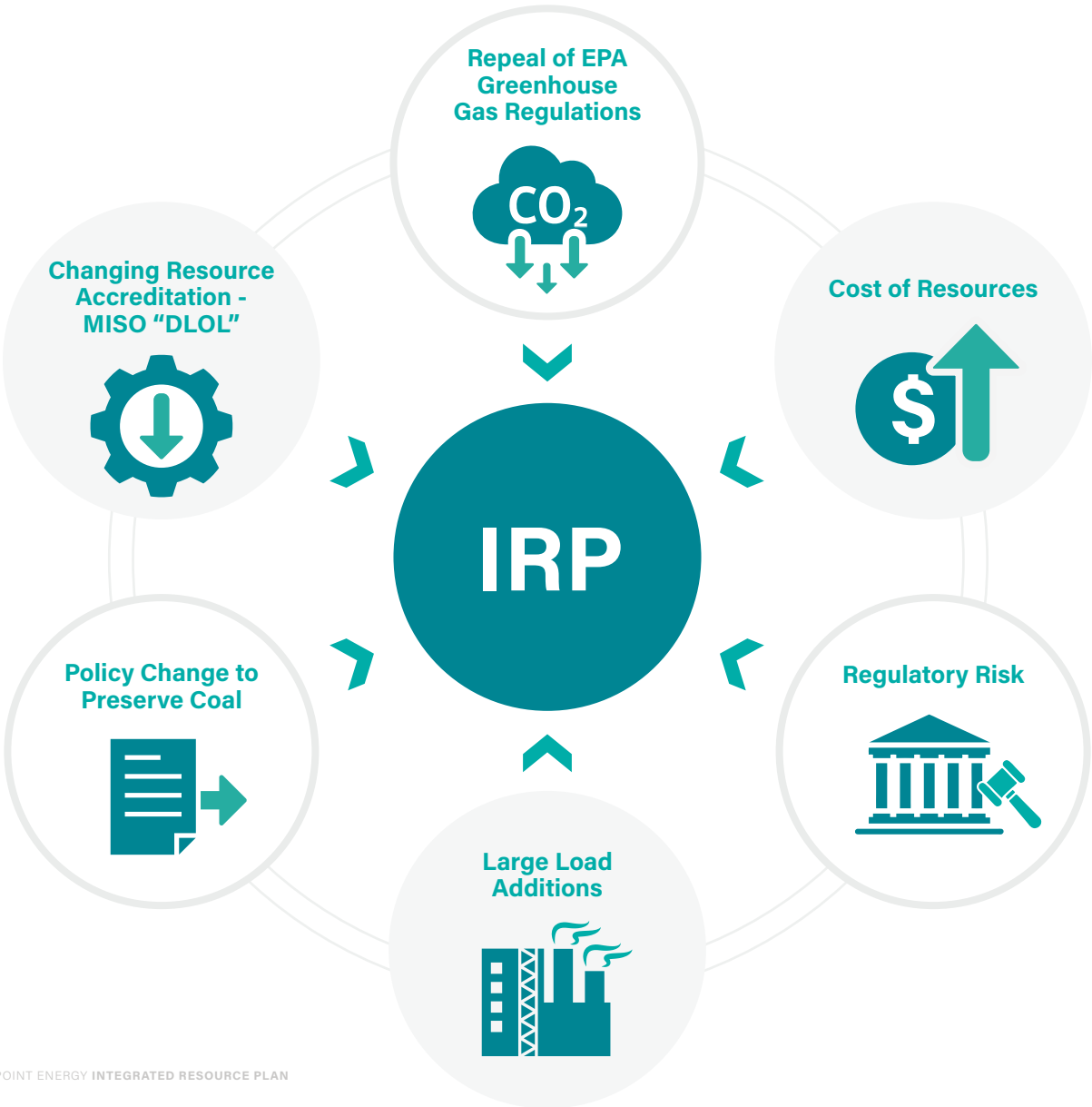
Now in 2025, during this time of unprecedented uncertainty across multiple fronts, the 2025 IRP analysis and its conclusions highlight the prudent decision for CEI South to reevaluate the timing of its generation fleet transition. Amid this time of evolving risk, and following our most recent rate case, there has been feedback from our customers and their advocates to keep bills more affordable. The IRP public meetings allowed us to listen to stakeholders and explain the uncertainty facing the industry.

Therefore, CEI South is reevaluating the timing of its transition to new or upgraded equipment in the near-term with a **focus toward rate stability and system reliability**.



The world looks very different than it did twelve months ago, when this IRP process began. The current pace and amount of change creates a variety of risks that, when weighed together, supports CEI South's decision to reevaluate the generation transition. The figure below summarizes current uncertainties.

Current Uncertainties





In 2023, CEI South filed its first electric base rate case in nearly 14 years. Ultimately, CEI South was approved to recover an additional $80 million from customers to continue to **safely and reliably deliver electricity** to their homes and businesses. While the energy transition CEI South set forth in prior IRPs was more affordable in the long run than continuing to operate its coal units, approximately 80% of the approved rate case increase was related to replacing A.B. Brown coal units 1 & 2 with 191 MW Posey Solar (~$385 million) and 460 MW natural gas combustion turbines (~$287 million). A.B. Brown's aging environmental equipment was required to be updated and replaced at a similar cost by 2024; this fact helps to illustrate the importance of strongly considering near-term affordability within the context of the IRP.

In this dynamic environment, CEI South has remained nimble to allow it to provide affordable and reliable service for its customers. Since the last IRPs were filed, there have been significant challenges in moving forward with key pieces of the last two IRPs' Preferred Portfolios. Several solar projects were terminated due to shifting market dynamics and substantial delays in commercial operation dates—one exceeding four years, with others averaging more than three. These market changes and delays drove project costs beyond the levels approved by the Commission and above what CEI South believed economical for its customers.

As such, the Crosstrack Solar Project, a 130 MW Build Transfer Agreement ("BTA") approved in Cause No. 45754, was terminated on March 15, 2024. Subsequently, two solar PPAs were also canceled on July 1, 2025, due to cost increases beyond the approved agreements, the 100 MW Warrick County Solar Project and the 185 MW Vermillion Solar Project, both approved in Cause No. 45839. Similarly, a 200 MW wind BTA also had upward pricing pressure. After years of negotiation and a re-evaluation of this project, CEI South opted, in this IRP, to abandon this project in an effort to avoid additional customer bill impact.

Also, in early 2025, CEI South announced that it paused the plan to convert F.B. Culley 3 to natural gas, to be re-evaluated in this IRP. Within this analysis, CEI South utilized more refined cost estimates and assumptions based on our preparation to convert the unit. This decision to pause the conversion was not taken lightly and was the direct result of near-term affordability concerns raised by the community, along with the current uncertainties listed in the previous figure.

Although the previous IRP projected long-term cost savings, CEI South estimates that implementing all proposed projects as planned would have resulted in a near-term bill increase of approximately $18 per month over the next few years. CEI South also heard some stakeholders express interest in re-evaluating the

decision to convert F.B. Culley 3 within the context of the transparent IRP process, particularly given the near-term uncertainty driven by changes in the Federal and State administrations. CEI South's decision to reevaluate this path forward proved to be prudent. Under today's market conditions, (elimination of future Federal tax incentives for renewables, declining accreditation from MISO for renewables, increased price pressure on resources based on tariffs/ongoing supply chain issues), converting F.B. Culley 3 to natural gas by 2030 with renewables is projected to be the second highest cost portfolio evaluated, 17% higher than the lowest cost portfolio examined and 14% higher than the Preferred Portfolio.

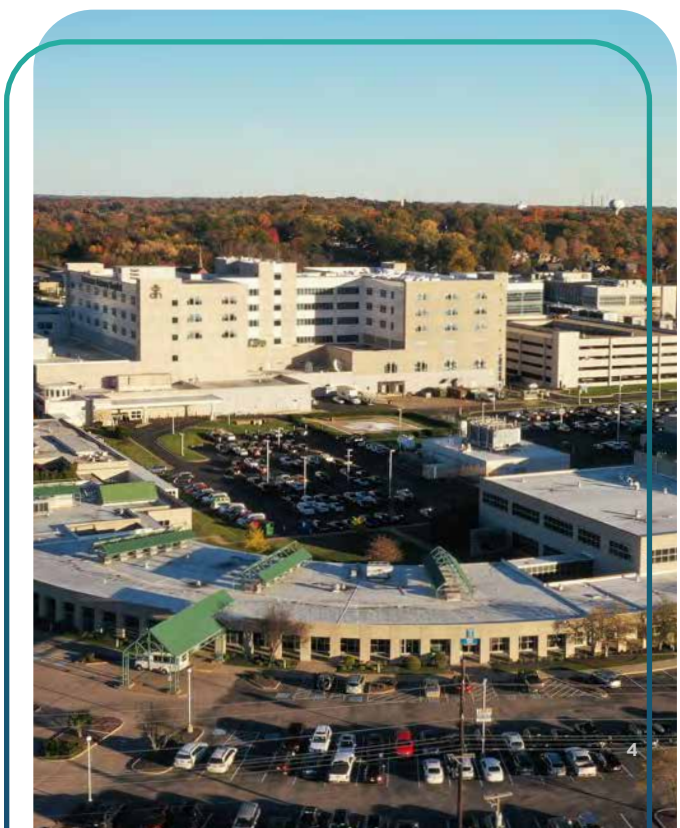
CEI South began its 2025 IRP process in early 2025 to explore new and existing supply-side and demand side resource options to reliably serve CEI South customers over the next 20 years. The Company's exploration included significant input and dialogue with stakeholders. While starting with our 2022/2023 IRP framework as a basis for the 2025 analysis, CEI South has enhanced its process and analysis in several ways. These enhancements include, but are not limited to, the following:

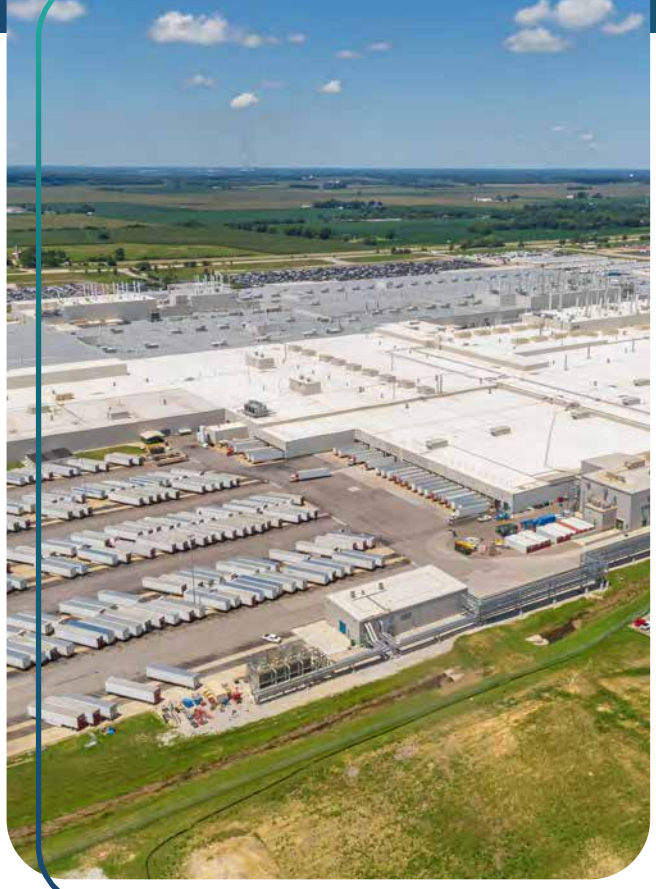
- expanded sensitivity analysis (distributed solar incentive, large load additions, Demand Response term, etc.);
- increased collaboration with transmission and distribution planning;
- enhanced transmission analysis, unserved energy, capacity risk, etc.;
- inclusion of an expected data release schedule;
- five pillars focused score card with an expanded view of affordability; and
- refreshed IRP layout with enhanced description of analysis and results.

Over the last year, CEI South has participated in active discussions with several large load customers, and there was considerable stakeholder interest in understanding how CEI South would serve a large load addition. In order to maintain maximum flexibility, CEI South responded by including large load sensitivities and adding an alternate reference case to its analysis.

To maintain maximum flexibility and agility in these uncertain times, CEI South has selected both a **Preferred** and an **Alternate Preferred Portfolio**.

The Preferred Portfolio assumes the status quo for our territory. The Alternate Preferred Portfolio was developed should CEI South be in a position to provide power to a large load addition.





The alternate reference case maintains reference case market conditions but includes a potential large load addition that grows by 250 MWs per year, topping out at 1.5 GWs above CEI South's current retail load. This large load profile is indicative of ongoing discussions/ negotiations with prospective customers. Potential large load customers require utilities to be able to serve their needs quickly, or they will take their economic development, supporting jobs and the tax base for the community, elsewhere.

CEI South plays a proactive role in **advancing economic development** across southwestern Indiana. By developing an Alternative Preferred Portfolio, the company enhances its agility **to better serve and support the region's evolving needs**.

With the need to provide reliable, stable, resilient, affordable, and sustainable energy to our customers, both Preferred Portfolios call for the conversion of A.B. Brown natural gas Combustion Turbine ("CT"), units 5 and 6, to an efficient Combined Cycle Gas Turbine ("CCGT"). The Preferred Portfolio provides customers with near and long-term rate stability and pushes this decision out to future IRPs until there is more clarity on the future while the Alternate Preferred Portfolio moves forward with the conversion by 2030. In either case, the decision on F.B. Culley 3's replacement will be decided in a future IRP. Both portfolios include the remaining solar and wind energy resources—secured prior to this IRP—at significantly lower costs compared to future renewable projects that may not benefit from near- to midterm Federal tax incentives. Both portfolios also include battery storage to replace CEI South's smallest and most inefficient coal unit, F.B. Culley 2. This allows time for CEI South to further evaluate the economics of this option relative to purchasing required capacity to maintain reliability. Finally, both include continued investment in energy efficiency and demand response resources.

The company has signed a contract with a demand response ("DR") aggregator for commercial and industrial DR by 2026. CEI South is also nearing the beginning of a pilot which was approved in its recent rate case to explore time-based rates. The Preferred Portfolio includes indicative DR amounts for IRP planning purposes.

Preferred Portfolio

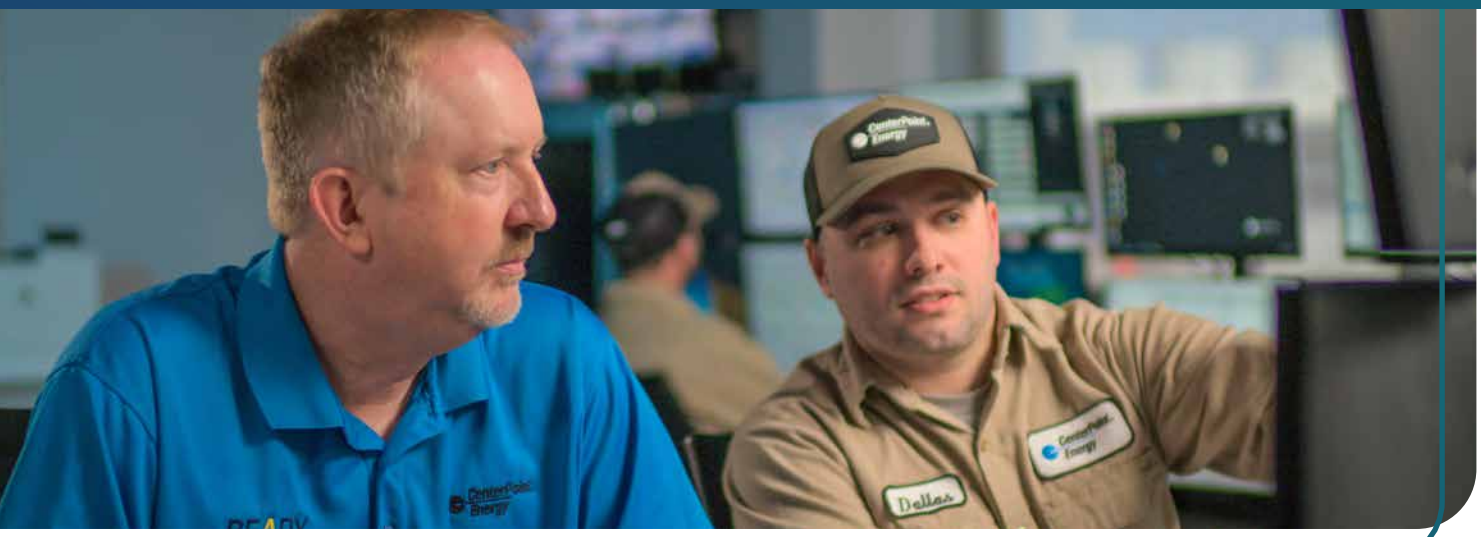


CEI South's Preferred Portfolio takes a more gradual approach to its generation transition, providing time for greater clarity amid today's unprecedented uncertainty. This approach also allows time for transmission system upgrades through CEI South's current TDSIC plan and the MISO's Long-Range Transmission Plan ("LRTP") Tranche 2.1 projects, which support enhanced reliability and resilience.

The Preferred Portfolio provides for **maximum flexibility** to pivot should the future turn out differently than expected.

This is crucial in this current environment, where developers are less willing to share in cost risk which drives generation project costs higher for utility customers, with uncertainty around how much accreditation resources will receive from MISO to meet reliability requirements, or the direction of future greenhouse gas regulations.

In the short term, the plan maintains the F.B. Culley 2 interconnection, with possible 90 MW battery storage reuse and continues the demand side management programs. In the long-term and to be reevaluated in a future IRP, the plan calls for the conversion of A.B. Brown units 5 & 6 gas turbines to an efficient CCGT unit in 2034 to replace F.B. Culley 3 by 2035. The plan also calls for 50 MWs of battery storage in 2040 and 2045 to meet its planning reserve margin requirements.



Preferred Portfolio: **How Did We Get Here**

While current modeling suggests that replacement of F.B. Culley 3 coal with conversion of CEI South's two new CTs to a CCGT by 2030 could save customers money in the long run, locking in this option for CEI South's retail customers could increase bills in the near-term, increase risk, and reduce future flexibility. The conversion of these units would cost approximately $1 billion dollars or more and would likely be included in customer rates by 2030, costing customers up to $21 [1] more per month on average in the near term compared to the Preferred Portfolio which delays this decision. Affordability, one of the five pillars, is top of mind for CEI South and its customers following our recent rate case and has also been prominent within IRP stakeholder comments.

By slowing down the generation transition, customers should benefit from rate stability while preserving the flexibility—a critical capability in today's landscape—for CEI South to reevaluate F.B. Culley 3's fate in a future IRP. For example, in its previous IRP, CEI South had planned to convert F.B. Culley 3 to natural gas by 2027 with a continued renewables build out. However, just three years later, shifting external factors—such as reduced MISO accreditation for renewables, increased costs driven by market uncertainty, and diminished federal support following the rollback of key IRA tax incentives—have made this a more costly strategy relative to alternatives (14-17% higher).

Preferred Portfolio: **Overview**

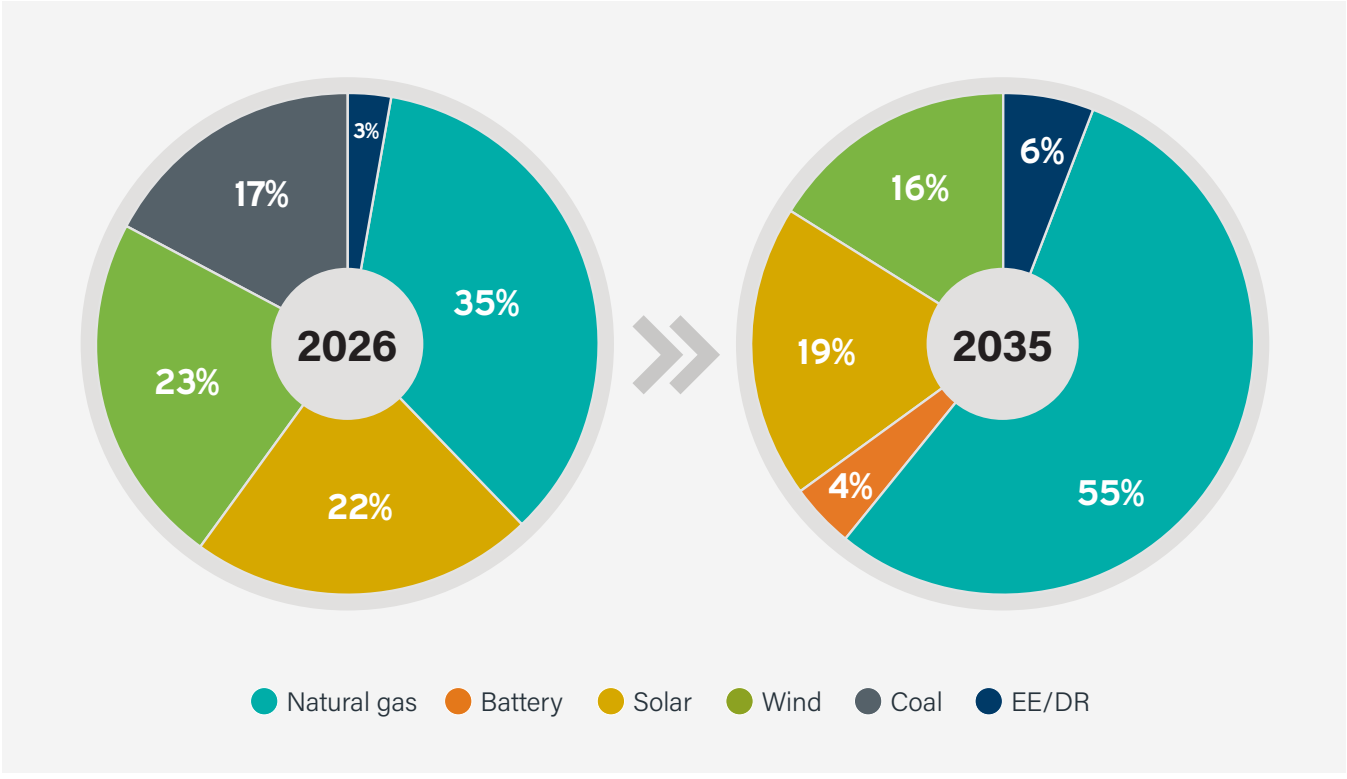
Between now and 2034, the Preferred Portfolio preserves the option to replace F.B. Culley 2 coal plant when it is suspended at the end of 2025 with a 90 MW battery storage unit by the end of 2028. CEI South will conduct another Request for Proposal ("RFP") to determine if the cost of this project has escalated from what was bid in the All-Source RFP and compare the cost to required capacity purchases. Based on the All-Source RFP, the cost of this battery is nearly identical to purchasing an equivalent amount of capacity on the market. Locking in capacity with a battery should help stabilize bills versus purchasing from a volatile capacity market that is expected to see rising prices as MISO's reserve margin continues to decline. It also helps maintain reliability with an on-system resource to help supply stored energy when it is needed most.

The Preferred Portfolio secures cost savings from wind and solar resources identified and acquired through previous IRPs, ahead of the repeal of IRA renewable energy tax incentives under the One Big Beautiful Bill Act ("OBBBA"). It also maintains operational flexibility by allowing F.B. Culley 3 to continue to run on coal, allowing time to reevaluate if conversion to natural gas or earlier retirement makes sense in a future IRP.

[1] *Not including expected offsetting sales revenues*

Preferred Portfolio: **Key Considerations**

CEI South's preferred resource plan reduces risk through continued diversification, lowers the cost to serve load over the next 20 years, and provides flexibility to evaluate and respond to future needs through subsequent IRPs.



The Preferred Portfolio has several advantages, including:

1. Among the least cost options, within **3% of the lowest cost portfolio** in the long term.
2. Provides near-term rate stability for **customer affordability** by delaying large capital investment.
3. Provides **affordable**, **reliable energy** with a well-balanced mix of **sustainable energy resources** and continued focus on demand side resources.
4. F.B. Culley 2 battery storage **enables avoidance of certain required capacity purchases**.



5. **Maximizes flexibility** to navigate unprecedented uncertainty; **minimizes risk**.

   - Delaying large capital investment also mitigates cost risk, as we live in very uncertain times. Current uncertainty is driving near-term price increases for various resources. It also helps reduce long-term price risk by allowing more time to better understand the direction of Environmental Protection Agency ("EPA") greenhouse gas regulations. Over the last 16 years environmental regulations have flexed and retracted with each administration. It is possible that in the next administration an aggressive greenhouse gas regulation could materialize which could throttle how much an efficient combined cycle gas unit may run, or a more stringent environmental regulatory requirement is finalized that would significantly increase operating costs for a fossil-fuel fired generation unit.

   - Provides flexibility under a wide range of potential future legislative, regulatory, and market conditions. Maximum flexibility is important as demonstrated by the massive amount of change that has been experienced over the last decade. By proactively canceling high-cost renewable projects and securing affordable wind power purchase agreements, CEI South has taken decisive action to avoid increasing customer expenses. This forward-thinking strategy also strengthens CEI South's position ahead of MISO's upcoming accreditation reforms—reforms that are expected to significantly reduce the reliability value of certain resources, particularly solar. Additionally, pausing the conversion of F.B. Culley 3 and reevaluating under current market conditions preserves future flexibility at a lower near and long-term cost to our customers.

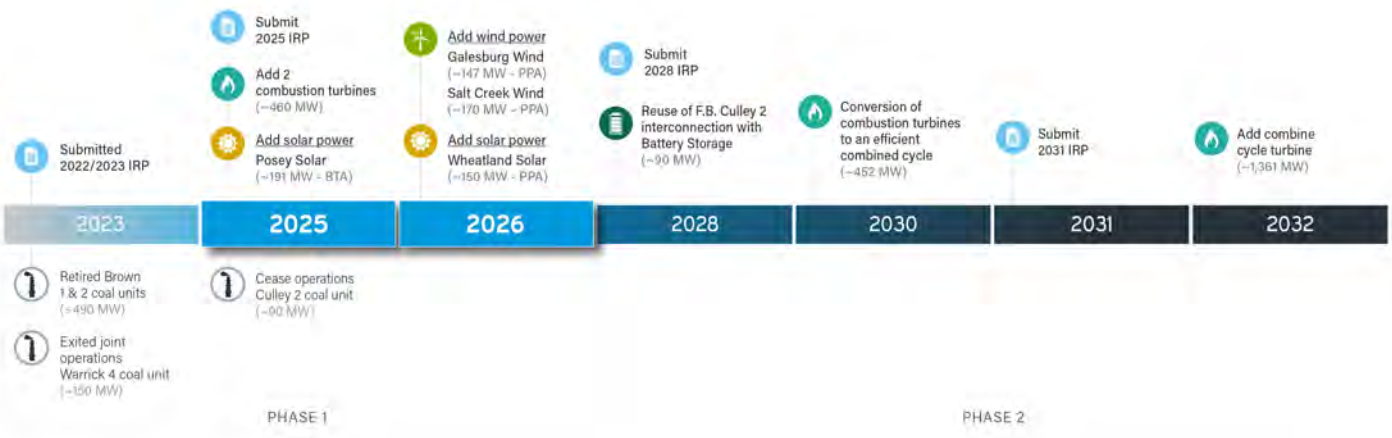
6. **Preserves tax base and jobs in Warrick County.** The replacement of F.B. Culley 2 with a battery storage system provides economic benefit to the community, whereas purchasing this needed capacity from the market does not. It is the equivalent of renting a home vs buying. Allowing F.B. Culley 3 to continue running in the near-term preserves tax base, benefiting the county while it continues to depreciate; it also maintains jobs associated with coal handling. Additionally, the facility uses Indiana-mined coal, preserving mining jobs and supporting the state's economy.

7. Maintains a base load generator on the east side of our system, providing **reliable**, **stable**, and **resilient power**.

   F.B. Culley Unit 3 continues to deliver essential voltage support to our community, providing valuable time for needed transmission expansion and offering flexibility as we await greater clarity on the future of nearby generation facilities that currently play a key role in grid stability.

8. Provides **flexibility** to serve a large load addition, should an **economic development** project materialize (See Alternate Preferred Portfolio).

Alternate Preferred Portfolio



The following Alternate Preferred Portfolio summary includes the process to identify the portfolio as well as an explanation of the planning process, all while focusing on CEI South's operations.

To maintain flexibility and stay nimble for potential economic development opportunities for southwestern Indiana, CEI South chose an **Alternate Preferred Portfolio** for a large load addition.

A large load addition scenario was created, starting at 250 MW and scaling up to 1,500 MWs in the early 2030s. Conversion of the new A.B. Brown CTs to a CCGT and F.B. Culley 2 battery storage become the most affordable options in the near-term to support the ramp. The Alternate Preferred Portfolio utilizes the interconnection at F.B. Culley 2 for a 90 MW battery storage unit by 2028 and continues demand side management programs.

Additionally, the plan calls for the conversion of A.B. Brown units 5 & 6 gas turbines to an efficient CCGT unit by 2030, continues F.B. Culley 3 on coal, and builds a large natural gas combined cycle unit by 2032 to support the large load addition. This build out is paired with near-term reliance on the market and aligns with system capabilities.

Alternate Preferred Portfolio: **How Did We Get Here**

Per stakeholder feedback, CEI South evaluated the potential for a large load addition that would scale over time. This scenario complements the multiple large load sensitivities conducted during the IRP and reflects insights gained from CEI South's ongoing conversations over the past several years with prospective customers across a range of industries. Commonly, CEI South is asked to determine how fast the system can be ready to accommodate a potential customer's business plan. Timelines have been compressed from what was considered normal in the past. These requests require CEI South's generation planning team to work closely with its transmission planning team. This scenario incorporates feedback from both teams, along with expert third party consultants to evaluate what is possible.



Alternate Preferred Portfolio: **Overview**

In the alternate reference case, all market conditions remain the same as reference case conditions, but load is increased by 250 MWs per year until the cumulative load reaches 1,500 MWs in the early 2030s. Load evaluations from prospective customers of this size were extremely uncommon for economic development projects in the past but are now approaching routine. CEI South selected the optimized, least cost model results as the Alternate Preferred Portfolio.

By including an Alternate Preferred Portfolio, CEI South is preserving necessary flexibility to quickly pivot, keeping southwestern Indiana competitive for economic development and growth. The Alternate Preferred Portfolio adds tax base and jobs to the community, not only from the prospective customer facility, but also from the infrastructure needed to support it. CEI South's analysis shows that generation near the site of the load is necessary to provide stability and avoid a large transmission outlay.

Alternate Preferred Portfolio: **Key Considerations**

The Alternate Preferred Portfolio:

- Preserves maximum future flexibility, keeping southwestern Indiana competitive for economic development and growth (Speed to market is important for most prospective customers),
- Adds tax base and jobs in our community, which helps all customers thrive,
- Aligns with Federal and State goals,
- Utilizes F.B. Culley 3 until replacement/conversion to natural gas is decided, and
- Adds efficient on-system base load generation for **reliability**, **stability** and **resilience**.

CEI South will continue to have ongoing conversations with prospective customers. At this point, no contract has been signed. As we prepare for this potential, CEI South will continue to evaluate possible timelines and costs necessary to serve. While the Alternate Preferred Portfolio provides a possible path, the resource mix to serve will be heavily influenced by a potential customer's need for low-cost power, along with other criteria important to the prospective customer. As such, CEI South modeled alternatives to aid in these conversations. CEI South will work to prioritize affordability for its existing customers and minimize future cost risk should conversations turn into negotiations/contracts.

CenterPoint Energy Overview

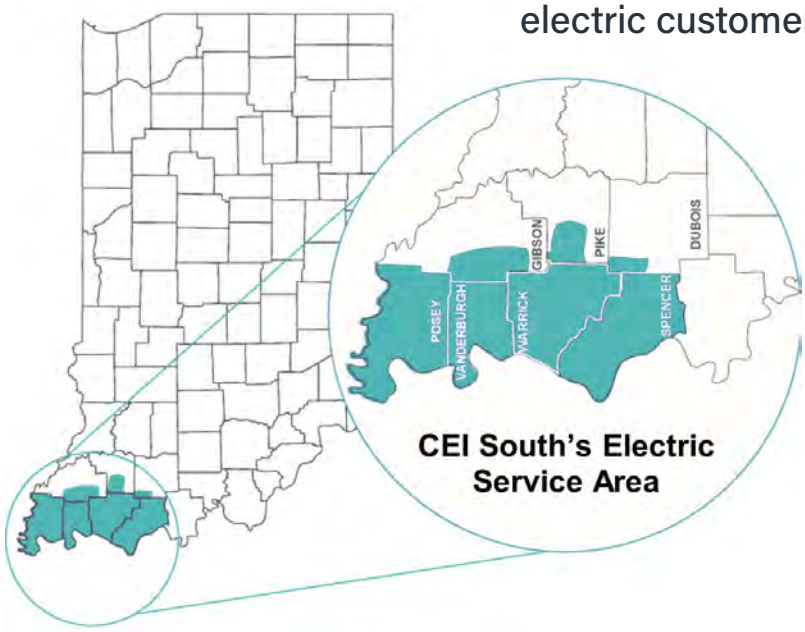
Provides energy delivery services to more than

150,000

electric customers

CEI South provides energy delivery services to more than 150,000 electric customers located near Evansville in southwestern Indiana. In 2024, approximately 45% of electric sales were made to large (primarily industrial) customers, 30% were made to residential customers, and 25% were made to small commercial customers.

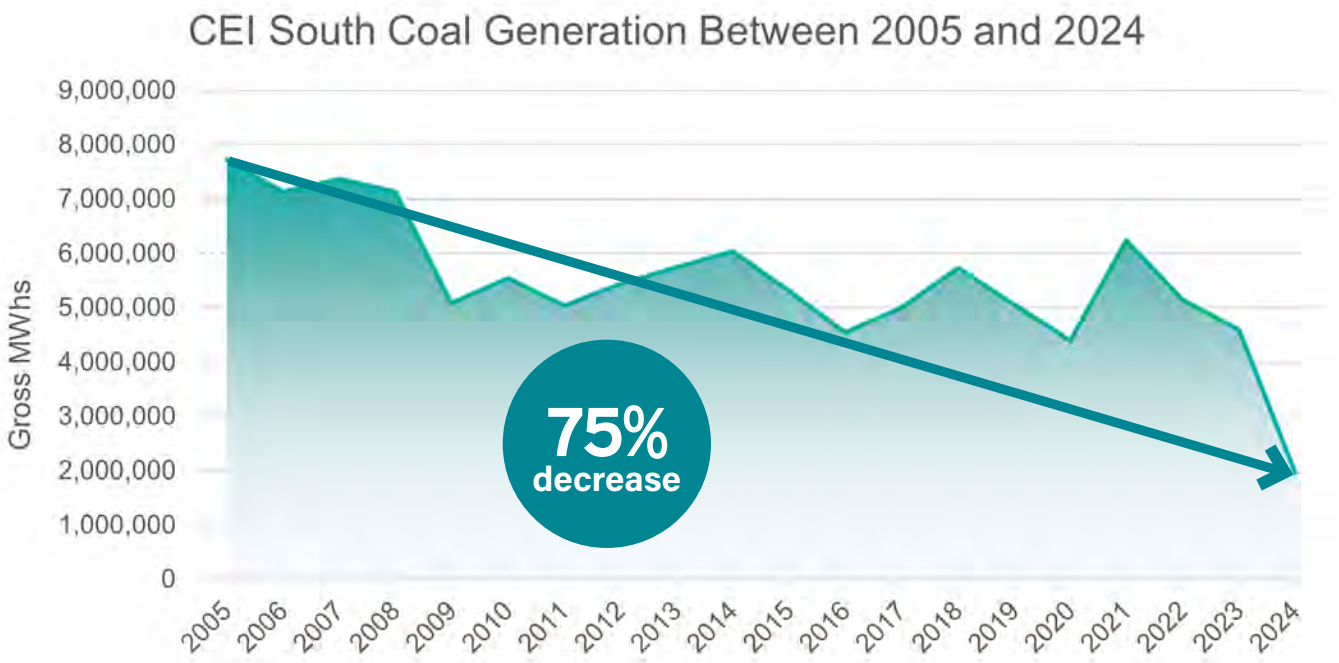
The table below shows CEI South generating units. Note that CEI South also offers customers energy efficiency programs to help lower customer energy usage and bills.



Unit [2]	Installed capacity ICAP (MW)	Primary Fuel	Unit in Service	Unit Retirement Date/Expiration	Unit Age	Coal Unit Environmental Controls [3]
F.B. Culley 2	90	Coal	1966	2025	59	Yes
F.B. Culley 3	270	Coal	1973	N/A	52	Yes
A.B. Brown 3	80	Gas	1991	N/A	34	
A.B. Brown 4	80	Gas	2002	N/A	23	
A.B. Brown 5	230	Gas	2025	N/A	<1	
A.B. Brown 6	230	Gas	2025	N/A	<1	
Blackfoot	3	Renewable Gas	2009	N/A	16	
Fowler Ridge	50	Wind PPA	2010	2029	15	
Benton County	30	Wind PPA	2007	2028	18	
Galesburg	147	Wind PPA	2026	N/A	N/A	
Salt Creek	170	Wind PPA	2026	N/A	N/A	
Troy	50	Solar	2021	N/A	4	
Posey	191	Solar	2025	N/A	<1	
Wheatland	150	Solar PPA	2026	N/A	N/A	
Volkman Rd	2	DG Solar + battery	2018	N/A	7	
Oakhill	2	DG Solar	2018	N/A	7	
Post House	<1	DG Solar	2020	N/A	5	

[2] CEI South has a 1.5% ownership share of Ohio Valley Electric Corporation ("OVEC") which equates to approximately 32 MW.
[3] Both Coal units are controlled for Sulfur Dioxide ("SO2"), Nitrogen Oxide ("NOx"), Particulate Matter (dust), and Mercury. F.B. Culley 3 is controlled for Sulfur Trioxide ("SO3") and Sulfuric Acid ("H2S04").

CEI South has largely moved away from coal, with the retirement of A.B. Brown units 1 & 2, exiting the joint operating agreement for Warrick 4, and the planned suspension of F.B. Culley 2 at the end of 2025.



These resources have been replaced with a diverse mix of wind, solar, energy efficiency, demand response, and gas resources. The current analysis demonstrates that customers receive a better balance of near-term and long-term affordability and reliability by continuing to evaluate the opportunity to replace CEI South's smallest and least efficient coal unit, F.B. Culley 2, with battery energy storage while deferring a decision on replacement of CEI South's last remaining coal unit that it operates, F.B. Culley 3, to a future IRP.

Integrated Resource Plan

Every three years CEI South submits an IRP to the IURC as required. The IRP describes the analysis process used to evaluate the optimal mix of generation, storage, energy efficiency, and demand response resources (resource portfolio) to meet customers' needs for reliable, resilient, stable, affordable, and environmentally sustainable power ("the five pillars") over the next 20 years. The IRP helps set the direction for future generation and energy efficiency options. Future analysis, filings and subsequent approvals from the IURC are needed to implement selection of new resources.

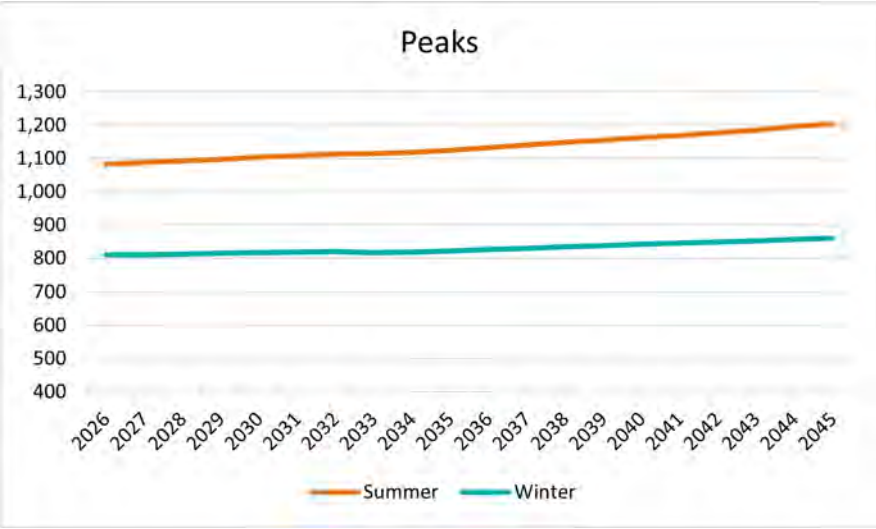
CEI South utilized direct feedback on analysis methodology, analysis inputs, and evaluation criteria from stakeholders, including but not limited to CEI South residential, commercial and industrial customers, regulators, elected officials, customer advocacy groups, trade associations and environmental advocacy groups. CEI South placed considerable emphasis on the five pillars, rate stability, risk, and resource diversity. The IRP process continues to increase in complexity as MISO continues to implement resource accreditation reforms to maintain reliability of the system that includes increased levels of renewable resources, battery energy storage, and natural gas resources to replace existing coal resources.

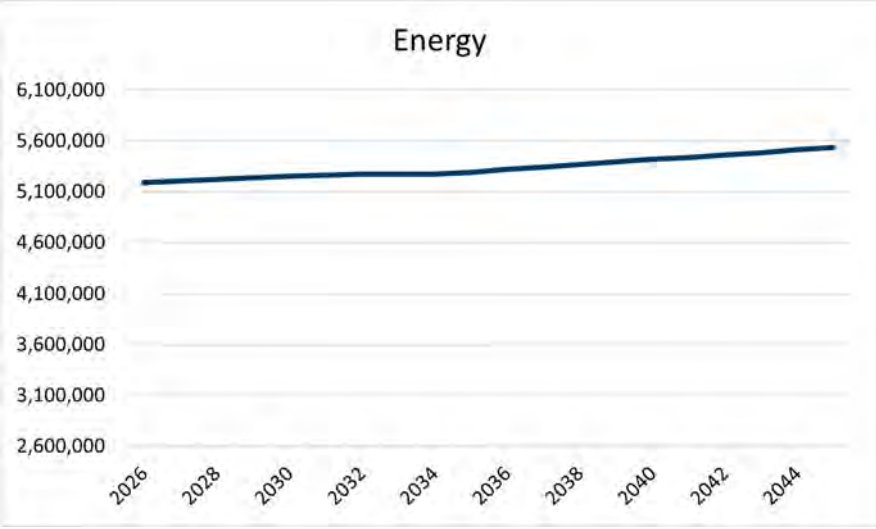
Customer Energy Needs

The IRP begins by evaluating customers' need for electricity over the 20-year planning horizon. CEI South worked with Itron, Inc., a leader in the energy forecasting industry, to develop a forecast of customer energy and demand requirements. Demand is the amount of power being consumed by customers at a given point in time, while energy is the amount of power being consumed over time. Demand is typically measured in Megawatts ("MW"), and energy is typically measured in Megawatt hours ("MWh"). Both are important considerations in the IRP. While CEI South purchases some power from the market, CEI South is required to have enough generation, demand side (energy efficiency and demand response), and storage resources available to meet expected customers' seasonal peak demand plus additional reserve resources to meet MISO's Planning Reserve Margin Requirement ("PRMR") for reliability. Reserve resources are necessary to minimize the chance of rolling black outs; moreover, as a MISO member, CEI South must comply with MISO's evolving rules to maintain reliability.



CEI South must meet customer demand in all hours of the year. This has become more challenging, as the regional resource mix changes towards intermittent (variable) renewable generation. MISO functions as the regional transmission operator for 15 midwestern and southern states, including Indiana (also parts of Canada). MISO evaluates how changes in the future resource mix impact reliability. Recently, they have received FERC approval to update the way resources are accredited to the Direct Loss of Load ("DLOL") methodology beginning in 2028, which is projected to have a substantial impact on solar accreditation in the summer and winter when load is at its highest. CEI South has accounted for this change and worked with stakeholders to develop a reasonable accreditation projection given the best available information. Later in this document it is further explained how MISO continues evaluating measures to help ensure year-round reliability.





CEI South utilizes sophisticated models to help determine energy needs for residential, commercial and large customers. These models include projections for the major drivers of energy consumption, including but not limited to, the economy, appliance efficiency trends, population growth, price of electricity, weather, specific changes in existing large customer demand and customer adoption of solar and electric vehicles.

Overall, customer energy and summer peak demand, excluding energy efficiency, are expected to grow by **0.5% per year**. Winter peak demand grows at a slightly slower pace of **0.3% per year**.

Resource Options Considered

The next step in an IRP is identifying resource options to satisfy customers' anticipated need. Many resources were evaluated to meet customer energy needs over the next 20 years. CEI South considered both new and existing resource options. 1898 & Co., a well-respected engineering firm, conducted an All-Source RFP which generated 95 unique proposals to provide energy and capacity from a wide range of technologies, including: solar, solar + short duration battery storage, standalone short duration battery storage, bio-mass thermal, demand response, and wind. These project bids provided up-to-date, market-based information to inform the analysis. Additionally, CEI South utilized other information sources for long-term costs and operating characteristics for these resources and others over the entire 20-year period. Other options include continuation of existing F.B. Culley 3 coal unit, conversion of F.B. Culley 3 coal unit to natural gas, various other natural gas resources, conversion of A.B. Brown combustion turbines to a Combined Cycle Gas Turbine, hydro, landfill gas, and long-duration batteries.

Every IRP is a snapshot in time producing a direction based on the best-known information. It is helpful to provide some background into significant issues that help shape the IRP analysis, including but not limited to: the accelerated sunset of wind and solar tax incentives from the IRA with the passage of OBBBA, the rise of Artificial Intelligence ("AI") data centers and onshoring of industrial manufacturing driving unprecedented load growth, state and federal executive orders to maintain existing resources, continued increased costs for renewables projects, new technologies, and rapid changes in the MISO market to adapt and help enhance reliability.

- Battery storage
- Coal
- Energy efficiency/ Demand response
- Hydro electric
- Natural gas
- Nuclear
- Wind and solar





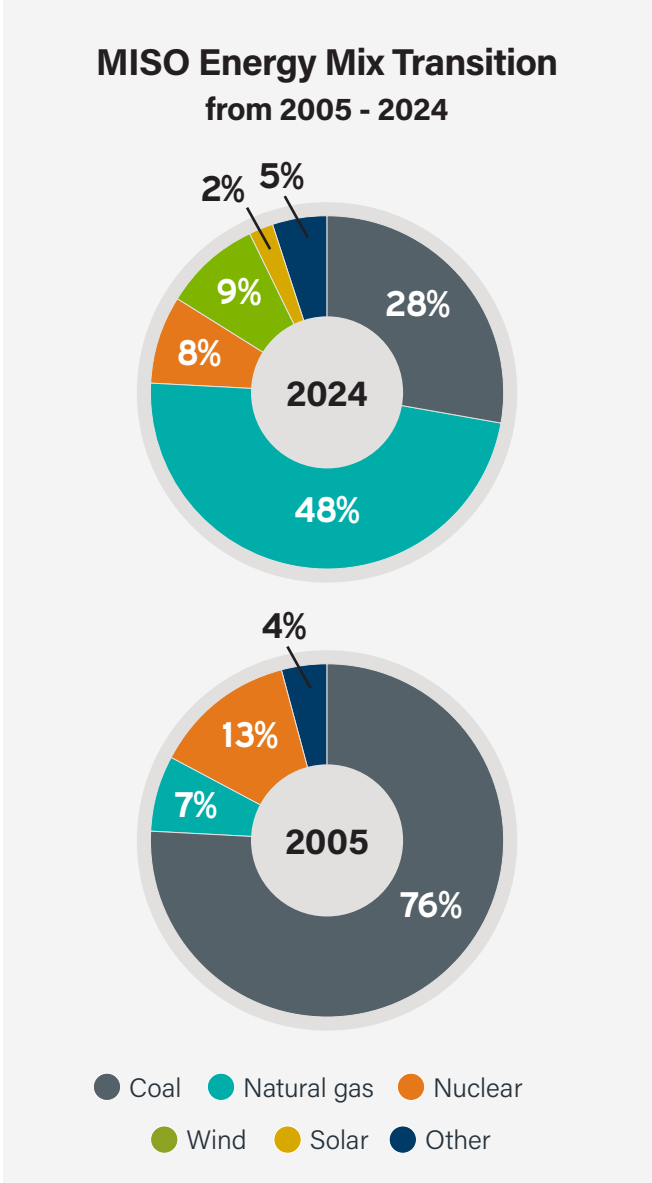


INDUSTRY TRANSITION

The transition to intermittent renewable resources within MISO has continued over the last several years, although at a slower pace. Until the pandemic, renewables costs declined rapidly due to improvements in technology and government incentives. This largely stalled and began an upward climb. Wind and solar resources continue to face increasing price pressure, interconnection delays, and decreasing accreditation from MISO. With the passage of OBBBA, renewable resource tax incentives sunset more quickly than under the IRA placing more pressure on renewable resources.

This comes as load growth to serve data centers supporting AI is projected to ramp very quickly over the next several years. Each data center can use enough energy to power a mid-sized city, and they require power twenty-four hours a day, necessitating dispatchable resources. Additionally, President Trump has made tariffs a core part of his second term. These tariffs are designed to incentivize manufacturing to come back to the United States, thus providing new economic development opportunities, particularly with industries related to national security. For example, his administration has focused on the steel and aluminum industries, which also bring the potential for extremely large loads.

To respond to this challenge, the federal government is working to slash regulations and maintain incentives for baseload (24x7 power) nuclear resources. Additionally, the state of Indiana has responded with incentives for these prospective customers and also with economic development incentives aimed at spurring development in small modular nuclear resources that can provide power intense data centers and large industrial facilities with zero carbon emitting resources, the first of which, in Indiana, is likely to come on-line in the early to mid-2030s.



In the near-term, gas resources are seeing unprecedented demand from utilities to meet increasing near-term load obligations. Installed capacity of wind and solar resources is expected to continue to increase within the MISO footprint, although more slowly than even a few years ago. Within the MISO footprint, energy from gas generation has increased from less than 10% of total electric generation in 2005, used primarily to meet the needs during peak demand conditions, to approximately 48% of total generation in 2024.[4] Meanwhile, coal has declined but still supplies a little more than a quarter of the energy need within MISO, followed by wind at 9%, nuclear at 8%, and solar at 2%.

[4] *MISO 2024 State of the Market Report, Potomac Economics, June 2025, page 6 https://cdn.misoenergy.org/2021 State of the Market Report625295.pdf https://www.potomaceconomics.com/wp-content/uploads/2025/06/2024-MISO-SOM_Report_Body_Final.pdf*

The move toward renewables and gas energy has come at the expense of coal generation, which has been rapidly retiring for several reasons. Coal plants have not been able to consistently compete on short term marginal price with renewable and gas energy. Operationally, the move toward intermittent renewable energy requires coal plants to more frequently cycle on and off. These plants were not designed to operate in this manner. The result is increased maintenance costs and more frequent outages. Older, inefficient coal plants are being retired to avoid spending significant dollars on necessary upgrades to achieve compliance with EPA regulations. Finally, public and investor pressure, coupled with future cost risk associated with the objective of decreasing carbon emissions, has also driven unit retirements.

While coal has been declining, it remains an important source of power for our grid, particularly as this capacity-rich resource has seen an uptick in market capacity revenues. Additionally, President Trump has written executive orders aimed at supporting the coal industry in an attempt to preserve remaining plants. With these market changes, coupled with increasing costs for renewable and gas resources, we are more likely to see some coal units remain online longer than they otherwise would have.



CHANGING MARKET RULES TO HELP ENSURE RELIABILITY

MISO recognizes the major changes in the way energy is being produced. Traditionally, baseload coal plants produced energy at a constant level around the clock, while peaking gas plants were available to come online as needed to meet peak demand. Gradual increases and decreases in energy demand throughout the day and seasonally were easily managed with these traditional resources. As described above, the energy landscape is continuing its rapid change with increased adoption of more intermittent renewable generation which is available when the sun is shining, or the wind is blowing. This creates much more variability by hour in energy production. Some periods will have overproduction (more energy produced than is needed at the time) and other periods will have low-to-no renewable energy production, requiring dispatchable resources to meet real-time demand for power. MISO has recognized the region's energy landscape continues to evolve toward a complex, less predictable future.

Some of the challenges MISO faces are resources that are primarily weather dependent, less predictable weather, less predictable resource outages, and increasing electric load. To maintain reliability with a changing mix of resources, there is an increased importance of ensuring that adequate attributes are available from the fleet such as ramp capability, long duration energy at high output, and fuel assurance. To ensure reliability is maintained, MISO implemented a seasonal resource adequacy construct beginning with the 2023/2024 planning year that focuses on meeting system demand in all hours as opposed to planning for meeting the summer peak demand. As part of the seasonal construct, thermal resource accreditation has shifted from an Equivalent Forced Outage Rate Demand ("EFORd") approach to one that accredits resources based on historical availability during tight operating hours. Accreditation for renewable resources continues to be challenged as MISO received approval to further revise the accreditation approach in 2028 with the introduction of DLOL methodology. The move to DLOL is expected to most affect renewable resources, particularly solar. For example, solar resources were expected to provide about 25% or more of their total installed capacity to cover MISO's reliability requirement. This is expected to drop over time to approximately 5% or below in the summer, CEI South's tightest season. The practical effect is that more capacity will be needed when fully implemented.

Also, MISO continues to study how demand response resources will be accredited. To date, these reforms have provided more certainty that demand response will be there when called upon; however, there is a much higher bar than in the recent past for industrial customers to participate with annual testing and required faster response times to remain a participant in these programs. MISO reforms will continue as reserve margins continue to tighten and increasingly include intermittent renewable resources that make it more difficult to maintain acceptable voltage and thermal limits on the grid than traditional, dispatchable resources.

CEI South has accounted for these changes by incorporating the seasonal construct and DLOL accreditation approach into the Encompass model, and the portfolios in this analysis provide sufficient resources to meet its MISO obligations in all four seasons with limited capacity purchases. Additionally, CEI South analyzed the thermal limits of equipment along with the voltage and reactive power needs of the system for various portfolio options and identified mitigations.

BATTERY STORAGE AND TRANSMISSION RESOURCES

To support greater reliance on intermittent renewable resources, utilities are increasingly considering the opportunity to add battery storage to resource portfolios to help provide availability and flexibility. Lithium-ion ("L-ion") batteries have seen significant cost declines over the last several years as the technology begins to mature. In fact, 2024 All-Source RFP bids for battery storage to replace F.B. Culley 2 as a potential CEI South resource were cost effective for the first time.

There are many applications for this resource, from shifting the use of renewable generation from time of generation to the time of need, to grid support for maintaining the reliability of the transmission system. CEI South has experience operating a 1 MW battery designed to capture energy from an adjacent solar project. This pilot project has provided information that will be helpful in moving forward with a much larger project. The 90 MW battery will be available to discharge energy for four hours and will be available for energy arbitrage and meeting peak load conditions.

Uncertainty/Risk

As demonstrated over the past few years, the future is far from certain. Uncertainty creates a risk that a generation portfolio that is reasonable under an anticipated future fails to perform as expected if the future turns out differently. CEI South's IRP analysis was developed to identify the preferred resource portfolio mix of generation and demand side resources to serve customer energy needs over a wide range of possible future states. CEI South worked with 1898 & Co. to perform two sets of modeling to contribute to the risk analyses, one exposing a defined set of portfolios to a limited number of scenarios and another that exposed the same portfolios to 200 scenarios (stochastic or probabilistic risk assessment). To help better understand the wide range of possibilities for wholesale market dynamics, regulations, technological breakthroughs and shifts in the economy, complex models were utilized with varying assumptions for major inputs (commodity price forecasts, energy/demand forecasts, market power prices, etc.) to develop and test portfolios with diverse resource mixes. Additionally, the risk analysis included sensitivities and qualitative judgement.

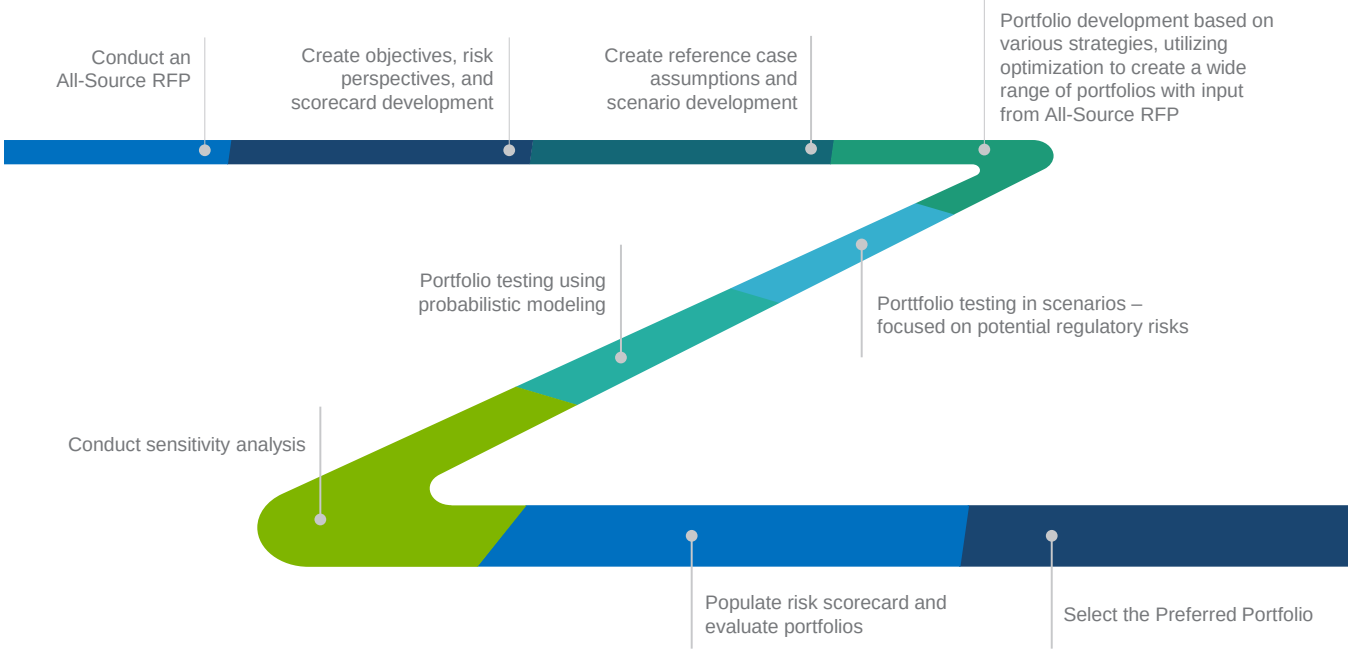


Analysis

CEI South's analysis included a step-by-step process to identify the Preferred Portfolio. The graphic below summarizes the major steps which included the following:

1. Conducted an **All-Source RFP** to better understand resource cost and availability.
2. Worked with stakeholders to develop a **scorecard** as a tool in the full risk analysis to help highlight several tradeoffs among various portfolios of resources.
3. Worked with stakeholders to develop a wide range of **future states**, called scenarios, to be used for testing of portfolios (mixes of various resource combinations to serve customer power and energy need).
4. Worked with stakeholders to develop a wide range of **portfolios** for testing and evaluation within scenarios, sensitivity analysis and probabilistic analysis. Each of these analyses involves complex modeling.
5. Conducted a **risk analysis,** including deterministic and probabilistic modeling with sensitivity analysis.
6. Utilized the **quantitative scorecard measures** and **judgment** to select the Preferred Portfolio (the best mix of resources to reliably and affordably serve customer energy needs while minimizing known risks and maintaining flexibility).

Analysis Process



Stakeholder Process

As in the last IRP, each of the last three stakeholder meetings began with stakeholder feedback. CEI South reviewed requests/comments from the prior stakeholder meeting and provided feedback. Suggestions were taken, and in instances where suggestions were not acted upon, CEI South explained why not. Notes for each meeting were included in question-and-answer format, summarizing the conversations. Additionally, feedback was received, and questions were answered via e-mail (IRP@CenterPointEnergy.com) and with phone calls/meetings in between each public stakeholder meeting by request.

While maintaining the virtual option to participate, CEI South thought it was important to continue face-to-face meetings. All stakeholder meetings were held at CEI South in Evansville, Indiana, with a virtual option for those that could not travel to southwestern Indiana or did not wish to participate in person. Dates and topics covered are listed below.

CEI South held a series of technical meetings with stakeholder groups willing to sign a Non-Disclosure Agreement ("NDA") and participate in ongoing tech-to-tech conversations about critical assumptions related to the analysis, including all significant modeling assumptions. These meetings, along with a data release schedule, helped keep technical stakeholders informed throughout the process and provided an opportunity to engage with CEI South in a way that is not always possible during public stakeholder meetings.

CEI South also incorporated feedback from the Director's report on its previous IRP, along with insights from the annual Contemporary Issues Conference hosted by the IURC. The 2025 Conference topics proved especially timely - highlighting considerations for large load coordination and planning. Discussions underscored the importance of flexibility and preparation to account for the impacts of large load within our planning process. Careful consideration was taken to ensure that the time spent was mutually beneficial to all parties involved.



Based on this stakeholder engagement, CEI South made fundamental changes to the analysis in real-time to address concerns and strengthen the plan. IRP inputs and several of the evaluation measures used to help determine the Preferred Portfolio were updated through this process. CEI South held meetings with interested stakeholders willing to sign an NDA ahead of and in between public stakeholder meetings. This, along with providing modeling inputs, helped to allow for a more productive dialogue throughout the process. CEI South appreciates the time and attention provided by each group that participated in this process.

CEI South utilized stakeholder information to create boundary conditions that were wide enough to produce plausible future conditions that would favor opposing resource portfolios, including the addition of a possible future, the alternate high regulatory scenario. CEI South updated the scorecard to measure risks in each of the five pillars (Affordability, Environmental Sustainability, Reliability, Resiliency, Stability) with a separate section for other market risks. Per the Director's report, CEI South added the 5th percentile of Net Present Value Revenue Requirements ("NPVRR"). CEI South worked closely with stakeholders to consider relevant risks to be included within the scorecard, adding an affordability metric (electric energy burden) that illustrated the 5-10 year incremental impact to energy burden (incremental residential bill impact in 2030 and 2035 divided by Vanderburgh County median household income). This measure highlights near to mid-term price pressure that customers may face for each portfolio. Additionally, CEI South added measures for Dynamic VAR Support ("MVAR") and Short Circuit Ratio ("SCR") from its updated transmission reliability analysis. CEI South also added SOx and NOx emissions and capacity sales/purchases to the scorecard. Adjustments were also made to modeling inputs and assumptions based on direct stakeholder feedback. The following table shows key stakeholder requests made during the process and CEI South's response.



Topic	Stakeholder Comments/Feedback	CEI South Updates/ Responses
Scorecard	Under the Environmental Sustainability Objective: Remove CO_2 intensity, keep CO2-e tons	CEI South believes that there is value in keeping CO_2 intensity, as well as CO_2-e metrics. CO_2 intensity allows the reader to compare CO_2 levels across scenarios.
Scorecard	Include metrics for SOx and NOx	CEI South has added metrics that includes combined tons of SOx and NOx.
Scorecard	Under the Affordability Objective: consider adding an energy burden calculation	CEI South proposes to add electric energy burden, defined as the 5-Year [5] residential rate impact as of July 1, 2025 divided by the Vanderburgh County Median Household Income.
Resource Options	Are the Demand Response proposals subject to discussion/change with Demand Side Management (DSM) Oversight Board	CEI South continues to discuss Demand Response with members of the DSM Oversight Board
Resource Options	Is CEI South considering what the resource mix could be if a resource incentive (updated EDG rate) is included in the IRP?	CEI South is conducting a sensitivity considering a $500 per kW incentive for Distributed Generation solar resource.
Load Forecast	Provide a breakout of peaks by customer class	See graph in 3/19/2025 Stakeholder meeting notes posted at www.centerpointenergy.com/irp
Load Forecast	Why is CEI South using historical rather than forecast temperature, e.g., Purdue University temperature forecast?	CEI South used a linear projection of temperature based on historical data; it is not significantly different from the Purdue University study for the IRP period.
Load Forecast	Requested CEI South to revisit the estimated 12,000 miles for EVs used in the forecast	Itron EV assumption for reference forecast. The 12,000 miles per year for EVs was revised to 9,500 miles per year. This revision is noted in the 5/14/2025 Stakeholder meeting slides

[5] *CEI South ultimately added a 5 and 10 year incremental energy burden per stakeholder request.*

Topic	Stakeholder Comments/Feedback	CEI South Updates/ Responses
Load Forecast	Does the EV charging profile used for CEI South's load forecast account for remote work at home?	The NREL tool, EVI-Pro, documentation does not specifically state any assumptions regarding work from home. The "EVHome" charging profile on slide 61 of the 3/19/2025 stakeholder slides includes some level of charging between 11am-2pm. (slides posted at www.centerpointenergy.com/irp)
Load Forecast	Does CenterPoint have plans to electrify its fleet?	CenterPoint does have plans to electrify its fleet - please see the following link https://sustainability.centerpointenergy.com/energy-transition-goals/fleet/
Commodity Inputs	Does the natural gas forecast assume increased drilling under the current administration?	At this time, CEI South is uncertain how the current administration's policies will affect natural gas prices. Our vendors consider multiple factors when developing commodity forecasts. Utilizing a consensus forecast is an approach CEI South has taken in previous IRPs. These various perspectives allow us to capture the diversity in opinions for future market prices.
Generation Timeline	Regarding Salt Creek Wind, is this project going to service CenterPoint customers or just provide power to the MISO grid as accredited power? If it's going to be service to CenterPoint customers, what kind of transmission loss are you expecting since the power is coming from Iowa?	Please see Witness Swanson's public testimony in Cause No. 46218.
Objectives & Draft Measures	Will the electric energy burden separate electrically heated homes from gas heated homes, or will those be combined in the aggregate?	We'll look at both the customers with electrically heated homes and the customers with gas heated homes. However, either view will show the same relative difference among portfolios.

Topic	Stakeholder Comments/Feedback	CEI South Updates/ Responses
Scenarios	Suggest adding an option where load stays at base. In this scenario, generation capital costs could still be high.	CEI South conducted a lower load sensitivity analysis to evaluate how lower load may impact the scenario(s). An update is included in today's (9/11/2025) Stakeholder meeting.
Scenarios	When looking between high regulatory and alternative high regulatory, can you potentially do the same with low regulatory (an alternative low regulatory with low load)?	CEI South conducted a lower load sensitivity analysis to evaluate how lower load may impact the scenario(s). An update is included in today's (9/11/2025) Stakeholder meeting.
Supply-Side Resource	Can CEIS incorporate real coal price offers made to CenterPoint. The uncertainty variable is not the mining cost as much as the demand.	Due to the confidential and competitive nature of CEIS's contractual coal price this was discussed during the 8/20/2025 Tech to Tech meeting
Supply-Side Resource	How many bids did CEIS receive for storage?	There were 17 standalone storage bids. The 2024 All-Source RFP results were shared during the 3/19/2025 Stakeholder meeting. The presentation is available here: CenterPointEnergy.com/IRP.
Supply-Side Resource	Is CEIS accounting for all costs and benefits, including considerations such as health costs? Will these other benefits be incorporated into the IRP?	Health costs are captured within EPA regulations that are included in the applicable scenarios.
Supply-Side Resource	Has CEIS considered the water pressure nuclear option, such as the Westinghouse AP1000?	The general nuclear option included in the Tech Assessment is representative of a variety of future nuclear options. If you have information regarding technology performance or costs that you would like to see in the model, please email IRP@CenterPointEnergy.com

Topic	Stakeholder Comments/Feedback	CEI South Updates/ Responses
MPS	For the battery storage program, without large enough penetration of batteries, it's hard for benefits to outweigh the costs. Could we look at a battery storage equipment incentive?	We performed cost-effectiveness screening using a range of incentives and adoption rates. In all scenarios the Utility Cost Test ratio was less than 1, which is not cost-effective. Results are included in today's (9/11/2025) Stakeholder meeting.
MPS	For EVs, are customers bringing their own device for the charger? Would customers have to use specific technology to participate?	We are assuming that the customer would supply their own charger, and CenterPoint would provide an incentive to join the program, as well as an annual participation incentive. A managed charging program would require some sort of network connection, which could include Wi-Fi, cellular, or a wired connection. A specific technology would not be required, as control could happen through the charger or telematics through the EVs
MPS	Some DR measures like batteries and water heaters can be used for other grid services (ancillary services, resilience) – how are these benefits being considered in developing levelized costs and/or accounted for in the IRP? Is it possible to treat these like T&D benefits and reduce from the cost side?	When performing cost-effectiveness screening, the benefits include the avoided energy, capacity, and T&D. Resilience and ancillary services have not been a benefit of Demand Response captured in the IRP analysis.
Model Inputs	Is CEIS going to include Scope 3 emissions?	Scope 3 emissions are outside the scope of the IRP as it's related to emissions of the end-user and separate from electricity generation.

Topic	Stakeholder Comments/Feedback	CEI South Updates/ Responses
Model Inputs	Since CEIS is considering nuclear, does CEIS want to run a stochastic process for uranium?	We are currently using publicly available data sources for uranium pricing forecasts. Uranium pricing is not expected to be a major differentiator in the portfolio risk assessment when compared with other cost drivers. Given this, we do not anticipate that running a stochastic process for uranium will materially change the outcomes of the analysis.
Model Inputs	Is CEIS planning to use the MISO published 2025/2026 indicative DLOL results for the solar and wind accreditation assumptions?	We have revised the accreditation values to interpolate between the first season of DLOL and 2035. Providing a smoother shift in accreditation. Revised Solar and Wind capacity accreditation forecasts are included in the 9/11/2025 presentation's Appendix.
Model Inputs	Recommendation to analyze two DER resource portfolios, Distributed Capacity Procurement (DCP) and Virtual Power Plants (VPPs) in CEI South's 2025 IRP	CEI South's evaluated demand response programs that align with the intent of both DCP and VPP programs as well as a DG Solar incentive during the IRP process. Updates on the evaluations are included in today's (9/11/2025) Stakeholder meeting.
Modeling	Scenario Portfolios – Explain why manual modifications applied to scenario portfolios to align with the Reference Case load	1898 & Co. posted documentation to the IRP File Share site for technical stakeholders. However, following Stakeholder feedback, CEI South decided to remove the manual modification.
Modeling	Scenario Portfolios – Request to re-run the capacity expansion simulation instead of the production cost simulation	1898 & Co. posted documentation to the IRP File Share site for technical stakeholders. However, following Stakeholder feedback, CEI South decided to remove the manual modification.

Topic	Stakeholder Comments/Feedback	CEI South Updates/ Responses
Modeling	Scenario Portfolios – Request to share documentation illustrating manual modifications made to the scenario portfolios	1898 & Co. posted documentation to the IRP File Share site for technical stakeholders. However, following Stakeholder feedback, CEI South decided to remove the manual modification.
Modeling	Build Limits – Request for CEI South to consider running scenarios with relaxed limits	CEI South ran a simulation and chose to relax limits to allow more resources to be selected within the capacity expansion model.
Modeling	Consider a study with FB Culley 3 retiring in 2030	Given the unprecedented amount of uncertainty at this time and future transmission upgrades that will help with system reliability and resilience, it would not be prudent to consider retirement prior to 2031/2032, as is being considered within this IRP.
Affordability Measure	Request for energy burden calculation	CEI South will make the energy burden workpaper available to technical stakeholders with a signed NDA.
Rates	Request to provide guidance on bill itemization	Please see the CenterPoint website, where is shows an explanation of the bills. https://www.centerpointenergy.com/en-us/residential/customer-service/resource-hub/understanding-your-bill?sa=in

Meeting materials for each meeting can be found at **CenterPointEnergy.com/IRP** and in Technical Appendix Attachment 4.2 Stakeholder Materials.

Next Steps

CEI South's flexible plan provides two paths forward, depending on what the future holds. If a large load customer agreement is not made prior to the next IRP in 2028, CEI South will move forward with the Preferred Portfolio. With this path, there are a few items that must be done in the short-term action plan.

First, CEI South will continue to implement the generation transition that was identified in prior IRPs. CEI South is currently pursuing three renewable projects that are scheduled to be online in 2026: 147 MW Galesburg Wind (approved PPA), 150 MW Wheatland Solar (approved PPA), and 170 MW Salt Creek Wind (approved PPA). These projects will continue to diversify CEI South's generation mix.

Secondly, CEI South will conduct two RFPs to determine current pricing for capacity and battery storage for replacement of F.B. Culley 2 interconnection in the next three years. Having run past its useful life, F.B. Culley unit 2 (coal) is slated for suspension at the end of this year. FERC rules allow for replacement of the interconnection within 3 years of suspension. CEI South will continue to evaluate the proper path forward with consideration for Indiana's five pillars. Should CEI South choose to reutilize the interconnection, it will seek approval in a Certificate of Public Convenience and Necessity ("CPCN") before the IURC and modify its Attachment Y with MISO to an Attachment X.

Third, CEI South will file for a DSM plan, consistent with the results of the Preferred Portfolio.

Finally, CEI South will continue to engage with economic development opportunities to help strengthen southwestern Indiana. Should a large load addition materialize, CEI South would diligently work to implement its Alternate Preferred Portfolio that would potentially require multiple CPCNs and approval of a contract with the IURC. These filings will be consistent with the Preferred Portfolio paths. However, the assumptions included in any IRP can change over time, causing possible changes to resource planning. Changes in commodities, regulations, political policies, customer need and other assumptions could warrant deviations from the Preferred Portfolio.

CEI South's plan must be flexible, as several items are not certain at this time, including but not limited to: MISO DLOL, EPA greenhouse gas regulations, cost of resources, policy change, the potential for large load additions, and regulatory risk.





Integrated Resource Planning

Chapter 1

1.1. Integrated Resource Planning

CEI South takes integrated resource planning very seriously. The Integrated Resource Plan ("IRP") is used as a guide for how CEI South will serve existing and future customers over the next 20 years in a reliable, affordable, stable, resilient, and environmentally sustainable manner. The integrated resource plan sets the direction for future generation and Demand Side Management ("DSM") options; however, future analyses of changing conditions, filings and subsequent approvals from the IURC are needed to chart the specific course.

CEI South is required to submit its IRP to the IURC every three years and last submitted it in 2023 with a plan to transition its generation fleet away from a majority reliance on coal to a portfolio of renewable generation, supported by a diverse set of natural gas generation resources. Since that time two new quick start, fast ramping natural gas combustion turbines and the Posey Solar project have come on-line, while the conversion of F.B. Culley 3 to natural gas was paused for re-evaluation within this IRP, and several renewable projects were canceled due to increasing cost.

With a focus on stakeholder input, CEI South began the 2025 IRP process by gathering feedback from stakeholders on the last IRP and the Director's Report for the 2022/2023 IRP. Additionally, CEI South worked closely with IRP stakeholders throughout the process, including multiple tech-to-tech discussions and information sharing between public stakeholder meetings, as discussed in Section 8.6 Public Advisory Process.

Although the future remains uncertain; several factors have set the stage for the 2025 analysis. After many decades of stagnant growth, reindustrialization and the Artificial Intelligence ("AI") race has changed the trajectory and will require a significantly larger supply of around-the-clock, reliable, and uninterrupted power in the near-term. Renewable resources have been slow to come online, many of which are not projected to come on-line at all due to higher than projected interconnection costs, delays in the MISO queue, tariffs, declining accreditation from MISO, changes to state and federal policy, the proposed repeal of EPA greenhouse gas regulation, and the passage of the One Big Beautiful Bill Act ("OBBBA") that accelerated the sunset of IRA tax credits to wind and solar resources.

Despite considerable uncertainty throughout the IRP development, CEI South has remained agile in navigating evolving risk, including but not limited to incorporation of stakeholder feedback on methodology, modeling, and assumptions, adding two additional scenarios per stakeholder feedback, and updating originally proposed scenario assumptions in near real time to account for proposed changes in EPA regulation. This necessitated requesting and receiving approval for an extension to submit the IRP on or before December 5, 2025.

1.1.1. Indiana's Five Pillars

On April 20, 2023, House Enrolled Act 1007 was signed into law by Governor Eric J. Holcomb. Indiana incorporated the Five Pillars of Indiana energy policy into state law in Indiana Code 8-1-20.6, with an effective date of July 1, 2023. The law states that decisions concerning Indiana's electric generation resource mix, energy infrastructure, and electric service ratemaking constructs must consider the following attributes: reliability, resiliency, stability, affordability, and environmental sustainability. The Indiana Utility Regulatory Commission adopted General Administrative Order ("GAO") 2023-04, which was inclusive of IRPs.

The Five Pillars are Reliability, Resiliency, Stability, Affordability, and Environmental Sustainability. Each has been considered equally within this IRP and are defined below:

Figure 1-1 – Five Pillars



To better account for the five pillars, CEI South structured its portfolio scorecard, a tool to help evaluate risk and tradeoffs, by aligning measures with each of the pillars to aid in the selection of a Preferred Portfolio. While affordability often takes center stage, each pillar is essential in shaping a comprehensive energy strategy. Under the lens of the five pillars, CEI South included the following scorecard updates:

- Incorporated a view into near-term affordability with the inclusion of an energy burden analysis. This complements the traditional long-term affordability measures;
- Conducted a more in-depth evaluation of reliability, resilience, and system stability in this IRP through a dedicated transmission analysis, which informed the development of additional scorecard measures; and
- Enhanced its view into environmental sustainability by adding additional air measures into the scorecard.

1.1.2. State of the World

Over the last year and a half, there has been unprecedented change that directly effects resource planning, including but not limited to:

- Updates to how resources will be accredited to meet reliability requirements,
- Updates to greenhouse gas regulations from the EPA,
- Escalating costs for various resources,
- Policy changes on the state and federal levels,
- Increasing load for the first time in decades, and
- Change in the regulatory environment.

Changes like these have escalated in recent years. Utilities typically face one or two major challenges per planning cycle. These risks demand careful mitigation to ensure the selected resource portfolio remains flexible and capable of adapting to an uncertain future. CEI South and other utilities across the country are required to make long-term planning decisions in a way that mitigates all of the risks that present themselves. This cycle is particularly challenging with at least 6 major unresolved issues, each of which presents a different risk.

1.1.3. Generation Transition (MISO)

MISO is in the midst of a significant transformation in how it plans for and accredits capacity, reflecting both the rapid transition of the generation fleet and the increasing level of system risk. In 2023, MISO shifted from an annual construct to a Seasonal Accredited Capacity (“SAC”) framework, requiring utilities to demonstrate sufficient accredited resources in all four seasons. This shift recognizes that reliability risks no longer occur only in the summer season. Growing penetrations of solar and wind, shoulder-season maintenance outages, and evolving demand patterns have increased exposure to non-summer season peaks. Seasonal planning introduces more precision into capacity

accreditation and compels utilities to build portfolios resilient to reliability challenges year-round.

Looking ahead, MISO is also preparing to replace its current accreditation methods with a more probabilistic approach based on Direct Loss of Load (“DLOL”) modeling. This proposed framework, expected to take effect in the 2028/2029 Planning Year, will assign capacity value to resources based on their performance in avoiding loss-of-load events rather than static assumptions. It builds upon traditional Loss of Load Expectation (“LOLE”) analysis but offers finer granularity by considering not only the probability of shortfall but also the contribution of each resource type in mitigating it. For utilities, the transition means that intermittent resources such as wind and solar will receive capacity credit more directly tied to their effective reliability contribution, while fast-start and dispatchable resources may become even more valuable.

Alongside the move to seasonal and probabilistic accreditation, MISO is also advancing changes in how the Planning Resource Auction (“PRA”) clears capacity through the introduction of the Reliability Based Demand Curve (“RBDC”). The RBDC links capacity prices directly to reliability outcomes by steepening the demand curve as the system approaches shortfall conditions. In effect, it values incremental capacity more highly when the system is at risk, sending stronger price signals for new entry and retention of resources that support reliability. By aligning market prices more closely with the reliability value of capacity, RBDC is designed to help ensure sufficient investment while avoiding undue reliance on emergency procedures.

At the same time, the generation interconnection queue is undergoing substantial reform. With thousands of megawatts of renewable and storage projects proposed, MISO has adopted new cluster-based study processes, standardized timelines, and cost allocation reforms to accelerate development while maintaining fairness and reliability. These reforms are intended to reduce backlog, improve transparency, and align new resource development with regional transmission expansion.

Taken together, the seasonal construct, evolving probabilistic accreditation, implementation of RBDC, and queue reforms reflect the broader generation transition underway in MISO. The system is moving away from static, one-size-fits-all capacity rules toward more dynamic, risk-informed approaches that account for the realities of a rapidly changing resource mix. For utilities like CEI South, these changes require close monitoring and integration into planning processes to ensure that portfolios not only meet today’s requirements but remain reliable and compliant under tomorrow’s market rules.

1.1.4. Political and Regulatory Environment

Since the last IRP, significant shifts have occurred at both the federal and state levels, including the election of Donald J. Trump as President of the United States and Mike Braun as Governor of Indiana.

President Trump immediately rescinded executive orders issued during the Biden administration and replaced them with new directives aligning with his administration's policy agenda. Speaking in broad strokes, these changes were intended to unleash American energy dominance, paving the way to keep existing fossil generation on-line and to put in place barriers to renewable energy generation.

Along with the flurry of executive orders, President Trump signed the OBBBA into law. With his signature, this bill set into motion the core of President Trump's tax and spend agenda. It has had far reaching impacts throughout the energy industry and integrated resource planning. The law rolls back tax incentives for those that purchase electric vehicles, which could have an effect on load projections in the long-term. Additionally, the bill rapidly phases out Inflation Reduction Act ("IRA") tax incentives for wind and solar resources, while nuclear and battery resource provisions from the IRA were largely preserved.

President Trump has also brought in a new era of tariffs in an effort to bring back lost manufacturing by leveling the playing field with foreign countries. While tariffs could bring more load back to the system in the long run, near-term uncertainty and inflation have had the effect of raising costs for new generating resources, often built with materials sourced from all over the world.

Finally, President Trump has worked to appoint those that will promote his agenda through government agencies. These agencies have made shifts that must be accounted for within the IRP, most notably, the potential roll-back of EPA greenhouse gas regulations could ease restrictions on fossil-fueled dispatchable resources needed to support the administration's desire for dominance in Artificial Intelligence.

Although Governor Braun's election has not yet resulted in policy shifts as sweeping as those at the federal level, several notable developments in Indiana warrant attention. Governor Braun is also supportive of maintaining existing fossil fuel generation to support economic development opportunities, and he is a strong proponent of building small modular nuclear reactors in Indiana by the early 2030's. To carry out his energy agenda to ensure affordable and reliable power for current residents and economic development opportunities, Governor Braun named Suzanne Jaworowski Secretary of Energy and Natural Resources. In her position, she oversees the Indiana Department of

Environmental Management, the Indiana Regulatory Commission, the Office of Utility Consumer Counselor, and several other agencies.

In August, Governor Braun named long-time utility consumer advocate Abby Gray as Utility Consumer Counselor and directed her find ways to lower bills for Hoosiers. Additionally, Governor Braun will soon be appointing three new Commissioners to the IURC.

1.1.5. Environmental Regulations

In June of 2025, EPA proposed to rescind greenhouse gas limits for new and reconstructed gas turbines and existing and modified coal fired generating units under Clean Air Act Sections 111(b) and (d). As an alternative, the proposal would withdraw a previous determination that carbon capture and storage is commercially available and cost effective to reduce greenhouse gas emissions. This change had a major effect on modeling assumptions within the current IRP, as the ultimate finalization of either option would rescind the drivers for retirement of uncontrolled (for CO_2) units by 2032. While this is still a proposal, the proposal is an action in response to the Administration's Executive Order 14154, "Unleashing American Energy", which directs EPA to identify rules that "impose an undue burden" on domestic energy resources. CEI South believes that the current requirements applicable to GHG's under 111(b) and (d) will not be the most likely future regulatory scenario and therefore updated its Reference Case. Ultimately, the proposed rule revisions will be litigated, and a new proposal could come from a future administration. CEI South developed scenarios to account for these future regulatory uncertainties and potential boundary conditions.

1.1.6. Large Loads

With the rise of AI data centers and onshoring of industry, the country is facing rapid electric growth that has not been seen in decades, if ever. Depending on the project, these loads can start large and scale very quickly, some of which grow to be larger than a mid-sized city such as Evansville, IN. CEI South has fielded many economic development inquires over the last two years, several of which fit this mold.

As part of this IRP, CEI South initially planned a large load sensitivity that evaluated possible build outs based on conversations. However, stakeholders were understandably very interested in this topic given the implications for our system. In response, CEI South agreed it was prudent to develop a separate scenario to address this realistic possibility. As a result, CEI South built an Alternate Reference Case to evaluate the best path forward should an agreement be reached with a potential large load addition.

1.1.7. CenterPoint Energy Rate Case and Community Engagement

In December of 2023, CEI South filed its first rate case in 14 years. Ultimately, a settlement was approved, increasing revenues by $80 million dollars. The increase was approved to be phased in over a year between February 2025 and March 2026, with the largest increase coming in the summer of 2025 as the Posey solar plant and the first of the two new combustion gas turbines (A.B. Brown unit 6) came on-line. 80% of the requested increase was associated with these generation units, including unit 5, which came online in August. Customer affordability was a key issue throughout the case with our customers and their advocates. With affordability top of mind, CEI South worked to evaluate the bill impact of various portfolios in the near to mid-term, as well as evaluating the long-term affordability of each portfolio. Ultimately, near to mid-term affordability proved to be one of the key differentiators in the selection of the 2025 Preferred Portfolio.

To strengthen communication with customers, CEI South hosted an initial round of Community Connect sessions across its service territory. These events offered customers the opportunity to engage directly with CenterPoint employees about key investments aimed at improving system reliability and enhancing bill transparency. Subject matter experts were on hand to answer questions and address concerns related to CEI South's long-term planning and the IRP Preferred Portfolio. Dates and times of the Community Connect sessions are listed in the table below.

Figure 1-2 – Community Connect Sessions

DATE	TIME	LOCATION
Thursday, 11/6	4 - 7 p.m.	**South Spencer High School** 1142 N. County Road 275 W., Rockport, IN
Saturday, 11/8	9 a.m. - noon	**Vanderburgh County 4H Fairgrounds** 201 E. Boonville-New Harmony Road, Evansville, IN
Wednesday, 11/12	4 - 7 p.m.	**Mount Vernon Junior High School** 701 Tile Factory Road, Mount Vernon, IN
Thursday, 11/13	4 - 7 p.m.	**CK Newsome Community Center** 100 E. Walnut Street #1, Evansville, IN
Saturday, 11/15	9 a.m. - noon	**Ohio Township Phoenix Event Center** 3433 Libbert Road, Newburgh, IN

1.1.8. CEI South Current Generation Portfolio

The table below shows CEI South generating units. Note that CEI South also offers customers energy efficiency programs to help lower customer energy usage and bills.

Figure 1-3 – CEI South Generating Units

Unit[6]	Installed Capacity ICAP (MW)	Primary Fuel	Unit in Service	Unit Retirement Date / Expiration	Unit Age	Coal Unit Environmental Controls[7]
F.B. Culley 2	90	Coal	1966	2025	59	Yes
F.B. Culley 3	270	Coal	1973	N/A	52	Yes
A.B. Brown 3	80	Gas	1991	N/A	34	
A.B. Brown 4	80	Gas	2002	N/A	23	
A.B. Brown 5	232	Gas	2025	N/A	<1	
A.B. Brown 6	232	Gas	2025	N/A	<1	
Blackfoot	3	Renewable Gas	2009	N/A	16	
Fowler Ridge	50	Wind PPA	2010	2029	15	
Benton County	30	Wind PPA	2007	2028	18	
Galesburg	147	Wind PPA	2025	N/A	N/A	
Salt Creek	170	Wind PPA	2025	N/A	N/A	
Troy	50	Solar	2021	N/A	4	
Posey	191	Solar	2025	N/A	<1	
Wheatland	150	Solar PPA	2026	N/A	N/A	
Volkman Rd	2	DG Solar + Battery	2018	N/A	7	
Oakhill	2	DG Solar	2018	N/A	7	
Post House	<1	DG Solar	2020	N/A	5	

1.1.9. Status on Implementing Prior IRP (Retirements and Additions)

Since the last IRP filing, CEI South has encountered significant challenges in moving forward with key pieces of the last two IRP Preferred Portfolios. First, several renewable projects have been terminated due to market dynamics that caused prices to escalate beyond what the Commission approved and beyond where CEI South believed to be affordable for its customers. The Crosstrack Solar Project, a 130 MW Build Transfer Agreement ("BTA") approved in Cause No. 45754, was terminated on March 15, 2024. Subsequently, two solar PPAs were also canceled on July 1, 2025 due to cost increases

[6] CEI South has a 1.5% ownership share of Ohio Valley Electric Corporation ("OVEC") which equates to approximately 32 MW.

[7] Both Coal units are controlled for Sulfur Dioxide ("SO_2"), Nitrogen Oxide ("NO_X"), Particulate Matter (dust), and Mercury. F.B. Culley 3 is controlled for Sulfur Trioxide ("SO_3") and Sulfuric Acid ("$H2S0_4$").

beyond the approved agreements, the 100 MW Warrick County Solar Project and the 185 MW Vermillion Solar Project, both approved in Cause No. 45839. Similarly, a 200 MW wind BTA also had similar upward pricing pressure; after years of negotiation and a re-evaluation of this project in this IRP, CEI South opted to walk away from this project in an effort to keep customer rates as affordable as possible.

CEI South conducts the IRP process every three years and each IRP, necessarily, builds on the IRP and the generation resource investments that have come before. At that time, the Preferred Portfolio in CEI South's previous 2022/2023 IRP concluded that a generation transition with the conversion of F.B. Culley 3 from coal to natural gas, along with DSM, wind, and solar resources was the optimal path forward. CEI South began implementing this 2022/2023 IRP by filing two cases seeking approval for (1) signed purchase power agreements ("PPA") for two wind facilities totaling 317 MWs, the Galesburg Wind Project and the Salt Creek Wind Project and (2) approval for the 2025-2027 DSM Plan. Each of these filings were consistent with the 2022/2023 IRP, and as noted below, this IRP affirms the direction taken by CEI South. These renewable resources still qualify for Federal incentives, which dramatically lowered the cost of these renewable resources relative to what could be acquired in the future, post elimination of IRA tax incentives for wind and solar resources.

In preparation for retirement, CEI South submitted an Attachment Y to MISO to suspend operations of its smallest, least efficient coal unit, F.B. Culley 2. This unit is slated for suspension at the end of 2025. A key decision in this IRP was to determine how to replace this unit and whether or not to preserve the existing interconnection to the grid. CEI South will have approximately three years to replace the unit, preserving the interconnection. Options that were available and evaluated were small gas units or battery storage.

1.1.10. Culley 3 Conversion

In the last IRP, CEI South selected a Preferred Portfolio that converted F.B. Culley 3, a 270 MW coal plant, to natural gas by 2027. Given the inputs and likely potential future at that time, this was a competitive option. In light of growing change and uncertainty, CEI South chose to pause its conversion plans and opted not to pursue a Certificate of Public Convenience and Necessity from the Indiana Utility Regulatory Commission at this time. CEI South chose to re-evaluate the F.B. Culley conversion with renewables within this IRP. While the F.B. Culley coal-to-gas conversion may become a viable option in the future, current analysis indicates it is not projected to be cost-effective. As detailed later in this IRP, a conversion paired with renewables is projected to be approximately 14% more expensive than the Preferred Portfolio.



Resource Planning Process

Chapter 2

2.1. Planning Structure

CEI South's IRP was developed using a structured, data-driven planning process that incorporates real-world operating conditions, market signals, stakeholder input, and long-range policy and technology expectations. While uncertainty remains a fundamental characteristic of long-term planning, CEI South's objective is to develop a portfolio that is resilient across a wide range of plausible futures while maintaining affordability, reliability, environmental sustainability, stability, resilience, and operational feasibility. The IRP process is organized around five major planning steps:

1) **Real-World Inputs and Modeling Foundations** – Establishing accurate load forecasts, technology costs, demand-side potential, resource data, and fuel assumptions, supported by market solicitations and expert consultation.
2) **Development of Resource Strategies and Planning Scenarios** – Structuring candidate resource strategies, evaluating transmission deliverability, and modeling a range of policy and demand futures.
3) **Planning Priorities and Guiding Principles** – Defining the core decision-making values that shape portfolio evaluation, supported by stakeholder perspectives and long-term CEI South objectives.
4) **Comprehensive Portfolio Development & Testing** – Using a suite of planning tools to simulate long-term portfolio performance, test sensitivities, and assess operational and financial tradeoffs.
5) **Portfolio Evaluation** – Comparing portfolios using a structured framework aligned with CEI South's long-term planning priorities.

The remainder of this section outlines each step in more detail, highlighting the analytical foundation that supports the Preferred Portfolio selection later in the IRP.

2.2. Real-World Inputs and Modeling Foundations

In Q2 2024, CenterPoint launched an open All-Source Request for Proposals ("RFP") (*Technical Appendix Attachment 2.1 2024 All-Source Request for Proposal*) to solicit capacity and energy resource options from the market, including specifically requesting options to replace the F.B. Culley 2 generator and reuse the existing transmission interconnection. This broad solicitation was essential for capturing current, technology-specific costs and operational characteristics. The 2024 All Source RFP yielded a diverse set of project proposals, including renewables, storage, thermal resources, and demand-side offerings. These responses informed both near-term procurement strategies and were also translated into representative long-term modeling inputs.

In addition to the All-Source RFP, CEI South worked with 1898 & Co. to conduct a detailed technology assessment (*Technical Appendix Attachment 2.2 2025 Technology Assessment Summary (Confidential)*) to support the evaluation of a wide range of

resources and to supplement the All-Source RFP. Resource-specific cost assumptions were based on a combination of historical operations data and forward-looking financial models. Fixed and variable O&M, depreciation, book life, and capital recovery factors were incorporated to reflect the true economic impact of maintaining or replacing legacy assets. Each resource type was reviewed for cost, performance, availability, and operational viability, which informed the resources that were included in modeling.
CEI South continued its long-standing partnership with Itron, a recognized leader in energy forecasting to produce 20-year energy and demand forecasts. The resulting load forecasts incorporated recent trends in fleet electrification, trended weather, customer behavior, economic growth, customer-owned rooftop solar, and appliance efficiency. This foundational input was used across all planning scenarios.

To evaluate the long-term potential of customer energy savings, CEI South worked with GDS Associates to conduct a comprehensive Market Potential Study (*Technical Appendix Attachment 3.6 2025 DSM Market Potential Study*) focused on demand-side management ("DSM"). The study assessed achievable impacts across the planning horizon by analyzing customer segmentation, end-use technologies, cost-effectiveness, and adoption potential. These results were integrated into portfolio modeling to reflect Demand Response ("DR") and Energy Efficiency ("EE") as resource options on a consistent and comparable basis with supply-side alternatives.

Supporting these major studies was a rigorous data development effort. CEI South used publicly available datasets, averaged confidential vendor information in order to incorporate multiple perspectives and to allow for public viewing, and internal data to populate a robust suite of assumptions. For instance, CEI South utilized industry forecasts for natural gas and other fuels, including NYMEX futures, third-party consultant projections, and public sources such as the EIA. These assumptions were scenario-specific and reflected differing regulatory environments and market conditions.

This work helped ensure that resource modeling was grounded in transparent and realistic expectations.

2.3. Development of Resource Strategies and Planning Scenarios

CEI South developed a set of generation strategies to reflect plausible pathways based on CEI South's existing fleet, known constraints, and evolving regulatory and market dynamics. For example, as part of evaluating the future of existing coal-fired generation, CEI South modeled multiple resource conversion and replacement strategies to test how the system responds to retirement timing, capacity shortfalls, and differing replacement technology mixes.

These deterministic generation strategies served as a foundational planning step, representing different strategic postures. Some explored early retirement and rapid decarbonization; others maintained legacy assets longer to evaluate affordability or for fuel diversity. To support this process, CEI South created several fixed resource configurations, including storage options, new gas replacements, continuation of existing resources, conversion of existing resources, and renewable heavy alternative, to observe how the capacity expansion model responded. These “what-if” inputs were used to test the system’s flexibility and better understand which technologies filled capacity gaps most effectively under different assumptions.

In parallel, CEI South initiated a transmission study (*Technical Appendix Attachment 2.3 Transmission Study (Confidential)*) to examine the deliverability, reliability, and cost implications of these generation strategies. This was a critical component of planning, as the viability of new generation, especially renewable resources, often depends on transmission availability and local system limitations. Transmission constraints, upgrade needs, and regional challenges were modeled alongside generation expansion to ensure that the resulting portfolios were not only economically viable but also physically feasible on an electric transmission basis. The findings from the transmission study were used to:

- Identify system constraints that might require upgrades or lead to curtailment risks;
- Quantify the cost of transmission upgrades associated with portfolio sensitivities; and
- Refine resource strategies and modeling assumptions where needed.

This integration of transmission and generation modeling ensured that resource portfolios were built on a technically sound foundation, which attempts to minimize the risk of stranded assets or overlooked system limitations.

2.4. Stakeholder Engagement

Stakeholder engagement is a cornerstone of integrated resource planning, as input is shared on all portions of the analysis. The stakeholder process functions as a collaborative forum – providing a diverse range of views with multiple opportunities to provide input on the assumptions, inputs, and methodologies to inform CEI South’s IRP development. Over the past twelve months, CEI South has provided many engagement opportunities to a diverse audience of CEI South customers, regulators, customer advocacy groups, environmental advocacy groups, fuel suppliers and advocacy groups, shareholders, economic development groups, generation developers, and elected officials. Throughout the 2025 IRP, stakeholders were encouraged to engage and participate in the development of the Integrated Resource Plan. Engagement opportunities included public meetings, technical meetings, and direct communication

channels via CEI South's IRP website and the IRP-specific email address, irp@centerpointenergy.com. CEI South has also engaged in written correspondence in response to data requests from several stakeholders.

CEI South hosted four public meetings in Evansville, Indiana – with in-person and virtual participation options (Figure 2-1). An average of 70 individuals, representing over 30 organizations, registered for the public meetings. Meeting agendas focused on a broad range of IRP topics, including the overall process, timelines, impactful industry factors, resource evaluations, modeling inputs and methodologies, scenarios and sensitivities. To ensure ample opportunity for stakeholder feedback and questions, Q&A touchpoints were scheduled throughout each meeting. Public meeting presentations and summaries were shared with stakeholders on CEI South's IRP website, www.centerpointenergy.com/irp.

Figure 2-1 – 2025 Stakeholder Meeting Schedule



In addition to public meetings, CEI South hosted three technical meetings. These meetings included detailed and often confidential discussions of modeling inputs and assumptions. Interested stakeholders, with a signed NDA, were able to participate in the technical meetings as well as access confidential modeling data provided throughout the process through a secure file share site. These meetings offer a forum to discuss detailed assumptions and evaluation criteria to gain insight from multiple perspectives.

Section 8.6, Public Advisory Process, further details CEI South's public engagement, including a robust description of the process, key issues discussed, stakeholder feedback, data requests and stakeholder impact on the development of the IRP.

2.5. Planning Scenarios

To ensure CEI South's Preferred Portfolio performs reliably under a broad range of future conditions, the IRP includes a suite planning scenarios. Each scenario reflects a distinct

"worldview" shaped by key uncertainties in environmental regulation, load growth, technology costs, fuel markets, and federal policy implementation. Together, they test the durability of candidate portfolios across plausible futures rather than anchoring planning decisions to any single forecast.

These scenarios share a consistent modeling foundation, using the same optimization tools, reliability targets, and engineering constraints, but differ in the external forces shaping utility operations. This framework allows CEI South to explore how shifts in demand, policy, and market conditions could alter resource needs, economic outcomes, and implementation feasibility.

2.6. Reference Case

The Reference Case represents CEI South's best estimate of future conditions and serves as the baseline for portfolio development and scenario evaluation. It reflects current law along with recent policy developments, specifically, developments in the proposed repeal of carbon regulation and modified elements of certain Inflation Reduction Act ("IRA") provisions. These assumptions were selected to reflect CEI South's planning judgment about the most likely regulatory, market, and economic trajectory over the 20-year horizon. To develop this scenario, CEI South worked with 1898 & Co. and other technical consultants to establish consistent and transparent assumptions across all major inputs:

- **Load Forecast:** CEI South's long-term energy and demand forecast was developed by Itron and reflects residential, commercial, and industrial usage patterns. It incorporates appliance efficiency trends, fleet electrification, long-term weather normalization, continued expansion of customer owned solar panels, and modest economic growth across the service territory.
- **Fuel Prices:** The Reference Case uses a consensus forecast approach for natural gas and coal, averaging inputs from sources such as S&P Global, Wood Mackenzie, Hitachi, and EVA. This reduces bias from any single forecast and reflects a transparent, market-aligned view of future commodity prices.
- **MISO Capacity Prices:** Scenarios include a forecast of MISO Zone 6 capacity prices, based on available projections from Hitachi, S&P Global, and Wood Mackenzie. These help inform portfolio revenue requirements and cost competitiveness resource portfolios, whether buying or selling excess capacity[8].

[8] Note that portfolios were not able to sell capacity in capacity expansion modeling runs. This helped prevent building more resources than needed for the purpose of selling capacity into the market.

- **CO_2 Price Proxy:** With the proposed repeal of Environmental Protection Agency ("EPA") Clean Air Act ("CAA") 111, the Reference Case only includes costs for compliance upgrades under framework modeled a proxy utilizing the Affordable Clean Energy ("ACE") Rule for existing coal resources, providing an efficiency requirement without assuming a carbon price.
- **Capital Costs:** Where available, baseline resource capital costs were developed utilizing a blend of All-Source RFP results and National Renewable Energy Laboratory ("NREL") Annual Technology Baseline ("ATB") curves, with adjustments made for inflation and supply chain constraints. These inputs ensure new technologies are evaluated on realistic, market-informed economics.
- **Resource Cost and Performance:** All-Source RFP data was supplemented with a comprehensive technology assessment by 1898 & Co., which was used to validate the capital, fixed and variable O&M, and operational performance assumptions of all resource types under consideration. Where data was not available from the All-Source RFP, the technology assessment was utilized. For example, CEI South utilized the technology assessment for several gas options, advanced nuclear, etc.
- **Demand-Side Resources:** A Market Potential Study ("MPS") developed with GDS Associates informed energy efficiency and demand response potential. These demand-side inputs were modeled on a consistent and comparable basis with supply-side resources to capture full system cost and performance tradeoffs.
- **Transmission Planning:** CEI South conducted a focused transmission study in parallel with generation strategy development to evaluate deliverability, upgrade needs, and local system constraints. The study identified areas where interconnection limitations or thermal constraints could impact various portfolios and ensured that Reference Case portfolios reflect realistic transmission system capabilities.

Portfolio modeling under the Reference Case was conducted using EnCompass, which performed a capacity expansion analysis to identify the least-cost resource mix, followed by chronological dispatch modeling to assess operational feasibility and system performance. The Reference Case was also used as the central comparison point in risk and scorecard evaluation to test how alternative portfolios perform under expected conditions.

2.7. Alternative Scenarios

While the Reference Case provides an outlook on likely future conditions, CEI South recognizes that long-term resource planning must account for the inherent uncertainty in regulatory policy, technology costs, economic development potential, and customer

demand. To stress-test portfolios across a broad range of possible futures, the IRP included four Alternative Scenarios that were each structured to represent distinct, plausible deviations from the Reference Case.

These alternative scenarios are not forecasts or policy goals; instead, they serve as analytical “bookends” that help reveal how portfolios perform when challenged by differing policy mandates, commodity prices, demand growth rates, or environmental regulation.

Each scenario alters multiple input drivers simultaneously, such as fuel prices, load trajectories, capital costs, and environmental policy, to reflect a coherent and internally consistent worldview. Together, they provide insight into how different futures affect system needs, cost exposure, and implementation risk.

Alternate Reference Case
This scenario retains the same policy and regulatory assumptions as the Reference Case but introduces high load growth and is representative of several potential economic development opportunities. It explores the impact of potential large-scale developments such as emerging technologies like AI data centers, metal smelting plants, etc. that could rapidly accelerate electricity demand. This high-demand future was set up to evaluate potential portfolios to maintain affordability, operability, and resource adequacy under increased load conditions on an accelerated timeline. It also tests the responsiveness of transmission and interconnection pathways under fast buildout.

High Regulatory
The High Regulatory scenario reflects a future shaped by progressive federal or state decarbonization mandates. This includes a consensus carbon price utilizing Hitachi, EVA, and S&P forecasts as source data, faster fossil retirements, and tighter compliance obligations under the Clean Air Act and other environmental statutes. Clean energy deployment is further accelerated through economic incentives including the renewable tax credits under the IRA, supporting rapid expansion of renewables and storage. Portfolios in this future must accommodate a faster transition away from legacy assets while preserving reliability and cost control under accelerated timelines and regulatory pressure.

Alternate High Regulatory
This variation on the high regulatory scenario was created due to stakeholder input; it assumes continued regulation under the Clean Air Act, without direct carbon pricing, but introduces elevated load growth tied to electric vehicle adoption, enhanced electrification incentives, and economic expansion. While regulatory pressure is still present, the primary driver of change in this scenario is demand growth, coupled with slightly less regulation than the high regulatory scenario. Supply chain constraints and development

bottlenecks amplify the complexity of meeting new load, increasing capital costs and siting challenges. Energy efficiency program costs are assumed to continue at baseline levels; as there is greater opportunity for EE under increased load conditions. This scenario tests portfolios for their ability to scale under load and capital pressure while maintaining regulatory compliance.

Low Regulatory

The Low Regulatory scenario represents a future with further repeal of progressive environmental rules. CAA 111(b) and (d) are repealed, and no new decarbonization mandates are introduced. IRA provisions are cancelled, and resource decisions are driven primarily by market forces and asset-level economics. This Low Regulatory scenario emphasizes affordability and system stability, favoring legacy asset utilization and measured adoption of new technologies. This scenario helps identify portfolios that remain viable in policy-light conditions with limited external drivers for transition.

Scenarios Summary

The following graphic provides a side-by-side comparison of the five planning scenarios used in this IRP. Each scenario reflects a distinct set of assumptions related to environmental regulation, federal policy, demand growth, fuel pricing, capital costs, and technology adoption. This visual summary highlights the key drivers that differentiate these futures and illustrates how CEI South tested the robustness of candidate portfolios across a wide spectrum of uncertainties.

Figure 2-2 – Scenario Summary

Key Drivers:	Policy Factors			Load	Commodity Prices		Capital Costs	
Scenario	Environmental Policy	Economic Policy	CO_2 Regulation	Load	Natural Gas Price	Coal Price	Generation	EE Costs
Reference Case	ACE Proxy	Modified IRA	No additional CO_2 regulation	Base	Base	Base	Base	Base
Alternate Reference Case	ACE Proxy	Modified IRA	No additional CO_2 regulation	Much Higher	Base	Base	Base	Base
High Regulatory	Clean Air Act 111 (b & d) and expansion to existing gas resources	IRA	Addition of CO_2 Tax	Lower	Higher	Higher	Lower	Higher
Alternate High Regulatory	Clean Air Act 111 (b & d) and expansion to existing gas resources; Electrification and EV policy	IRA	No additional CO_2 regulation	Higher	Higher	Higher	Higher	Base
Low Regulatory	No Clean Air Act 111 (b & d)	No IRA	No additional CO_2 regulation	Higher	Lower	Lower	Higher	Lower

Together, these five scenarios form the analytical backbone of CEI South's deterministic portfolio development and evaluation processes. Four of these worldviews, core scenarios (Reference Case, High Regulatory, Alternate High Regulatory, and Low Regulatory), served as the primary analytical foundation for this IRP. By modeling a range of regulatory, economic, and operational conditions, the IRP attempts to capture the spectrum of challenges that may emerge over the planning horizon. Each scenario was constructed to test how resource decisions could change relative to key drivers, as well as providing a view into how each portfolio would perform if applied to a different future. It also helps ensure that no single set of assumptions determines the outcome.

The fifth scenario, the Alternate Reference Case was developed as an alternate parallel analysis, providing additional perspective on the unique impact of a large load addition within CEI South's service territory. Since the load forecast and overall system need significantly differ from those found in the other scenarios, this worldview was modeled separately. This is discussed further in Section 6, The Alternate Preferred Portfolio.

This scenario-based framework enhances transparency and decision-making confidence. It enables CEI South to identify portfolios that are not only cost-effective under expected conditions but also resilient in the face of disruptive change. The insights from scenario modeling directly inform the risk evaluation and scorecard comparison process that follows, ultimately helping shape the selection of a Preferred Portfolio that balances affordability, reliability, resilience, stability, and environmental sustainability, and implementation feasibility across all plausible futures.

2.8. Planning Priorities and Guiding Principles

To bring clarity to how CEI South evaluates potential resource portfolios, this IRP is organized around the five pillars, into three overarching evaluation layers. These layers reflect the practical structure of utility decision-making; first, establishing whether a portfolio is technically viable, second, determining which feasible portfolios best align with customer priorities, stakeholder values, and long-term policy uncertainty, and third, ensuring all risks such as market, policy, and execution risks are accounted for.

Technical Requirements

Reliability – Reliability is foundational to electric system planning and refers to the ability of a portfolio to maintain sufficient generation capacity to meet peak demand. CEI South assessed resource adequacy using capacity expansion modeling that enforced MISO Planning Reserve Margin Requirements ("PRMR"), along with seasonal and annual load shape variation. Resource accreditation was modeled according to MISO's seasonal capacity valuation methodologies and included the transition to direct-loss-of-load

accreditation methodology beginning in 2028. Portfolios that failed to maintain reserve adequacy were not included for consideration.

Stability – Grid operability refers to the capacity of a portfolio to maintain real-time and near-term system stability, including frequency regulation, voltage support, inertial response, and ramping adequacy. To evaluate operability, CEI South leveraged production cost modeling that simulated hourly dispatch and reserve commitment over the full planning horizon. These simulations tested portfolios for ability to manage renewable intermittency, net load variability, and contingency events while complying with reliability standards. Dispatchable thermal resources, fast-ramping assets, DR, and renewable generation were all critical to ensuring operability in modeled futures.

Resilience – Resilience reflects the ability of the electric system to prepare for, absorb, and recover from disruptive events, such as extreme weather, prolonged fuel supply limitations, correlated renewable shortfalls, and simultaneous generation derates. CEI South evaluated resilience through scenario-based and probabilistic-based modeling. Portfolio resilience was quantified through the total installed capacity of resources capable of fast start and spinning reserve benefits. Beyond the metrics, the inclusion of resources that offer black start capability were considered. Through price fluctuations, capacity factor limitations, and other variations in market conditions and assumptions, the portfolios were stress-tested and the system-wide response capability was evaluated.

Strategic Differentiators

Affordability – Affordability is evaluated using the Net Present Value of Revenue Requirements (“NPVRR”), which captures all generation-related costs, including but not limited to the following: capital, O&M, fuel, and market purchases – discounted over the 20-year planning horizon. This metric enables consistent comparison of portfolios with differing investment profiles and cost timing. CEI South examined NPVRR three ways: the mean value, and the 95^{th}/5^{th} percentile across 200 stochastic iterations. The 5^{th} and 95^{th} percentile represent possible boundary conditions for the 20-year costs, helping to measure cost risk. In addition to system-level costs, CEI South considered Incremental Electric Energy Burden, defined as total electric costs as a percentage of household income, to evaluate near to mid-term affordability of portfolio decisions on customer bills.

Environmental Sustainability – Environmental sustainability was assessed by analyzing portfolio emissions relative to expected environmental regulations and policy drivers. Modeling included assumptions around IRA incentives, potential Clean Air Act regulatory requirements, and carbon prices in the high regulatory scenario. Portfolios were also reviewed for alignment with stakeholder values around decarbonization, public health, and long-term climate risk mitigation.

Risk Management

MISO Market – Participation in the MISO market provides valuable flexibility, but increased reliance on market purchases introduces cost and reliability risks, especially as regional conditions evolve. Thermal retirements and rising renewable penetration may reduce capacity market liquidity and heighten price volatility during system stress.

To help illustrate tradeoffs, CEI South modeled energy market exposure across all scenarios, applying purchase limits mirroring system constraints and requiring portfolios to have a minimum level of self-sufficiency. This approach helps ensure resource adequacy even when market conditions are unfavorable.

Federal Policy – The Inflation Reduction Act included significant tax credits that enhance the economics of renewables, storage, and low-carbon technologies. While these incentives improve portfolio affordability and emissions performance, they also introduce planning risk due to evolving regulatory guidance, compliance complexity, and potential policy reversals. Scenarios were constructed with and without IRA tax incentives to evaluate boundary conditions, the One Big Beautiful Bill Act repeal and reinstatement of IRA incentives.

Execution and Supply Chain – Implementing large-scale resource transitions requires coordination across permitting, procurement, interconnection, and construction, each vulnerable to delays and cost escalation. National supply chain constraints, equipment lead times, and labor shortages present material risk to project execution.

CEI South incorporated these risks into modeling through cost sensitivities and contingencies, while also qualitatively assessing the scale and complexity of each portfolio. Portfolios with phased buildouts, technology diversity, and distributed development timelines were favored to reduce execution risk and support achievable, cost-effective implementation.

The final definitions of the objectives and metrics that were provided in the fourth Stakeholder meeting can be reviewed in the following table.

Figure 2-3 – Objectives, Measures, & Metrics

Objective	Measure	Metrics
Affordability: Consider portfolios' impact on the retail electric utility service providers' ability to provide affordable power across residential, commercial, and industrial customer classes	20-year NPVRR across 200 dispatch iterations under varying market conditions	millions$
	95th percentile of NPVRR across 200 dispatch	millions$

Objective	Measure	Metrics
	iterations under varying market conditions	
	5th percentile of NPVRR across 200 dispatch iterations under varying market conditions	millions$
	Incremental Electric energy burden (2030 – 2035)	% HH Income
Environmental Sustainability: Consider the impact of environmental regulations on the cost of providing electric utility service and demand from consumers for environmentally sustainable sources of electric generation	CO_2 Intensity	Tons/ CO_2/kwh
	CO_2 Equivalent Emissions	Tons CO_2e
	SO_x and NO_x Emissions	Tons
Reliability: Consider portfolios' ability of the electric system to supply the aggregate electrical demand and energy requirements of end use customers at all times and withstand sudden disturbances **Resiliency:** Consider portfolios' ability to adapt to changing conditions and withstand and rapidly recover from disruptions **Stability:** Consider portfolios' ability to maintain a state of equilibrium during normal and abnormal conditions or disturbances and deliver a stable source of electricity, in which frequency and voltage are maintained within defined parameters	Unserved energy across 200 dispatch iterations under varying market conditions	MWh
	Spinning Reserve	Portfolio MW's that offer spinning reserve
	Fast Start Capability	Portfolio MW's that offer fast start
	Transmission reliability analysis	Dynamic VAR support ("MVAR") Short Circuit Ratio ("SCR")
Risk/Other:	Energy market purchase and sales	% (average, near/long-term)
	Capacity sales and purchases	$

2.9. Comprehensive Portfolio Development & Testing

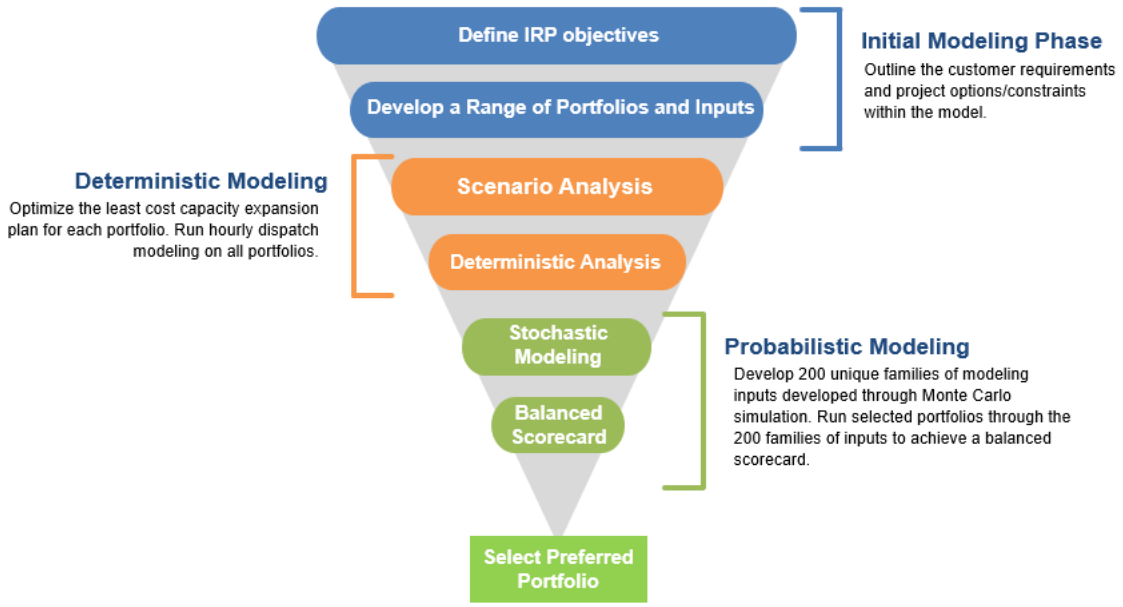
Following the completion of scenario design and modeling setup, CEI South initiated an iterative portfolio development process to explore and evaluate long-term resource pathways. Three major decisions were evaluated within this IRP: replacement of F.B. Culley 2 interconnection, the next three-year DSM Plan, and evaluation of F.B. Culley 3,

CEI South's last remaining coal unit that it operates. For portfolio development, economic decisions for DSM programs were locked in prior to building out the final 12 portfolios. Then, the process began with initial runs of the primary scenarios designed to identify common themes across load, policy, and cost conditions. Resources that consistently emerged across scenarios, such as early storage or demand-side measures, were considered for inclusion in a "going-in" resource position to anchor subsequent modeling. Then CEI South focused on capacity need and built around various resource options to replace or maintain F.B. Culley 3.

Building from this foundation, CEI South constructed a broad set of candidate portfolios that reflect diverse planning priorities and technology pathways. These portfolios were then evaluated against CEI South's predefined criteria, including but not limited to technical performance, customer affordability, emissions outcomes, and implementation feasibility.

Figure 2-4 below illustrates the structured, multi-step approach used to refine, test, and compare resource strategies before selecting a final Preferred Portfolio. Note that with the inclusion of the Alternate Reference Case, this multi-step approach was performed once with the core scenarios and then again with the Alternate Reference Case inputs.

Figure 2-4 – Portfolio Development Process



Modeled Portfolios

Each portfolio represents a distinct pathway for meeting future energy needs, varying by generation mix, retirement timing, renewable adoption, and storage deployment. These resource portfolios test specific planning themes, and while some emphasize emerging resource types, others prioritize system flexibility. Several explore the role of legacy resources under evolving market and regulatory conditions. By modeling a wide range of options, CEI South was able to evaluate tradeoffs and performance across multiple dimensions, including reliability, cost, emissions, and implementation risk, under the four core planning scenarios. Twelve portfolios were evaluated in the final risk analysis. These portfolios and the selection process will be discussed further in Section 4, Portfolio Development and Evaluation.

The modeling framework included EnCompass and PSSE software packages to support both long-term system development and near-term operational analysis. These tools allowed CEI South to capture cost, reliability, and policy tradeoffs with appropriate technical rigor.

Capacity Expansion Modeling

For each scenario, capacity expansion modeling was used to identify optimal long-term resource plans that met planning reserve margins, and reliability criteria, while minimizing system cost. Fixed generation strategies, such as early coal retirement or prescribed storage additions, were used in certain runs to explore how portfolio configurations responded under controlled planning assumptions. Additionally, this strategy was used to create portfolios with a wide range of potential technologies to maintain needed capacity.

Production Cost Modeling

Once expansion plans were established, system dispatch and production costs were simulated on an hourly basis. This allowed CEI South to assess operational dynamics, including renewable integration, unit starts, expected unserved energy, and emissions output. These production cost insights ensured that modeled portfolios were not only cost-effective in theory but also viable under real-world system conditions.

Probabilistic Analysis

Recognizing the uncertainty inherent in long-term planning, CEI South performed targeted sensitivity analyses to test portfolio robustness. Key variables including fuel prices, load growth, carbon costs, energy sales, and capital expenses were varied within reasonable bounds. This helped identify portfolios that consistently performed well across multiple risk dimensions, even under adverse conditions.

Sensitivity Analysis

Sensitivity analysis is conducted to evaluate certain risks. It includes changing only one

variable at a time to understand the impact of a single risk factor. In some cases, the sensitivity is used as a screening tool for ideas to see if the risk is worth further exploration within more comprehensive modeling. In other cases, it was used to provide more insight into the impact of one cost driver or explore potential differences in resource build out. Sensitivity analysis is particularly helpful in explaining isolated impacts that stakeholders or the company is interested in.

Together, these modeling efforts produced a well-rounded view of how candidate portfolios would perform across regulatory, economic, and operational contexts.

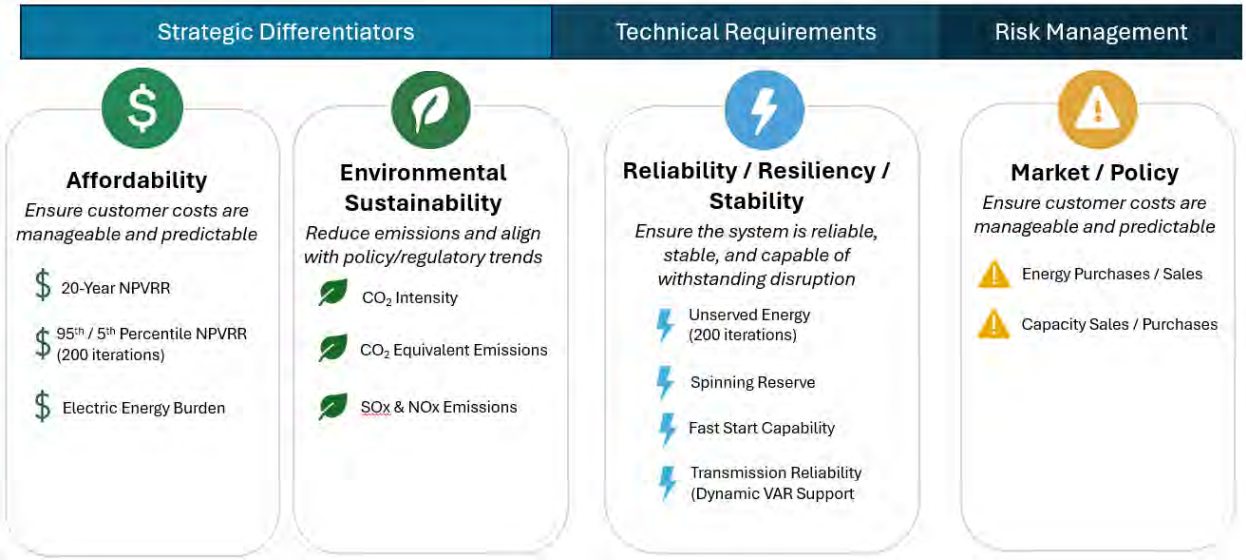
2.10. Portfolio Scorecard Evaluation

Once candidate portfolios were developed and tested, CEI South used a scorecard-based framework to compare performance across the three evaluation layers outlined above. This approach translated complex modeling outputs into a structured decision-making tool, allowing CEI South to balance technical feasibility with strategic value.

Evaluation Framework Summary

Figure 2-5 summarizes how CEI South's evaluation criteria are organized into the three assessment layers, Technical Requirements, Strategic Differentiators, and Risk Management. The image also illustrates the specific pillars, objectives, and performance metrics considered within each layer. This structure enables transparent, side-by-side comparison of portfolios across operational, economic, environmental and risk dimensions.

Figure 2-5 – Evaluation Objectives, Measures & Metrics



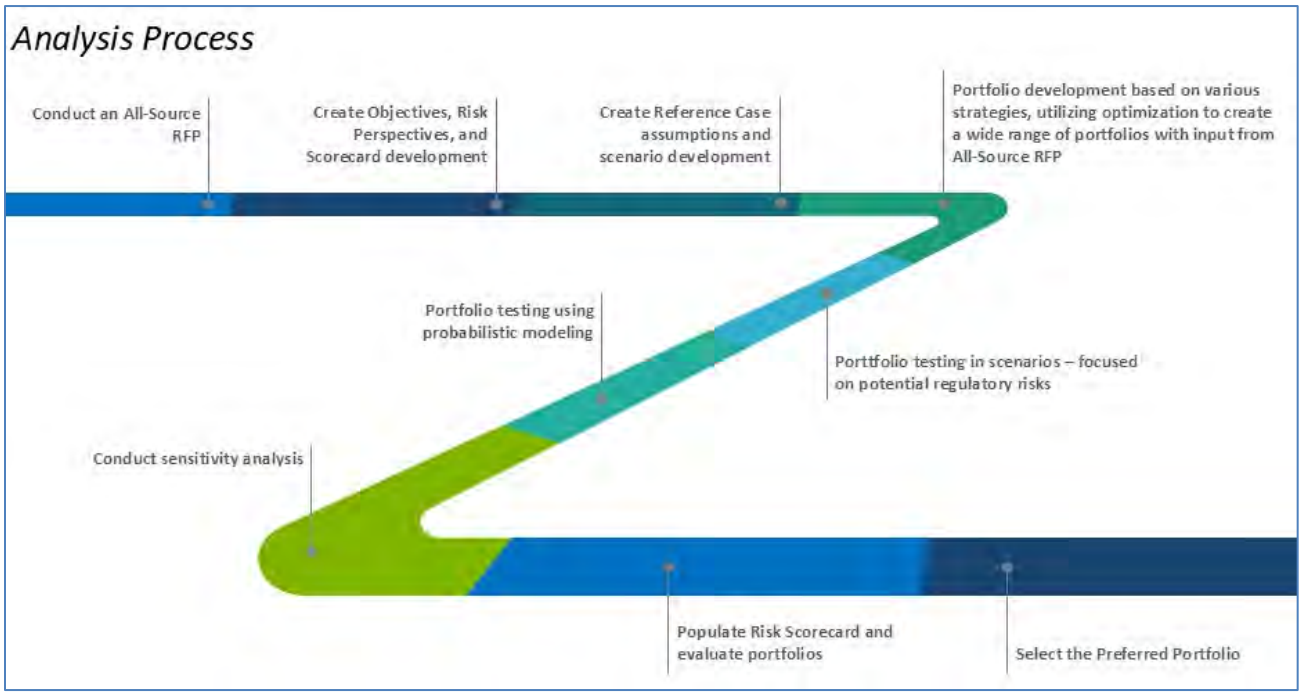
Together, this method ensures that CEI South's Preferred Portfolio is not only technically sound and cost-effective, but also robust under a range of future uncertainties. By integrating operational standards, long-term strategic objectives, and explicit risk considerations, the framework supports balanced decision-making and reflects CEI South's commitment to reliable, affordable, resilient, stable, and environmentally sustainable service for its customers. This structured approach also provides transparency and an opportunity for stakeholder engagement, reinforcing confidence in the IRP process and its outcomes.

2.11. Analytical Process & Tools

2.11.1. Analytical Roadmap

As shown in Figure 2-6, CEI South initiated the IRP process with the 2024 All-Source RFP (*Technical Appendix Attachment 2.1*), which provided current market data on resource availability and pricing. Following the 2024 All Source RFP, CenterPoint developed key evaluation metrics, perspectives, and scenario worldviews based on stakeholder input and existing knowledge. These scenarios, combined with additional planning considerations, were used to create potential future portfolios. Each portfolio was then evaluated through probabilistic modeling and various sensitivity analyses to quantify risk and performance under varied market conditions. Finally, the results were evaluated, and a Preferred Portfolio was selected.

Figure 2-6 – Analytical Roadmap



2.11.2. Modeling Tools

The primary modeling software used to assist in portfolio development, probabilistic modeling, and sensitivity analysis was the EnCompass capacity expansion and production cost simulation software package, licensed from Yes Energy. The National Database provided by Horizons Energy was used to represent the broader power grid beyond CEI South's service territory.

In parallel with generation system planning, a comprehensive transmission assessment was performed using the PSS/E software, licensed from Siemens. This analysis incorporated the MISO Transmission Expansion Planning ("MTEP") 2024 dataset to reflect the current state of the regional transmission network, supplemented with system-specific insights provided by CEI South.

2.11.3. Process Enhancements

Several enhancements were made to the IRP process in alignment with feedback from the previous IRP cycle and stakeholder requests. These updates included refinements to objectives and metrics, expanded sensitivity analysis, improvements to probabilistic

modeling, and other process modifications intended to increase transparency and stakeholder engagement throughout the IRP development.

2.11.3.1. Enhancements to Objectives and Metrics

Additional scoring measures were introduced across the pillars to provide a more comprehensive assessment of the impacts evaluated in this study. Under the affordability metric, the 5th percentile of the NPVRR was added to the final scorecard, in addition to the traditional 95th percentile, to better represent the potential range of customer cost outcomes under varying future conditions. In response to stakeholder requests, electric energy burden was also incorporated as a new affordability metric. Accordingly, 5- and 10-year incremental electric energy burdens were calculated by dividing the bill impact in those years by the median household income in Vanderburgh County. This metric is intended to illustrate the potential near to mid-term impacts to customers associated with portfolio decisions made in this IRP cycle.

To strengthen the evaluation of environmental sustainability, new scoring measures were added to capture criteria air pollutants not previously reported in the scoring process. Specifically, cumulative tons of sulfur oxides ("So_x") and nitrogen oxides ("No_x") emitted were added to the environmental metrics. While previously captured in the broader CO_2 equivalent emissions intensity metric, this explicit inclusion provides greater transparency into portfolio environmental performance.

The transmission reliability analysis was conducted to assess system stability measuring the available dynamic reactive power ("VAR") support and short circuit ratio ("SCR"). Both metrics were evaluated under single element outage (N-1) conditions. The dynamic VAR support metric quantifies the maximum available reactive power on the system during an outage event by summing the total system VAR capability and accounting for each generator's reactive power contribution. Scenarios with lower dynamic VAR support may indicate potential voltage stability concerns. The SCR represents the ratio of the apparent power available at a given system bus following a fault to a benchmark apparent power value of 100 MW. Scenarios exhibiting lower SCR values are indicative of potential stability limitations. Together, these metrics help identify locations or scenarios where the system may require additional reactive support or reinforcement to maintain reliable operation.

Finally, in the risk category, capacity sales and purchases were added to the scorecard to better capture exposure associated with interactions in the market. This metric is intended to quantify the potential risks tied to capacity sales, particularly given their influence on the overall affordability results and customer cost outcomes. Moreover, highlighting reliance on

capacity purchases in this way clearly demonstrates the risks related to market capacity availability and price volatility.

2.11.3.2. Enhancements to Probabilistic Modeling

One key enhancement to the probabilistic modeling framework involved the addition of energy sales variability within the stochastic analysis. To better reflect a range of potential market conditions, the model varied the limits of allowable energy sales across the 200 probabilistic iterations. These limits were implemented at the current transfer capability of 660 MW as well as reduced limits of 330 MW and 165 MW, with each limit applied to one-third of the total draws. This improvement provides a more realistic representation of operational flexibility and market exposure, while also preventing portfolio overreliance on market energy sales revenues to offset costs.

Another improvement expanded the probabilistic modeling of capital costs beyond renewables and storage to include all resources in the model. Each resource type was assigned high, base, and low capital cost forecasts to reflect a realistic range of potential outcomes. This addition allows the model to better capture uncertainty in future costs and improves the understanding of how capital cost changes influence overall portfolio performance.

2.11.3.3. Stakeholder Scenario Input

Throughout the IRP process, stakeholders were continually offered the opportunity to provide feedback and input for incorporation into the analysis. For example, during the initial stakeholder meeting, draft scenarios were presented, prompting stakeholders to request an additional scenario with substantially different key drivers. In response, CEI South developed an Alternate High Regulatory worldview, in which environmental regulations become more stringent, while load continues to grow a rapid pace due to electrification of heating equipment and vehicles, resulting in upward pressure on capital costs. Stakeholders also proposed the development of an Alternate Low Regulatory scenario—mirroring the original Low Regulatory scenario but incorporating lower projected load growth. This latter case was included as a sensitivity analysis rather than a new scenario.

2.11.3.4. Alternate Reference Case

This IRP coincides with a period of unprecedented uncertainty in the industry, particularly related to the rapid emergence of large loads seeking interconnection to the power grid. Following stakeholder interest surrounding the impacts of potential large load additions in CEI South territory and continued interest from multiple industries to locate in CEI South's territory, CEI South introduced an Alternate Reference Case. This analysis utilized IRP capacity expansion modeling to develop multiple portfolios for further evaluation using

probabilistic modeling and selection of an Alternate Preferred Portfolio. More information on the Alternate Reference case can be found in Section 6, The Alternate Preferred Portfolio.

2.11.3.5. Expanded Sensitivity Analysis

To provide a more comprehensive understanding of portfolio performance under varying conditions, CEI South expanded the scope of sensitivity analyses performed in this IRP. These sensitivities examined the effects of several key factors, including the distributed solar incentive, large load additions, A.B. Brown 5 and 6 conversion costs, inclusion of F.B. Culley 2 storage, demand response term, and the Alternate Low Regulatory case. Together, these analyses provided greater insight into how changes in resource costs, load levels, distributed generation, and market conditions could influence portfolio development and overall system reliability.



Forecasts and Key Modeling Assumptions

Chapter 3

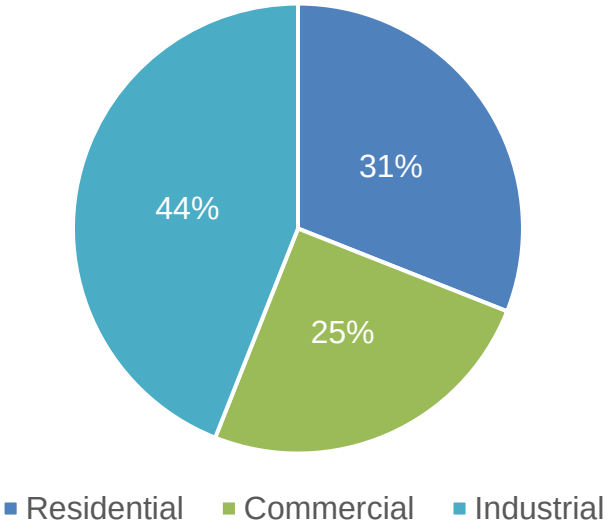
3.1. Load Forecast

3.1.1. Methodology

CUSTOMER TYPES

CEI South serves more than 150,000 electric customers in Southwestern Indiana; Evansville is the largest city within the service area. The service area includes a large industrial base with industrial customers accounting for approximately 44% of energy sales in 2024. The residential class accounts for 31% of sales with approximately 133,000 customers and the commercial class is 25% of sales; there are approximately 19,000 nonresidential customers. System 2024 energy requirements were 5,032 GWh with non-weather normalized system peak reaching 1,065 MW. Figure 3-1 shows 2024 class-level sales distribution.

Figure 3-1 – 2024 CEI South Annual Sales Breakdown



3.1.2. Forecast Drivers and Data Sources

The main drivers of the energy and demand forecast include the following: historical energy and demand data, economic and demographic information, weather data, equipment efficiencies and equipment market share data.

Itron used more than 10 years of historical energy and demand data within the energy and demand forecasts. This data is maintained by CEI South in an internal database and was provided to Itron. Energy data is aggregated by rate class for the purposes of forecasting.

There are two major rate classes for residential customers: the standard residential rate and the transitional electric heating rate (rate closed to new premises). Information for these rates is combined for the purposes of forecasting residential average use per customer ("AUPC"). Similarly, small to large commercial (general service) rates are combined to produce the commercial forecast and large customer rates are combined to produce the industrial forecast. The demand forecast utilizes total system demand.

Economics and demographics are drivers of electricity consumption. Historically, there has been a positive relationship between economic performance and electricity consumption. As the economy improves, electricity consumption goes up and vice versa. Economic and demographic information was provided by S&P Global (formerly IHS Markit), which contains both historical results and projected data throughout the IRP forecast period. Examples of economic variables used include, but are not limited to, population, income, output and employment.

Weather is also a driver of electric consumption. CEI South's peak demand is traditionally in summer when temperatures are hottest. Air conditioning drives summer usage. Itron used a trended weather assumption for the normal weather in the sales and demand forecast to capture recent weather activity. The trended weather picks up the 0.06 degree annual increase in temperature the Evansville area has experienced since 1988.

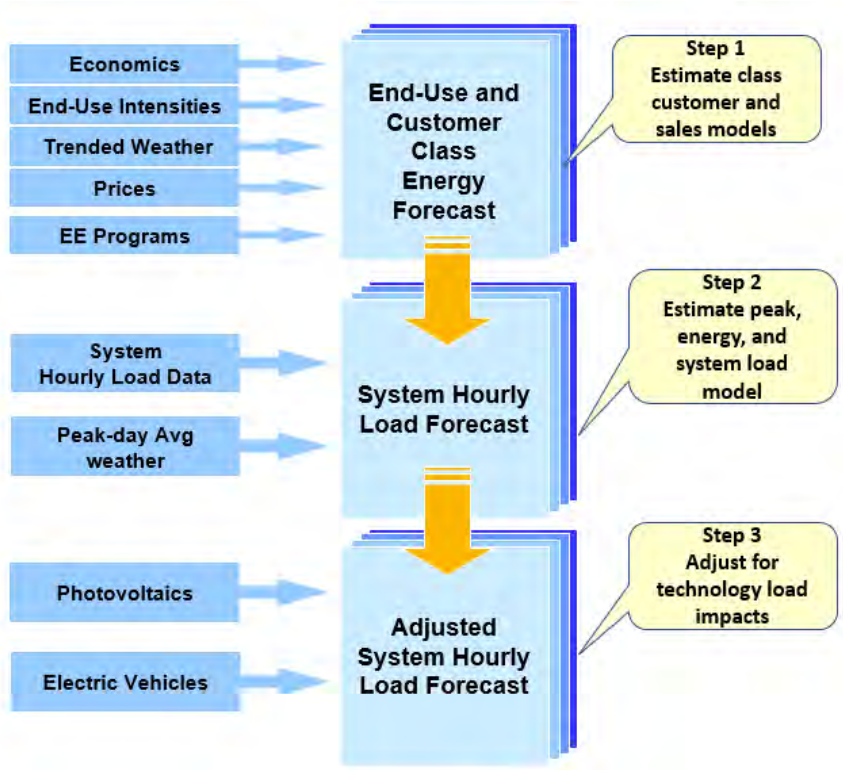
Itron provides regional Energy Information Administration ("EIA") historic and projected data for equipment efficiencies and market shares. This data captures projected changes in equipment efficiencies based on known codes and standards and market share projections over the forecast period, including but not limited to the following: electric furnaces, heat pumps, geothermal, central air conditioning, room air conditioning, electric water heaters, refrigeration, dish washers, dryers, etc. Residential market share data was adjusted to CEI South's service territory based on the appliance saturation survey data.

3.1.3. Model Framework

The long-term energy and demand forecasts are based on a build-up approach. End-use sales derived from the customer class sales models (residential, commercial, industrial and street lighting) drive system energy and peak demand. Energy requirements are calculated by adjusting sales forecast upwards for line losses. Peak demand is forecasted through a monthly peak-demand linear regression model that relates peak demand to peak-day weather conditions and end-use energy requirements (heating, cooling and other use). System energy and peak are adjusted for residential and commercial PV adoption and EV charging impacts.

Figure 3-2 shows the general framework and model inputs.

Figure 3-2 – Class Build-up Model



In the long-term, both economic growth and structural changes drive energy and demand requirements. Structural changes include the impact of changing appliance ownership trends, end-use efficiency changes, increasing housing square footage and thermal shell efficiency improvements. Changing structural components are captured in the residential and commercial sales forecast models through a specification that combines economic drivers with end-use energy intensity trends. This type of model is known as a Statistically Adjusted End-Use ("SAE") model. The SAE model variables explicitly incorporate end-use saturation and efficiency projections, as well as changes in population, economic conditions, price and weather. Both residential and commercial sales are forecasted using an SAE specification. Industrial sales are forecasted using a two-step approach, which includes a generalized econometric model that relates industrial sales to seasonal patterns and industrial economic activity. Streetlight sales are forecasted using a simple trend and seasonal model.

3.1.4. Reference Case

ENERGY AND DEMAND FORECAST (REFERENCE CASE)

For the IRP, the long-term energy and demand forecast does not include energy savings from future DSM programs; DSM activity is considered a supply option and not a reduction to demand. Excluding DSM, energy requirements increasing 0.3% per year, summer peak demand increases of 0.5% per year and winter peak demand increases 0.3% per year growth over the next 20 years. The table below shows CEI South's energy and demand forecast; the forecast includes the impact of customer owned distributed generation, electric vehicles, trended weather (warmer summers and winters), company owned distributed generation (solar and landfill gas) and customer EE outside of energy company sponsored programs but excludes future energy company sponsored DSM program savings. For more information on CEI South long-term energy and demand forecasts, including load shapes, see *Technical Appendix Attachment 3.1 2025 CEIS Long-Term Electric Energy & Demand Forecast Report, Technical Appendix Attachment 3.2 Energy and Demand Forecast Model Inputs/Outputs (Confidential)*, and *Technical Appendix Attachment 3.3 CEIS 2024 System Hourly Load.*

Figure 3-3 – Energy and Demand Forecast

Year	Energy (MWh)		Summer Peak (MW)		Winter Peak (MW)	
2025	5,201,610		1,083		813	
2026	5,191,351	-0.2%	1,083	0.0%	810	-0.4%
2027	5,203,796	0.2%	1,088	0.5%	811	0.1%
2028	5,222,633	0.4%	1,093	0.5%	813	0.2%
2029	5,235,038	0.2%	1,098	0.5%	815	0.2%
2030	5,251,045	0.3%	1,104	0.5%	817	0.2%
2031	5,262,958	0.2%	1,108	0.4%	818	0.1%
2032	5,275,867	0.2%	1,113	0.4%	819	0.2%
2033	5,271,139	-0.1%	1,115	0.2%	818	-0.2%
2034	5,272,156	0.0%	1,118	0.3%	818	0.0%
2035	5,288,369	0.3%	1,124	0.5%	821	0.4%
2036	5,321,526	0.6%	1,133	0.8%	826	0.6%
2037	5,342,859	0.4%	1,140	0.6%	830	0.4%
2038	5,367,527	0.5%	1,148	0.7%	834	0.5%
2039	5,391,397	0.4%	1,155	0.6%	838	0.5%
2040	5,422,019	0.6%	1,163	0.7%	842	0.6%
2041	5,438,402	0.3%	1,169	0.5%	846	0.4%
2042	5,460,741	0.4%	1,177	0.7%	849	0.4%

Year	Energy (MWh)		Summer Peak (MW)		Winter Peak (MW)	
2043	5,483,087	0.4%	1,186	0.7%	852	0.4%
2044	5,512,360	0.5%	1,196	0.9%	857	0.5%
2045	5,535,614	0.4%	1,204	0.7%	860	0.4%
CAGR 25-45		0.3%		0.5%		0.3%

3.1.5. Alternate Scenarios

Itron developed three alternative scenario load forecasts as part of the IRP, one for each core scenario; they include a Low Regulatory, High Regulatory, and Alternate High Regulatory with electrification forecast. These forecasts are developed by altering the model inputs such as the EV/PV forecasts, economics, and end-use saturations and efficiencies. In addition to scenario forecasts, Itron developed four large load forecasts, three for the large load sensitivity and one for the alternate reference case. These forecasts assume the additional of a large load such as an industrial customer or data center.

Figure 3-4, Figure 3-5, and Figure 3-6 show the scenario, large load, and Alternate Reference Case forecasts.

Figure 3-4 – Alternate Scenario Forecasts

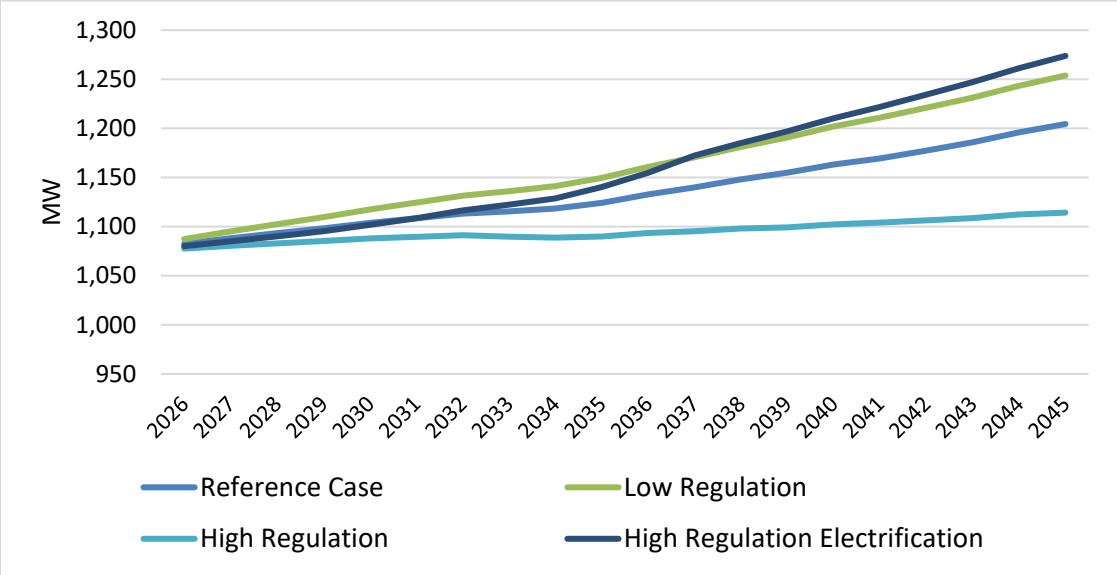


Figure 3-5 – Sensitivity Forecasts

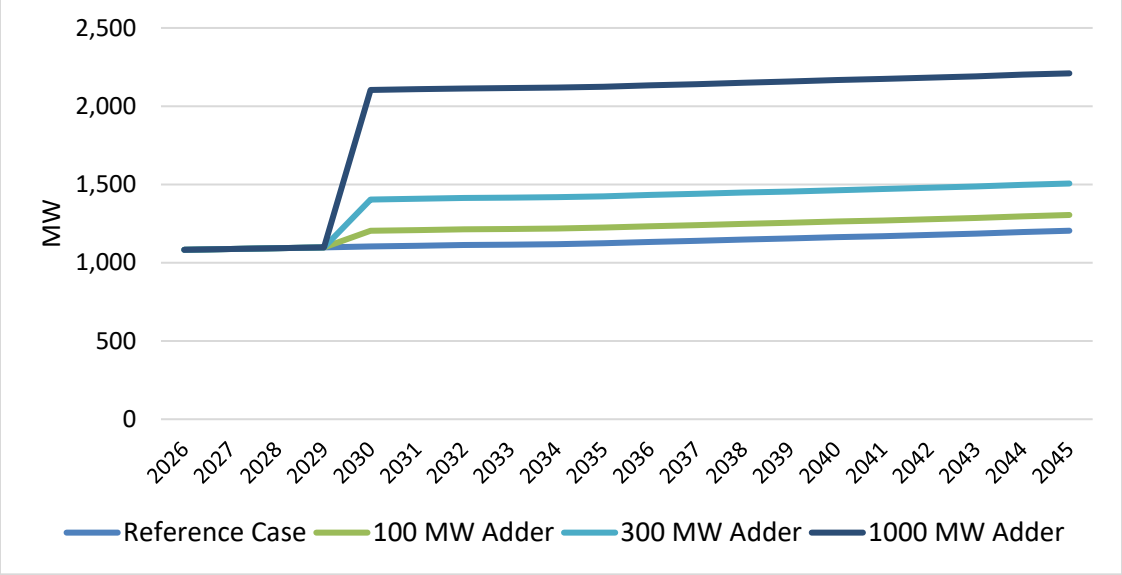
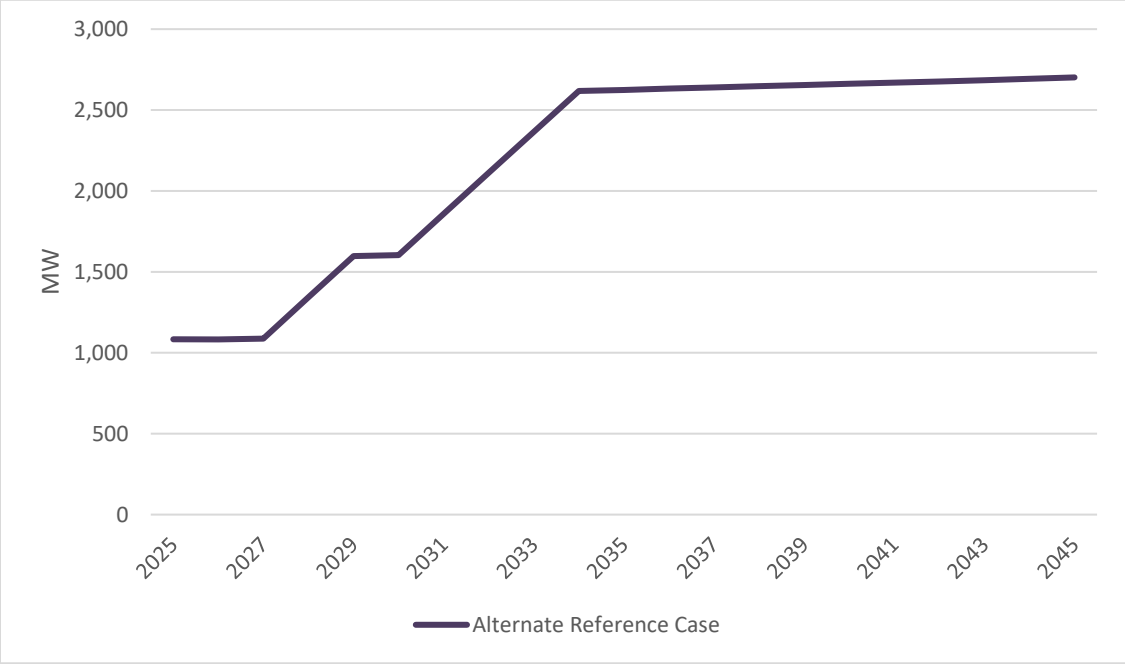


Figure 3-6 – Alternate Reference Case



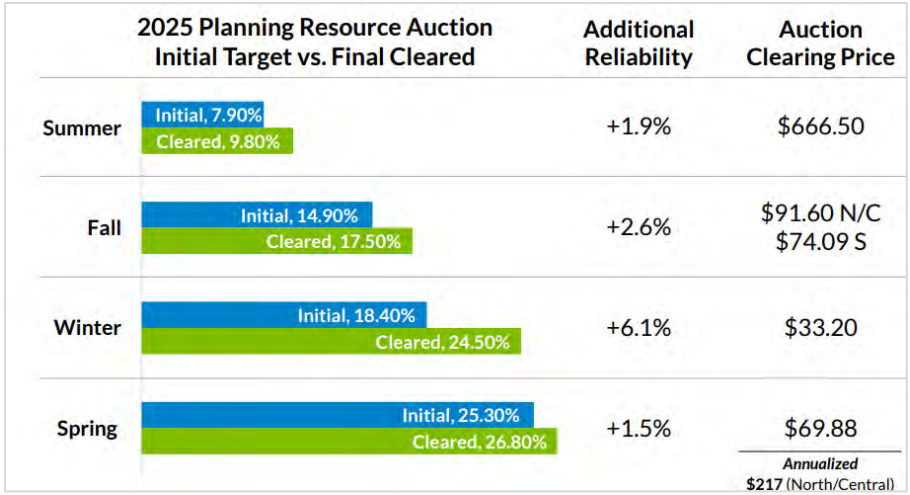
3.2. MISO

3.2.1. Planning Reserve Margin Requirement

MISO's Planning Reserve Margin ("PRM") is the percentage of additional capacity that Load Serving Entities ("LSEs"), including CEI South, must maintain above their forecasted peak demand to ensure grid reliability. The Planning Reserve Margin Requirement ("PRMR") is calculated based on the LSE's peak load forecast and the applicable PRM. The PRMR is further detailed by the Local Clearing Requirement ("LCR") which mandates how much of a LRZ PRMR must be met by generation resources physically located within that LRZ for each respective season. In recent years the number of available resources to meet load needs throughout MISO has tightened excess capacity that acts as a reliability safeguard. This trend is continuing as more baseload units are projected to retire in the coming years.

In 2024, FERC approved MISO's transition from a vertical demand curve to a reliability-based demand curve ("RBDC") for its capacity market, characterized by a sloped design, it is intended to improve MISO's capacity market by assigning value to surplus capacity based on its contribution to reliability, while also stabilizing prices, reducing volatility, and encouraging long-term investment in dependable energy resources. For LSE's the introduction of the RBDC adds complexity as each season has an initial PRM, but the final PRM can shift based on auction outcomes—requiring LSEs to estimate their potential final PRMR. The illustration in Figure 3-7[9] shows the impact of the RBDC on the 2025/2026 Planning Auction PRM.

Figure 3-7 – 25/26 RBDC Impact on the Planning Resource Auction



[9]"MISO Resource Adequacy PY 25-26: 2025 PRA Results Posting 20250529_Corrections". MISO Energy. May 29, 2025. https://cdn.misoenergy.org/2025%20PRA%20Results%20Posting%2020250529_Corrections694160.pdf, page 5

3.2.2. Capacity Price

MISO's PRA is held annually for each of the load zones within the MISO footprint to ensure sufficient capacity resources. The PRA has yielded a wide fluctuation in capacity pricing for Zone 6 since its inaugural year of 2013, as shown in Figure 3-8 below. These large swings have made it difficult to forecast prices. Outside of the 2022-2023 anomaly, prices were relatively low for MISO's Zone 6 market participants. However, in the last three Planning Years, since the implementation of the Seasonal Construct, prices have been steadily increasing. RBDC prices are in line with MISO expectations and send more accurate price signals that properly value incremental capacity.

Figure 3-8 – MISO Capacity Prices



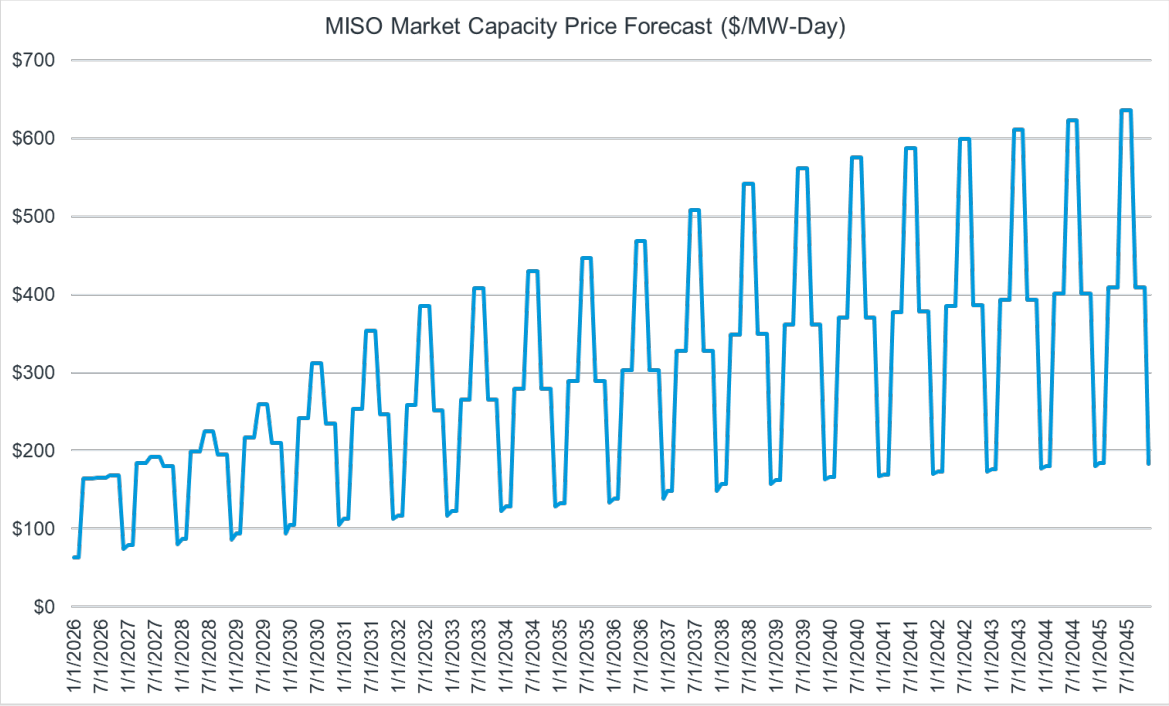
In Figure 3-9, the 2025-2026 seasonal PRA zone 6 cleared at $666.50 in the Summer, $91.60 in the Fall, $33.20 in the Winter, and $69.88 in the Spring, all in $/MW-Day.

Figure 3-9 – 2025-2026 MISO Seasonal Capacity Prices

Planning Year	Highest Clearing Price for MISO-region per MW-Day	Clearing Price for Zone 6 (Indiana & Kentucky) per MW-Day
Summer	$666.50	$666.50
Fall	$91.60	$91.60
Winter	$33.20	$33.20
Spring	$69.88	$69.88

Forward-looking capacity prices were modeled using a consensus forecast from their sources, Hitachi, S&P Global, and Wood Mackenzie. This limits reliance on a single forecast and captures views from several experts. Seasonal capacity price forecasts are given in Figure 3-10. As illustrated below, the capacity price in all seasons is increasing over time, with the summer capacity price increasing at the quickest pace.

Figure 3-10 - MISO Market Capacity Price Forecast



3.2.3. Addressing Resource Adequacy and Reliability Challenges

To address escalating reliability risks and resource adequacy challenges, MISO is executing a series of strategic reforms guided by its Reliability Imperative—a framework launched in 2020 that defines the shared responsibility among MISO, its members, and states to ensure grid reliability amid rapid change. The Reliability Imperative is structured around four pillars: Market Redefinition, Transmission Evolution, System Enhancements, and Operations of the Future, each driving targeted initiatives to manage uncertainty, integrate new technologies, and modernize planning and operations.

Key reforms have included the transition to a seasonal PRA in Fall 2022, the implementation of the RBDC effective June 3, 2024, and resource accreditation reforms scheduled for full rollout by the 2028–2029 planning year. These changes improve capacity valuation, align planning with seasonal risks, and incentivize reliable resource performance. MISO's interconnection reforms, including the Expedited Resource Addition Study ("ERAS") process launched in May 2025, aim to accelerate critical resource deployment, with the first Definitive Planning cycle beginning January 2026.

Additionally, FERC Order 881, effective December 31, 2028[10], requires utilities to implement ambient-adjusted transmission line ratings, enhancing grid efficiency and transparency, which may require improved forecasting tools and data integration to reflect dynamic transmission capabilities. FERC Order 2222 mandates the integration of Distributed Energy Resources ("DERs") into wholesale markets. MISO's compliance efforts in 2025 have involved building new workflow models and structuring communication frameworks for key roles that CEI South will incorporate into future IRPs as it becomes clearer how DER aggregation, visibility, and dispatchability affects our system. The impact of these regulatory changes is addressed in more detail below.

3.2.3.1. Direct Loss of Load ("DLOL") Resource Accreditation

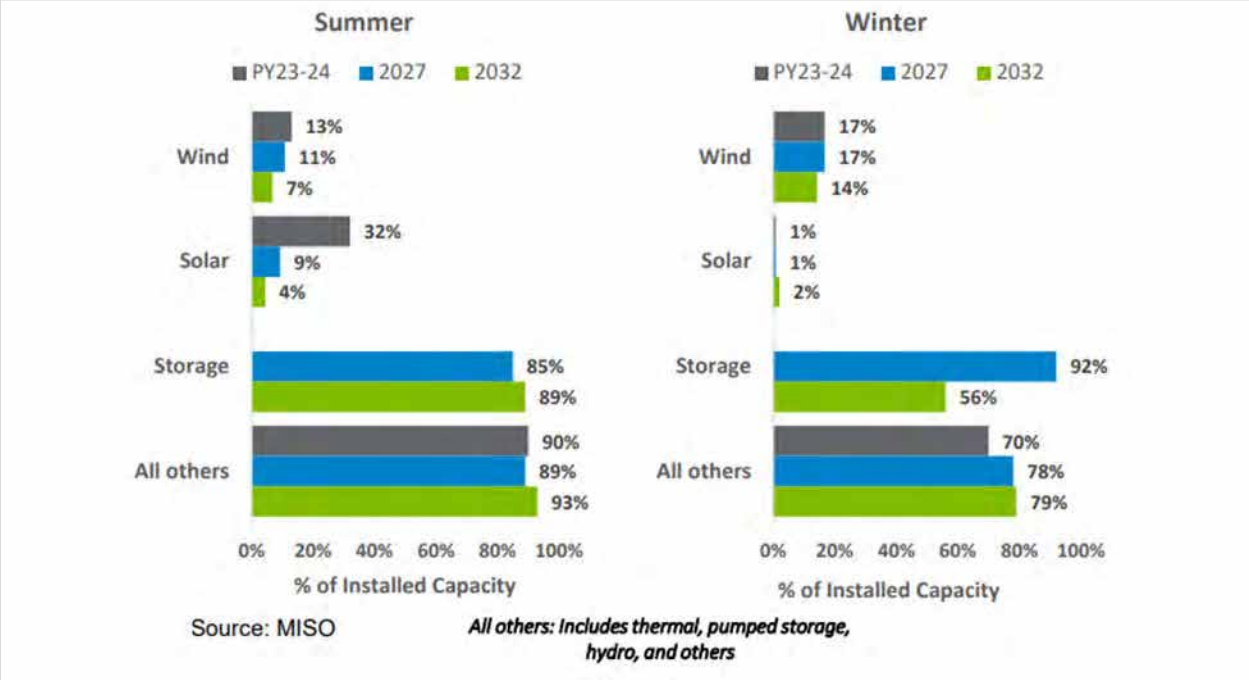
MISO is undergoing a pivotal transformation in its resource portfolio. A substantial portion of dispatchable thermal generation is approaching retirement, while being replaced by a growing share of weather-dependent, intermittent wind and solar resources. This shift combined with the increasing penetration of variable generation and the rising frequency of extreme weather events is fundamentally altering the nature of system risk and presenting new challenges to maintaining reliable grid operations, as part of MISO's broader Resource Availability and Need ("RAN") initiative (2019) and Market Redefinition, MISO proposes a two-step accreditation framework, known as the DLOL-based methodology, to address emerging reliability challenges and ensure a balanced, diverse resource mix. This approach also builds on recent reforms, including FERC's approval of Seasonal Accreditation ("SAC") and the shift to a seasonal PRA.

MISO's proposed DLOL-based resource accreditation methodology involves two steps. First, it uses a probabilistic assessment to estimate a resource's expected contribution to reliability by analyzing class-level performance during high-risk periods, based on 30 years of weather and load data through Monte Carlo simulations. Second, it applies a

[10] "Commissioner Rosner's Concurrence on Order Granting Extension of Time re MISO, Inc. under ER22-2363 | Federal Energy Regulatory Commission". FERC News. June 6, 2025. https://www.ferc.gov/news-events/news/commissioner-rosners-concurrence-order-granting-extension-time-re-miso-inc-under.

deterministic assessment that evaluates each resource's historical performance during critical reliability hours to assign accreditation within its resource class. Seasonal and resource-specific impacts under MISO's DLOL based resource accreditation methodology reflect a shift in reliability risk from summer to winter, which significantly affects solar and wind resources. Solar accreditation declines as penetration increases due to reduced effectiveness during evening risk hours, while both wind and solar receive lower proposed accreditation values compared to current methods. In contrast, thermal and storage resources maintain more stable accreditation levels, though they are still influenced by probabilistic risk modeling. The DLOL methodology began a three-year transition starting September 1, 2024, with full implementation targeted for the 2028/29 Planning Year.

Figure 3-11 – MISO DLOL Accreditation Forecast



3.2.3.2. Demand and Emergency Resources Accreditation Reforms

MISO's Demand and Emergency Resources Accreditation Reforms introduce a performance-based approach to resource accreditation, emphasizing availability during high-risk reliability periods. Utilities must now account for seasonal and hourly availability rather than static nameplate capacity and adjust planning reserve margins accordingly. With emergency DR programs being phased out starting in 2025 and full implementation of the reforms by Planning Year 2028–2029, IRPs developed during this transition must

reflect evolving accreditation values and anticipate reduced capacity credits for certain demand-side resources[11].

3.2.4. Generation Interconnection Process

Before a new generating facility can connect to the MISO-controlled transmission network, the new energy source is evaluated and approved through the MISO Generator Interconnection Process. The Generator Interconnection Process ("GI") defines the steps an interconnection customer and MISO take to move interconnection requests through the interconnection queue[12].

The three steps are: Pre-Queue, Application Review and Definitive Planning.

Pre-Queue: Provides interconnection customers with an overview of the Generator Interconnection process, including timelines and output expectations.

Application Review: MISO reviews the request, checks customer readiness, and conducts a mandatory scoping meeting.

Definitive Planning Phase ("DPP"): The final phase of MISO's generator interconnection study process where MISO conducts reliability and deliverability studies that determine whether there is available transmission capacity to accommodate the interconnection of a new, proposed generation facility or whether network upgrades are needed.

Upon completion of the third DPP, MISO and the GI requestor begin the GI Agreement ("GIA") process. After satisfying all terms of the GIA, the GI requestor will receive a fully executed GIA that enables the generator to connect to the MISO transmission system and depending on the transmission service selected, participate, and receive full accreditation in the MISO energy and capacity markets.

3.2.4.1. Interconnection Reforms

In parallel to MISO's strengthening of system reliability and resource adequacy initiatives, MISO is advancing key interconnection reforms to meet the 373-day processing timeline per MISO's Tariff. This includes implementing a queue volume cap to manage the surge

[11] "IRP Contemporary Issues Technical Conference". IN.GOV-IURC. June 6, 2024. https://www.in.gov/iurc/files/MISO-Resource-Accreditation-Reform-IRP-Contemporary-Issues-Technical-Conference-06062024.pdf

[12] Midcontinent Independent System Operator, Inc., Generator Interconnection and Retirement, available at https://www.misoenergy.org/planning/resource-utilization/generator-interconnection/

in interconnection requests, limiting new proposals to 50% of each region's non-coincident peak load to reduce delays and improve study accuracy. Alongside this, financial reforms have increased milestone payments and introduced penalties for late-stage withdrawals from the queue to discourage speculative projects and streamline the process. SUGAR (Suite of Unified Grid Analyses with Renewables) is MISO's advanced automation tool developed to streamline and accelerate interconnection studies. SUGAR significantly reduces engineering time from months to minutes by automating tasks like base case creation, voltage and thermal violation detection, and contingency analysis. It has demonstrated a 99.2% match rate with legacy MISO studies and is being used to support Phase 1 of the DPP. Together, these coordinated initiatives reflect MISO's commitment to efficient resource integration and maintaining system reliability[13].

3.2.4.2. Expedited Resource Addition Study ("ERAS")

Resource adequacy is the cornerstone of MISO's FERC-approved ERAS process, which was established to accelerate the interconnection of generation resources deemed critical for near-term reliability. ERAS enables states or load-serving entities like CEI South to nominate projects that directly address resource adequacy needs such as meeting planning reserve margins or replacing retiring capacity allowing these projects to bypass the traditional queue. Designed as a temporary mechanism to mitigate emerging reliability risks until broader queue reforms are implemented by 2028. ERAS is limited in scope and duration, concluding by August 31, 2027, with a cap of 68 projects and a maximum of 15 per quarter[14].

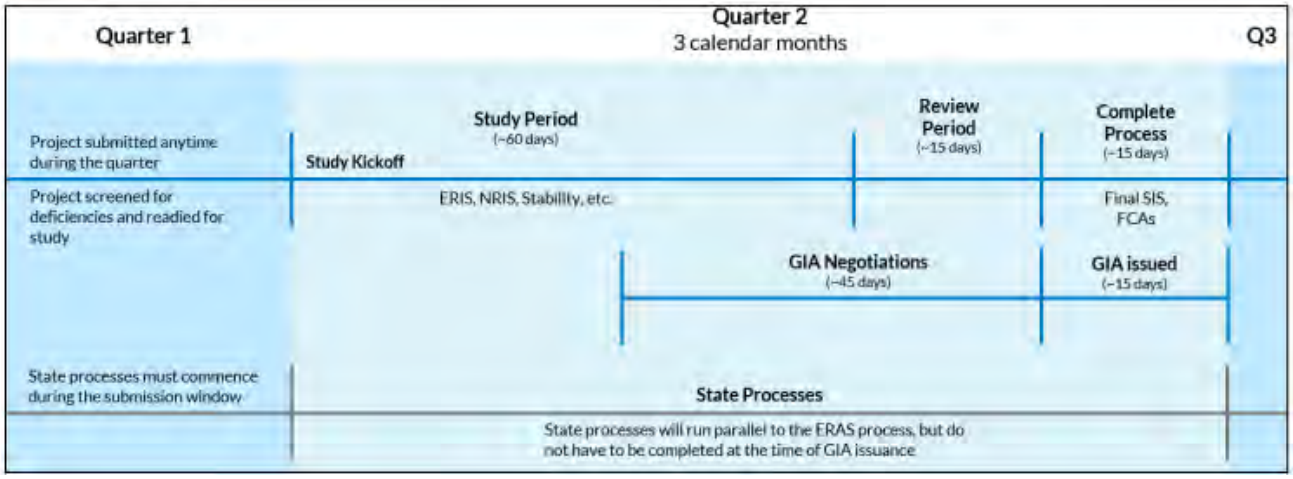
Eligible projects must resolve a specific load addition or resource adequacy deficiency, be commercially operable within 3–6 years of submission, and receive interconnection service capped at 150% of the identified need within the same Local Resource Zone. Each nomination must be verified by the Relevant Electric Retail Rate Authority ("RERRA") to confirm the necessity of the project. As of September 2025, MISO has received 47 ERAS applications totaling 27 GW of capacity. These projects represent a diverse mix of energy sources—primarily gas (74%), followed by nuclear (15%), solar and wind (each 4%), and storage (3%). The applications span multiple states, indicating a

[13]"MISO Dashboard". MISO Energy. June 26, 2025. https://www.misoenergy.org/engage/MISO-Dashboard/generator-interconnection-queue-improvements/

[14] 2025-11-25_193 FERC ¶ 61,168_Docket No. ER25-3543-000729602.pdf. FERC Order approving MISO's September 2025 request to increase from ten projects to fifteen projects per quarter.

broad geographic interest in expedited resource development[15]. Under the ERAS process GIAs are expected to be executed as early as Q4 2025.

Figure 3-12 – ERAS Timeline



3.2.5. Impact of Regulatory Changes

Recent FERC orders 2023, 2222, and 881 introduce significant changes led by MISO. It also requires transmission providers to evaluate Grid Enhancing Technologies ("GETs") to improve system efficiency These orders may promote more agile, data-driven, and distributed approaches to resource planning in the future, requiring adaptation to evolving grid realities and regulatory requirements.

FERC Order 2023:

Requires MISO and other Regional Transmission Operators to overhaul their generator interconnection processes. It mandates MISO to modernize its generator interconnection process by adopting a "first-ready, first-served" cluster study model, enhancing transparency, and enforcing stricter timelines. It calls for MISO to prioritize commercially viable projects, streamline queue management, and evaluate Grid Enhancing Technologies to optimize transmission capacity. The order also reinforces cost allocation principles, ensuring developers fund necessary upgrades[16]. These reforms aim to reduce interconnection delays, support renewable integration, and align MISO's procedures with

[15]"Board of Directors – System Planning Committee". MISO Energy. June 10, 2025. https://cdn.misoenergy.org/06_2025-09-16_SPC_Open_Long%20Term%20Resource%20Adequacy%20%20Interconnection%20Queue%20Update_FINAL717559.pdf., page 6

[16] "Fact Sheet – Improvements to Generator Interconnection Procedures and Agreements". FERC. July 27, 2023. https://www.ferc.gov/news-events/news/fact-sheet-improvements-generator-interconnection-procedures-and-agreements

FERC's national standards. Compliance filings were submitted in April and May 2024, and continuing through 2026. MISO continues to work with stakeholders to enhance transparency and align its processes with FERC's expectations for Transmission Evolution initiatives.

FERC Order 2022:

Issued in September 2020, requires RTOs/ISOs to allow DERs to aggregate and participate in wholesale markets. MISO submitted its second compliance filing in early 2025, which FERC accepted, allowing full market integration of DER aggregators by 2030. Utilities will adapt IRPs by integrating DERs more explicitly into planning models, potentially revising forecasting methods to include aggregated DER impacts, and coordinating more closely with distribution system operators and aggregators. Intermediate steps may allow limited participation under demand response models between 2027 and 2029. MISO is currently upgrading its market platform and settlement systems, with major milestones expected in 2025–2028.[17]

FERC Order 881:

Mandates that all U.S. transmission providers—including RTOs, ISOs, and utilities implement Ambient Adjusted Ratings ("AARs")[18]. This order requires CEI South to develop a Facility Rating Methodologies, ensuring hourly electronic updates of line ratings based on forecasted ambient temperatures, and maintaining secure databases of rating methodologies. This shift enhances grid efficiency by unlocking unused transmission capacity based on real-time weather data.

Overall, Order 881 drives more accurate, cost-effective, and flexible transmission resource planning. Originally set for July 2025, MISO requested and received an extension to December 31, 2028, citing vendor delays and software readiness issues. Despite the delay, stakeholders and FERC encourage MISO to implement components of AARs ahead of schedule to reduce congestion costs and improve reliability.

3.3. Fuel

The thermal units in this analysis are fueled by three main sources: natural gas, coal, and uranium. Fuel forecasts were obtained from a variety of sources in order to capture perspectives from multiple industry experts, allowing CEI South to be more transparent and

[17] "Distribution Energy Resource Task Force (DERTF)". MISO Energy. April 11, 2024. https://cdn.misoenergy.org/2024%20Order%202222%20Compliance%20Framework631391.pdf

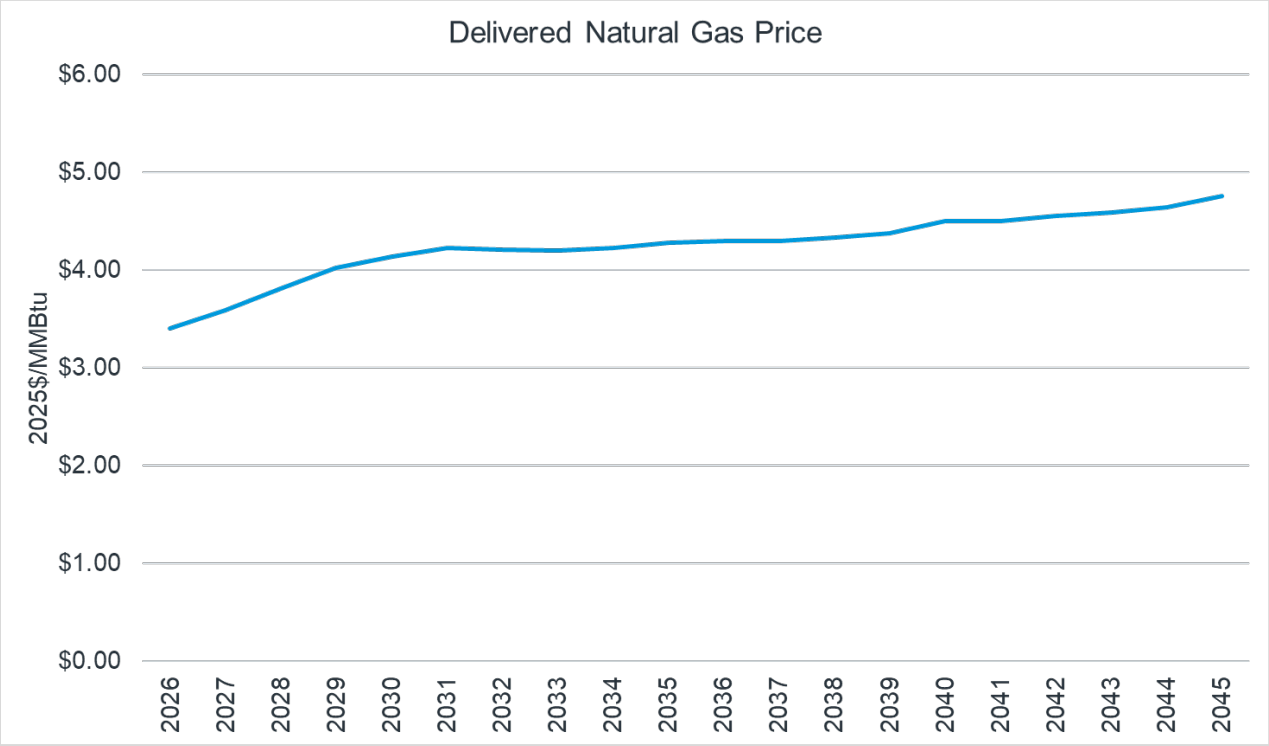
[18] "FERC Rule to Improve Transmission Line Ratings Will Help Lower Transmission Costs". FERC. December 16, 2021. https://www.ferc.gov/news-events/news/ferc-rule-improve-transmission-line-ratings-will-help-lower-transmission-costs

less reliant on a single perspective in the planning process. For natural gas and coal, forecasts from Wood Mackenzie, Hitachi, S&P Global, and EVA were averaged.

3.3.1. Natural Gas

In addition to the sources mentioned above, CEI South utilized NYMEX data to adjust the Henry Hub price based on historical price separation between Henry Hub and delivered gas prices to the CEI South system. Figure 3-13 displays the delivered natural gas price forecast for the Reference Case.

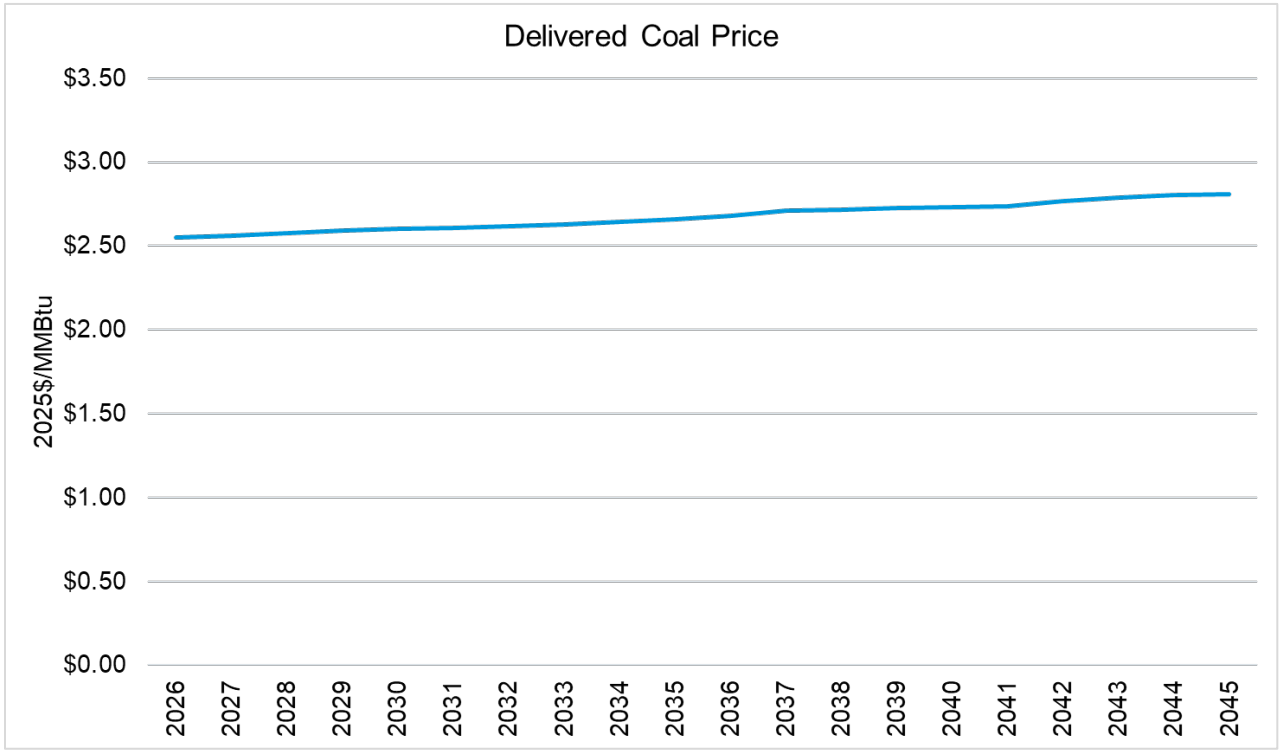
Figure 3-13 – Reference Case Natural Gas Price Forecast (2025$/MMBtu)



3.3.2. Coal

CenterPoint's coal facility is fueled by Indiana-mined coal. Similar to natural gas, a transportation adder based on historical data was included to obtain a price for coal delivered to CEI South. Figure 3-14 displays the consensus coal price forecast for the Reference Case.

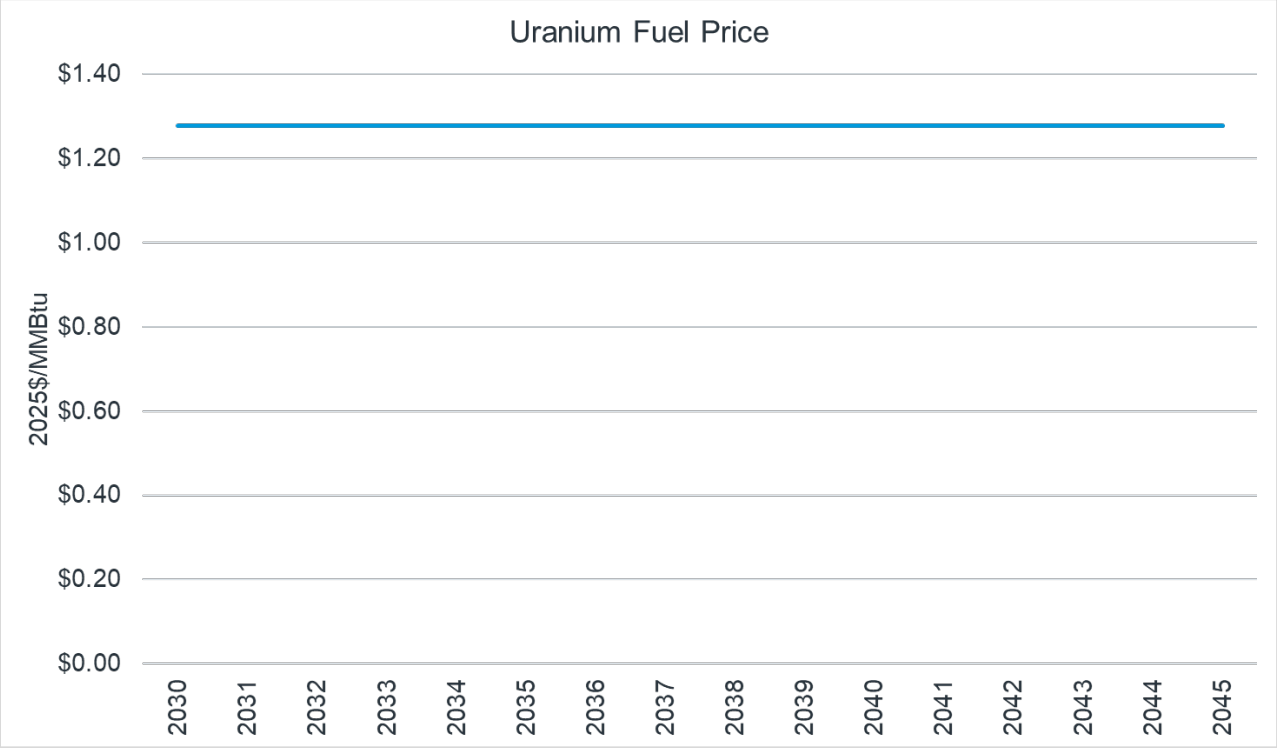
Figure 3-14 – Reference Case Coal Price Forecast (2025$/MMBtu)



3.3.3. Uranium

Nuclear power plants use uranium fuel to produce heat. The uranium price forecast, shown in Figure 3-15, was sourced from the 2024 Annual Technology Baseline published by the NREL[19]. Because uranium is a fuel associated with an emerging technology in NREL's dataset, the forecast begins in 2030 and assumes a constant price throughout the study period.

Figure 3-15 – Reference Case Uranium Price Forecast (2025$/MMBtu)

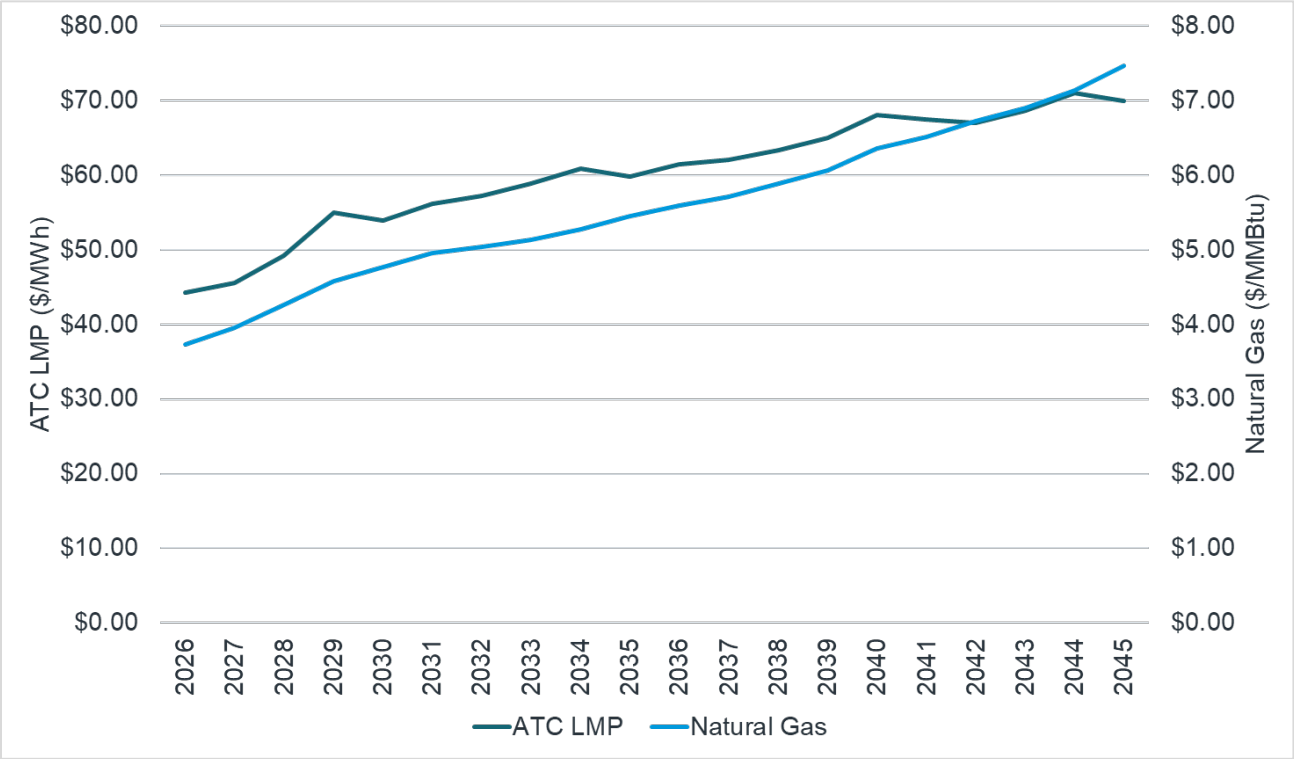


3.4. Power Prices

Energy prices as an input into the IRP model were developed by 1898 & Co. using the EnCompass software. The starting model for the analysis was the national database licensed from Horizons Energy, LLC. Updates to the National Database were made to specifically align the input assumptions with the IRP Scenario assumptions. A summary of around the clock ("ATC") power price forecast can be seen below in Figure 3-16 which also illustrates the macro correlation to natural gas prices over the study period.

[19] The NREL ATB Excel workbook can be found here: https://atb.nrel.gov/electricity/2024/data. Uranium fuel costs were taken from the "Nuclear" tab. The moderate forecast for a small nuclear facility was used.

Figure 3-16 – Reference Case Power Price Forecast (Nominal $)



3.5. Environmental Regulations

The current modeling analysis includes relevant costs primarily focused on evaluation of alternatives to comply with the ELG, 316(b), and ACE rule proxy requirements where applicable. The costs presented below are preliminary screening level estimates used for modeling purposes only. Individual elements of the estimate may go up or down depending on final design specifications, permit requirements, and vendor bids. It should be noted that environmental regulatory requirements represent one of the areas presenting significant uncertainty with respect to the current administration's activities related to regulatory reform and potential future requirements related to greenhouse gas emissions from fossil fuel-fired generating units.

3.5.1. Effluent Limitations Guidelines ("ELG")

F. B. Culley Unit 3 is equipped with dry fly ash and dry bottom ash handling systems, thereby eliminating ash transport water discharges in compliance with the current requirements of the ELG rule. The Spray Dryer Evaporator Zero Liquid Discharge system

has been completed and is online, timely meeting the ELG requirements that are incorporated into the NPDES permit and eliminating the discharge of FGD Wastewater. F.B. Culley Unit 2 still utilizes bottom ash transport water and is slated for retirement on December 31, 2025, in compliance with the requirements of its NPDES permit.

In May 2024, EPA published updated Effluent Limitation Guidelines rule, which contains a provision that requires Zero Liquid Discharge ("ZLD") of unmanaged Combustion Residual Leachate ("CRL") for facilities that do not permanently cease combustion of coal by the end of 2034. This technology is factored into scenarios that include operating Culley Unit 3 on coal past 2034.

3.5.2. Coal Combustion Residuals ("CCRs")

Company continues to close its ash ponds in timely compliance with the requirements of the CCR rule, which was first promulgated in 2015 and has undergone multiple revisions since implementation. The timing of the closures is based on forced closure (i.e., exceedance of Ground Water Protection Standard ("GWPS") and failure of aquifer location restriction) and compliance with the Site-Specific Alternatives to Initiate Closure plans that were submitted to U.S. EPA under the requirements of the CCR Part A rule. The base cost for the closures does not change regardless of future generation and closure cost for CCR units is not part of the IRP modeling.

3.5.3. Greenhouse Gas Regulations

As noted previously, the federal regulation of greenhouse gases is an area of significant uncertainty stemming from years of litigation and continual swings in requirements between federal administrations. In June 2019 the first Trump administration finalized the ACE rule, which replaced the 2015 Clean Power Plan (a cap and trade program which sought to lower CO_2 emissions from existing power plants by 30% from 2005 levels) with a requirement that existing fossil fuel-fired generating units meet certain efficiency targets. This rule was referred to as the Affordable Clean Energy Rule ("ACE"). The ACE rule was repealed and replaced by the Biden administration's New Source Performance Standards for Greenhouse Gas Emissions from New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units which was effective on July 8, 2024 (Biden Rule). The Biden Rule is currently in effect; however, on June 17, 2025, the second Trump administration has proposed revisions to the Biden Rule. The current proposal would rescind greenhouse gas emissions targets as they related to fossil fuel-fired EGUs, or in the alternative declare carbon capture and sequestration technology. We believe it is unlikely that we will cease to have any regulatory requirements applicable to greenhouse gas emissions from fossil fuel-fired generating units, so CEI South used ACE as a proxy for

carbon legislation in the reference case (see Figure 3-17). Since F.B. Culley 2 is planned for suspension in 2025, no ACE costs were included for this unit.

Figure 3-17 – ACE Proxy Cost

Unit	Total ACE Update Cost (2025$)
F.B. Culley 3	$32 Million

3.5.4. 316(b)

In 2014 EPA issued its final rule regarding Section 316(b) of the Clean Water Act which seeks to mitigate impacts to aquatic life from large water intake structures. The rule establishes requirements for Cooling Water Intake Structures ("CWIS") at existing fossil fuel-fired generating facilities and applies to the Culley generating facility which employs a once-through cooling water system. The 316(b) rule requirements are implemented through the facility's NPDES permit. Company is currently in the final stages of finalizing the selected technology and estimated costs for compliance at the Culley facility is included in the current IRP modeling scenarios as appropriate.

3.6. Tax Incentives

3.6.1. Inflation Reduction Act ("IRA") and One Big Beautiful Bill Act ("OBBBA")

The IRA was signed into law by President Biden on August 16, 2022. The $500 billion legislation was intended to mitigate the effects of climate change by offering numerous incentives to promote investment in clean energy production and included tax credits for households to offset energy costs. A substantial portion of the funding was directed toward reshaping the nation's energy infrastructure. Key provisions of the IRA included the extension of wind Production Tax Credits ("PTC"), the allowance of solar production tax credits, the continuance of solar Investment Tax Credits ("ITC"), funding for energy efficiency, the introduction of the ITC for stand-alone battery storage, and incentives for electric vehicle charging.

Vast portions of the IRA were eliminated with the passage of the OBBBA, signed into law on July 4, 2025. The legislation repeals most clean energy provisions and includes eligibility conditions that effectively disqualify clean energy projects that are not shovel-ready. The OBBBA includes a dual-condition eligibility test; a project must begin construction (start physical work or incur at least 5% of total project costs and maintain continuous progress)

within 60 days of the bill's enactment and be placed into service by December 31, 2028. Projects that do not meet these criteria will no longer be eligible for the PTC or ITC. Additionally, the law removes consumer energy incentives for distributed energy adoption after 2025 and repeals electric vehicle tax credits after 2026. Credits for carbon capture and storage, clean fuels credit, and zero emissions nuclear power production credits remain in place.

These updates to the renewable tax credits were incorporated into the modeling assumptions based on the description of the scenarios. In the Reference Case and Alternate Reference Case, solar ITC and wind PTC eligibility expires at the end of 2029, while nuclear and storage resources retain their full credits through 2033, followed by declining values in 2034 and 2035. Figure 3-18 shows the updated tax credits included in the reference and alternate reference case scenarios.

Figure 3-18 – Reference and Alt Reference Scenario Tax Credits

		2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Solar	ITC	30%	30%	30%	30%	30%	0%	0%	0%	0%	0%	0%	0%
Storage	ITC	30%	30%	30%	30%	30%	30%	30%	30%	30%	23%	15%	0%
Wind	PTC	100%	100%	100%	100%	100%	0%	0%	0%	0%	0%	0%	0%
Nuclear	PTC	100%	100%	100%	100%	100%	100%	100%	100%	100%	75%	50%	0%

For the High Regulatory and Alternate High Regulatory worldviews, the previous legislation governing tax credit eligibility was retained. Under these scenarios, solar and storage resources qualify for the full ITC through the end of 2032 and wind resources qualify for full PTC through 2029, with a reduced credit from 2030 through 2032. Figure 3-19 shows the pre-OBBBA tax credits that are included in the High Regulatory and Alternate High Regulatory scenarios.

Figure 3-19 – High Reg and Alt High Reg Scenario Tax Credits

		2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Solar	ITC	30%	30%	30%	30%	30%	30%	30%	30%	0%	0%	0%	0%
Storage	ITC	30%	30%	30%	30%	30%	30%	30%	30%	0%	0%	0%	0%
Wind	PTC	100%	100%	100%	100%	100%	100%	100%	100%	0%	0%	0%	0%

3.7. Resource Options

3.7.1. Current Resource Mix

Thermal generating units are often categorized as either base load, intermediate, or peaking units. This characterization has more to do with the economic dispatch of the units and how much service time they operate rather than unique design characteristics, outside of intermittent renewables, which do not have variable fuel costs. Base load units generally have the lowest energy costs per kWh and tend to operate most of the time, thereby providing the base of the generating supply stack after intermittent renewables, which operate as available and typically unrelated to market prices and conditions. The supply stack is the variable cost of production of power by each generating unit, stacked from least cost to most cost. In general, units that cost less to run are dispatched before units that cost more.

F.B. Culley 3 has historically operated as a base load unit but with low natural gas prices and the introduction of more renewables into the market, capacity factors have decreased. F.B. Culley 3, CEI South's last coal unit that it plans to operate past 2025, more recently has operated more like an intermediate unit, particularly in shoulder months during Spring and Fall seasons. Intermediate units may cycle on and off frequently and may sit idle seasonally. CEI South's current peaking units have relatively high energy costs per kWh and are typically only started when energy demand exceeds 24/7 baseload capacity. Currently, CEI South's small gas turbines, units 3 and 4, are dispatched during these peak periods to assure reliability. These small peaking units may only run for a few hours and remain idle for long periods of time until called on. Most recently, CEI South has added two new combustion turbines and one solar array. These assets will provide necessary support for grid stability following the retirement of A.B. Brown coal units 1 and 2 in 2023.

3.7.1.1. Generation

CEI South's current and expected generation mix consists of approximately 1,807 MW of installed capacity. This capacity currently consists of approximately 360 MW of coal-fired generation from F.B. Culley 2 & 3. Following the suspension of F.B. Culley 2, which is scheduled for the end of 2025, the installed capacity of coal-fired generation in CenterPoint's fleet will drop to 270 MW. CEI South's existing generation also includes 624 MW of gas fired peaking generation, 3 MW of renewable landfill gas generation, 397 MW of wind procured through Power Purchase Agreements ("PPAs"), 391 MW of solar (with 150 of that total coming from PPAs), and a 1.5% ownership share of Ohio Valley Electric Corporation ("OVEC") which equates to approximately 32 MW.

3.7.1.2. Existing Resources

Figure 3-20 references both Installed Capacity ("ICAP") and Seasonal Accredited Capacity ("SAC"). Installed capacity is also referred to as nameplate capacity. Seasonal accredited capacity is the amount of capacity that can be relied upon to meet load during tight operating hours. MISO now uses SAC for planning purposes. The SAC accreditation recognizes all resources are not equally reliable or, in some cases, capable of achieving their design output. MISO uses a three-year operating history and a weather normalized capability verification to determine the SAC accreditation of each unit. CEI South used historical data and MISO's current methodology for thermal units to determine seasonal accreditation values along with the MISO seasonal planning reserve margin requirements (7.9% for summer, 14.9% for fall, 18.4% for winter, and 25.3 in spring[20]) in the current IRP. This information was utilized to help ensure all portfolios met MISO obligations on a seasonal basis.

Figure 3-20 – CEI South's Owned Generating Units (2026/2027 Planning Year)[21]

Unit	Installed Capacity (MW)	Summer - Seasonal Accredited Capacity (SAC - MW)	Fall - SAC (MW)	Winter -SAC (MW)	Spring - SAC (MW)	Primary Fuel	Initial Service Year
F.B. Culley 3	270	181.4	248.8	231.6	269.6	Coal	1973
A.B. Brown 3	80	67.4	72.1	91.7	75.8	Gas	1991
A.B. Brown 4	80	70.5	67.3	89.2	80.3	Gas	2002
A.B. Brown 5	232	209.1	195.1	183.5	195.1	Gas	2025
A.B. Brown 6	232	209.1	195.1	183.5	195.1	Gas	2025
Posey Solar	191	85.0	66.7	48.7	89.2	Sun	2025
Troy Solar	50	22.25	17.5	12.75	23.35	Sun	2021
Blackfoot	3	N/A	N/A	N/A	N/A	Landfill Gas	2009
Oak Hill Solar	2	N/A	N/A	N/A	N/A	Sun	2018
Volkman Rd. Solar	2	N/A	N/A	N/A	N/A	Sun	2018

[20] "Loss of Load Expectation Working Group (LOLEWG)". MISO Energy. October 24, 2024. https://cdn.misoenergy.org/20241024%20LOLEWG%20Item%2003%20PY%202025-2026%20LOLE%20Study%20Results654956.pdf, Slide 2

[21] CEI South plans to place F.B. Culley 2 into suspension by December 31,2025.

3.7.1.2.1. Energy Efficiency

CEI South utilizes a portfolio of Demand Side Management ("DSM") programs to achieve demand reductions and energy savings, thereby providing reliable electric service to its customers. CEI South's DSM programs have been approved by the Commission and implemented pursuant to various IURC orders over the years.

Since 1992, CEI South has operated a Direct Load Control ("DLC") program called Summer Cycler which can reduce residential and small commercial air-conditioning and water heating electricity loads when needed during summer peak hours. A description of the program is included below. While this technology can still be reliably counted on to help lower demand for electricity at times of peak load, this aging technology will be phased out over time. CEI South's Summer Cycler program has served CEI South and its customers well for more than three decades, but more recent technology is now making the program obsolete. Between 2010 and 2024, CEI South's DSM programs reduced demand by approximately 97,000 kW and provided annual incremental gross energy savings of approximately 521,000,000 kWh.

Figure 3-21 below outlines the estimated program penetration on an annual basis since CEI South programs began in 2010. Gross cumulative savings below, are shown as a percent of eligible retail sales. Note that historical DSM savings are implicitly included in the load forecast as these savings are embedded in the historical sales data.

Figure 3-21 – Gross Cumulative Savings[22] [23]

Year	Eligible Retail Sales (GWh)	Gross Cumulative Savings (GWh)	Gross Cumulative Savings (GW)	Percent of Sales Achieved (Cumulative)
2010	5,617	2.53	0.00051	0.04%
2011	5,595	19.40	0.00331	0.35%
2012	5,465	66.95	0.01212	1.23%
2013	5,459	128.64	0.02416	2.36%
2014	3,499	175.98	0.03215	5.03%
2015	3,224	202.82	0.03698	6.29%
2016	3,256	236.40	0.04222	7.26%
2017	3,281	268.86	0.04861	8.20%
2018	3,491	309.28	0.05624	8.86%

[22] Gross Cumulative Savings are adjusted for Residential Behavioral, which has a one-year program life therefore not cumulative in nature.
[23] Statewide DSM programs ended in 2013. The drop in eligible sales is attributed to industrial customers opting out of DSM programs effective July 1, 2014.

Year	Eligible Retail Sales (GWh)	Gross Cumulative Savings (GWh)	Gross Cumulative Savings (GW)	Percent of Sales Achieved (Cumulative)
2019	3,135	352.76	0.06455	11.25%
2020	3,176	398.16	0.07411	12.54%
2021	3,174	428.56	0.08102	13.50%
2022	3,209	454.79	0.08638	14.17%
2023	3,265	490.01	0.09265	15.01%
2024	3,285	521.50	0.09717	15.87%

3.7.1.2.1.1.1. 2025-2027 Plan Overview

Consistent with the 2022/2023 IRP, the framework for the 2025-2027 EE Plan was modeled at a savings level of 1.1% of retail sales adjusted for an opt-out rate of 77% of eligible load. Below is a listing of residential, as well as commercial and industrial programs offered in 2025-2027. For full program descriptions including the customer class, end use of each program and participant incentives provided by the programs, please refer to the 2025-2027 EE Plan detail found in the *Technical Appendix Attachment 3.4 CEIS Electric 2025-2027 DSM Plan*.

Residential Programs

- Residential Prescriptive
- Residential Midstream
- Home Energy Assessment
- In Store Discount
- Multi Family Energy Solutions
- Community Connections
- Residential New Construction
- Income Qualified Weatherization
- Energy Efficiency Store (Marketplace)
- Residential Behavior Savings
- Smart Cycle (“DLC Change Out”)
- Bring Your Own Thermostat (“BYOT”)
- Conservation Voltage Reduction (“CVR”) Residential

Commercial and Industrial Programs

- Commercial and Industrial Prescriptive
- Commercial and Industrial Midstream
- Commercial and Industrial Custom

- Small Business Energy Solutions
- Building Optimization
- Conservation Voltage Reduction ("CVR") Commercial

The 2025-2027 plan was included as an existing resource in the 2025 IRP and has an assumed average measure life of 13 years. The table below shows the amount of net savings included in the IRP as a resource (gross savings can be found in *Technical Appendix Attachment 3.4 CEIS Electric 2025-2027 DSM Plan*).

Figure 3-22 – Energy Efficiency Savings[24]

	2025		2026		2027	
Sector	Net kWH Energy Savings	Net kW Demand Savings	Net kWH Energy Savings	Net kW Demand Savings	Net =kWH Energy Savings	Net kW Demand Savings
Residential	13,259,256	7,818	14,814,287	8,854	14,732,977	7,874
C&I	19,224,000	2,528	21,344,251	2,982	21,570,750	2,757
Total	**32,483,256**	**10,345**	**36,158,538**	**11,836**	**36,303,727**	**10,631**

3.7.1.3. Demand Response

CEI South's tariff currently includes five Demand Response ("DR") programs:

- Direct Load Control Rider ("DLC"),
- Thermostat Load Control Rider ("TLC"),
- Two interruptible options for larger customers (Interruptible Contract Rider and Interruptible Option Rider),
- Aggregation Demand Response Rider ("ADR") and
- MISO Demand Response Rider.

Demand response programs allow CEI South to curtail load for reliability purposes. CEI South's MISO DR tariff and interruptible tariffs have no customers currently enrolled and registered with MISO. CEI South has recently contracted a third-party DR aggregator from the All-Source RFP to begin a DR aggregation program based on CEI South's customer load and industry demographics.

[24] Gross Cumulative Savings are adjusted for Residential Behavioral, which has a one-year program life therefore not cumulative in nature.

3.7.1.3.1. Current DLC (SUMMER CYCLER)

The DLC program provides remote dispatch control for residential and small commercial air conditioning, and electric water heating through radio-controlled load management receivers. Under the program, CEI South compensates customers in exchange for the right to initiate events to reduce air-conditioning and water-heating electric loads during summer peak hours. CEI South can initiate a load control event for several reasons, including to balance utility system supply and demand, to alleviate transmission or distribution constraints, or to respond to load curtailment requests from MISO.

CEI South manages the program internally and utilizes outside vendors for support services, including equipment installation and maintenance. Prospective goals for the program consist of maintaining load reduction capability and program participation while achieving high customer satisfaction. CEI South also utilizes an outside vendor, The Cadmus Group, to evaluate the DLC program and provide unbiased demand and energy savings estimates.

In 2024, Cadmus predicted that the DLC Program was capable of generating approximately 8 MWs of peak demand savings from residential air-conditioning load control and residential water heating load control during MISO load curtailment events during the summer season. This figure will continue to decrease over time with the increasing occurrence of switch failures.

Until recently, DLC switches have been the default choice for residential load control programs. CEI South has had a DLC program since the early 1990's and as of 2024 had approximately 16,000 residential customers with 22,250 switches participating in the program. However, with the advent of smart thermostats and the myriad of benefits they offer for both EE and DR, CEI South has begun replacing DLC switches with smart thermostats, and the DLC program is closed to new customers as of February 13, 2025.

3.7.1.3.2. Current Interruptible Load

CEI South makes available a credit for qualified commercial and industrial customers to curtail demand under certain conditions. CEI South previously had three customers who were participating for a total demand reduction of approximately 31 MW. MISO issued a curtailment on June 10, 2021. CEI South's largest interruptible customer at approximately 30 MW elected to no longer participate in the interruptible tariff after the event. CEI South worked with stakeholders to help update its interruptible tariffs to streamline language, open them up to a wider number of potential participants, and bring in line with MISO's on-going updates to the Load Modifying Resource ("LMR") rules to derisk this segment of resources. CEI South requested and received approval from the Commission to update these tariffs

accordingly in its most recent rate case in Cause No. 45990. Even with these updates, CEI South still has no customers on the tariff registered as a resource with MISO. See section 3.7.1.3.4 for more information on how CEI South is working to partner with customers to maximize its demand response potential with this segment of C&I customers.

3.7.1.3.3. SMART THERMOSTATS

CEI South launched its pilot Smart Wi-Fi Thermostat program in 2016, by installing 2,000 smart Wi-Fi enabled thermostats in homes in its service territory. As an alternative to DLC switches, smart thermostats can optimize heating and cooling of a home to reduce energy usage and control load while learning from occupant behavior/preference, adjusting Heating, Ventilation and Air Conditioning ("HVAC") settings. Evaluation results are showing significantly more load reduction delivered by smart thermostats than DLC switches. As such, CEI South has designed a program to replace switches with smart Wi-Fi thermostats, a strategic option for cost-effective load control. The Smart DLC Change-out program focuses on residential single-family homes and apartment dwellers. By installing connected devices in customer homes rather than using one-way signal switches, CEI South will be able to provide its customer base deeper energy savings opportunities and shift future energy focus to customer engagement. This change-out program is reflected in IRP modeling.

CEI South also launched the Bring your Own Thermostat program as a DR program. The BYOT program is a further expansion of the Residential Smart/Wi-Fi thermostat initiative. The 2025-2027 Plan provides for approximately 1,430 kW demand each year from the BYOT program based on approximately 1,300 participants each year. BYOT allows customers who have or will purchase their own device from multiple potential vendors to participate in the Thermostat Load Control program. By taking advantage of two-way communicating smart/Wi-Fi thermostats, BYOT programs can help utilities reduce acquisition costs for load curtailment programs and improve customer satisfaction. BYOT allows the utility to avoid the costs of hardware, installation and maintenance associated with transitioning to a smart thermostat. Through the use of smart/Wi-Fi enabled thermostats, the utility can remotely verify how many customers are connected to the network at any given time and determine which thermostats are participating in DR events. Smart thermostat DR programs provide approximately 1 kW per thermostat in load reductions during a DR event.

3.7.1.3.4. Aggregation Demand Response

CEI South received approval to launch the Aggregation Demand Response program in Cause No. 45590. CEI South recently executed a contract with a third-party aggregator for C&I customers which allows the third-party aggregator to provide customers with a

customized energy reduction plan specific to customer's needs based on customer type, such as the following: commercial office building, public school systems, and manufacturing. Aggregators often have the metering and controls technology to allow customers to see and manage their load reduction in real time.

CEI South has included 12 MWs in 2026 ramping up to 25 MWs in 2027 through 2045 based on a market potential analysis during the bidding process. CEI South is one of the first utilities to offer a new Aggregation program in Indiana within approximately the last 10 years. CEI South put this program in place in recognition of stakeholder interest, providing more optionality for C&I customers than CEI South alone can provide.

Aggregation provides long-term affordability by allowing participating customers to earn payments, improve resilience by allowing customers to receive advance notification of grid stability issues, protecting facilities from potential power outages, and supporting the community by helping to maintain reliable, low-cost energy. Aggregation allows for energy industry experts to work with customers to define strategies that leverage existing assets, manage enrollment and execution, and helps maximize revenue for participants.

3.7.2. Potential Future Resource Options

CEI South evaluated a broad range of supply-side technologies, including natural gas, renewable energy, storage technologies, and advanced nuclear. Operational inputs for all supply-side resources were developed from the technology assessment conducted by 1898 & Co., while capital costs were primarily sourced from CEI South's 2024 All-Source RFP results to reflect current market conditions. Where RFP data was not available, capital costs from the technology assessment were used, unless otherwise noted. Detailed information for the All-Source RFP and the technology assessment can be found in *Technical Appendix Attachments 2.1* and *2.2 (Confidential)*, respectively.

The following section details supply-side resource options including conversion opportunities at existing sites, followed by new natural gas, renewables, advanced nuclear, and storage technologies. Then, demand-side resources are outlined including Energy Efficiency and Demand Response programs. Finally, innovative rate designs are also considered.

3.7.2.1. Existing Site Conversions

CEI South evaluated two existing sites, F.B. Culley 3, and A.B. Brown 5 and 6, for potential conversion of existing units to provide additional capacity and energy to meet system needs. F.B. Culley 2 interconnection replacement was also explored in this IRP.

F.B. Culley 2:

At the F.B. Culley 2 site, three power generation technologies were evaluated: reciprocating engines, aeroderivative engines, and storage. The option to let the interconnection agreement at F.B. Culley 2 expire without reuse was also considered. The three resource types were selected based on available space at the site, available infrastructure, regulations on timing of a replacement resource, and CEI South's system needs. Operational parameters of all stated resource options, as well as the capital costs of the natural gas resources, were sourced from the technology assessment. The capital investment of a storage resource at the F.B. Culley 2 site was informed by the 2024 All Source RFP. The gas transportation costs included in all existing site conversions are for firm gas supply and were informed by vendor and internal estimates. Additional detail surrounding gas transportation costs is given in the *Technical Appendix Attachment 3.5 Gas Pipeline Cost Estimates (Confidential)*. Figure 3-23 displays the operational and financial parameters for these potential resources.

Figure 3-23 – F.B. Culley 2 Potential Future Resource Options

Operating Characteristics and Estimated Costs	Reciprocating Engines	Aeroderivative Engines	Storage
Technology Description	Five 18-MW Engines	Two 50 MW Engines	4-Hour Lithium-Ion Storage
Base Load Net Output (MW)	91.5	104.4	90
Base Load Heat Rate (HHV Btu/MWh)	8,340	9,310	N/A
Capital Expenditures (2025$/kW)	$2,650	$3,440	$1,573
Fixed O&M (2025$MM/year)	$2.6	$3.2	$3.2
Gas Transportation Costs (2025$MM/yr)	$10.2	$9.6	N/A
Variable O&M (2025$/MWh)	$4.0	$0.90	N/A

F.B. Culley 3:

At the F.B. Culley 3 site, CEI South analyzed three potential operating pathways for the existing coal plant: continue operating on coal until retirement, convert to operating on natural gas, or co-fire with 40% natural gas. For the first two options, multiple implementation dates were studied. Potential retirement dates for F.B. Culley 3 included December 31, 2031, December 31, 2034, and beyond the planning horizon of this IRP. For conversion to natural gas, start dates of January 1, 2030 and January 1, 2035 were analyzed. Portfolios that included unit conversion also assumed a four-month outage prior to the conversion to allow for necessary construction. The co-fire pathway was modeled with only a single implementation date, primarily driven by the former Clean Air Act 111(d) rule. This includes beginning co-fire operation on January 1, 2030, followed by unit retiring by the end of 2038. These pathways are described in Figure 3-24. Converting F.B. Culley

3 to natural gas will likely result in the unit operating at a lower capacity factor compared to its current coal-fired operation, more similar to that of a peaking resource. The capital costs for this option were developed using vendor estimates, historical data, and internal calculations.

Figure 3-24 – F.B. Culley 3 Potential Future Resource Options

Operating Characteristics and Estimated Costs	Operate on Coal	Conversion to Natural Gas	Convert to Co-Fire
Description of Available Options	• Continue through 2045 • Retire on 12/31/2031 • Retire on 12/31/2034	• Start Gas Fired operation on 1/1/2030 • Start Gas Fired operation on 1/1/2035	• Start Co-Firing operation on 1/1/2030, followed by unit retirement on 12/31/2038
Base Load Net Output (MW)	270	270	270
Base Load Heat Rate (HHV Btu/MWh)	10,560	10,560	10,560
Gas Transportation Costs (2025$MM/yr)	N/A	$15.5MM	$8.9MM

A.B. Brown:

At the A.B. Brown site, the simple cycle gas turbines ("SCGT") placed in service in 2025 (A.B. Brown Units 5 and 6) were evaluated for conversion to a 2x1 combined cycle gas turbine (CCGT), which would improve thermal efficiency, increase generation capacity, and transition the primary use of the facility to be a baseload resource. In this configuration, the exhaust heat from each existing combustion turbine would be captured by a Heat Recovery Steam Generator ("HRSG") which converts the waste heat into steam. This steam then drives a steam turbine generator to produce additional electricity without additional fuel input. Furthermore, this combined cycle configuration was investigated with and without duct firing. In the duct-fired CCGT, natural gas burners are installed in the HRSG to inject supplemental fuel directly into the exhaust steam, raising the temperature and causing the production of more steam. This design provides approximately 150 MW of additional output compared to the non-duct fired configuration. Both options were included to evaluate the tradeoff between increased output and higher capital investments, fuel usage and slightly lower efficiency when operated in this mode. Two implementation dates were considered for this conversion, with the unit being fully operational as a combined cycle at the start of 2030 or 2034. Figure 3-25 depicts the operational and financial parameters of this option.

Figure 3-25 – A.B. Brown Potential Future Conversion Options

Operating Characteristics and Estimated Costs	2x1 F Class SCGT to CCGT Conversion, Unfired	2x1 F Class SCGT to CCGT Conversion, Fired
Base Load Net Output (MW)	735	734
Base Load Heat Rate (HHV Btu/MWh)	6,430	6,440
Duct Fired Net Output (MW)	N/A	893
Duct Fired Heat Rate (HHV Btu/MWh)	N/A	6,830
Capital Expenditures (2025$/kW)	$1,050	$950
Fixed O&M (2025$MM/yr)	$6.2	$6.2
Gas Transportation Costs (2025$MM/yr)	$37.7	$37.7
Variable O&M (2025$/MWh)	$1.5	$1.5

3.7.2.2. Natural Gas

Natural gas power plants are characterized by igniting natural gas and transforming the heat generated from combustion into electrical energy. In addition to the natural gas projects at existing sites, CEI South evaluated a wide range of natural gas technologies including peaking resources such as simple-cycle turbines and reciprocating engines, and intermediate and baseload options such as combined cycle units. This wide range of available natural gas-powered alternatives allow for the evaluation of the tradeoffs between cost effectiveness, reliability, and environmental sustainability.

3.7.2.3. Simple Cycle Gas Turbines

SCGTs utilize natural gas to produce power. The gas turbine (Brayton) cycle is one of the most efficient cycles for the conversion of gaseous fuels to mechanical power or electricity. Typically, SCGTs are used for peaking power due to fast load ramp rates, higher heat rates compared to other technologies and relatively low capital costs. See Figure 3-26 for further details on the simple cycle gas turbine technologies evaluated.

To aid in the evaluation of SCGT, technology estimates were developed to represent the natural gas pipeline costs to supply firm gas service to the unit. An average pipeline cost (in dollar per MW) was developed from the F.B. Culley and A.B. Brown site estimates and then applied to the maximum capacity of all evaluated generic thermal resources. More detail on the estimated gas transportation costs is given in the *Technical Appendix Attachment 3.5 Gas Pipeline Cost Estimate (Confidential)*.

Figure 3-26 – Simple Cycle Gas Turbine Technologies

Operating Characteristics and Estimated Costs	1xF-Class SCGT	1xJ-Class SCGT
Base Load Net Output (MW)	235	426.4
Base Load Net Heat Rate (HHV Btu/kWh)	9,930	8,940
Base Project Costs (2025$/kW)	$1,520	$1,190
Fixed O&M Costs (2025$MM/year)	$2.5	$2.6
Gas Transportation Costs (2025$MM/year)	$17.7	$32.2
Variable O&M (2025$/MWh)	$0.9	$1.2

3.7.2.4. Combined Cycle Gas Turbines

CCGTs utilize natural gas to produce power in a gas turbine which can be converted to electric power by a coupled generator and to also use the hot exhaust gases from the gas turbine to produce steam in a HRSG. This steam is then used to drive the steam turbine and generator to produce electric power. Using both gas and steam turbine (Brayton and Rankine) cycles in a single plant results in high conversion efficiencies and low emissions. Additionally, natural gas can be fired in the HRSG to produce additional steam and associated output for peaking load, a process commonly referred to as duct firing.

For this assessment, seven different configurations were evaluated: a 1x1 F class (unfired and fired), 2x1 G/H class (unfired and fired), 1x1 J class (unfired), and 2x1 J class (unfired and fired), as shown in Figure 3-27 and Figure 3-28. A 1x1 CCGT is configured with one gas turbine and one steam turbine where a 2x1 CCGT is configured with two gas turbines and one steam turbine. General Electric (“GE”) turbines were used as representative CCGT technologies for the operational and financial parameters. The F class is based on the GE 7FA.05 turbine, the J class is based on the GE 7HA.03, and the G/H class is based on the GE 7HA.01 turbine.

Figure 3-27 – Combined Cycle Gas Turbine Technologies (Unfired Configuration)

Combined Cycle Gas Turbines - Unfired				
Operating Characteristics and Estimated Costs	**1x1 F-Class**	**2x1 G/H-Class**	**1x1 J-Class**	**2x1 J-Class**
Base Load Net Output (MW)	366	848	620	1,254
Base Load Net Heat Rate (HHV Btu/kWh)	6,470	6,260	6,150	6,080
Base Project Costs (2025$/Unfired kW)	$2,271	$1,961	$2,039	$1,695
Fixed O&M Costs (2025$MM/year)	$5.9	$6.7	$6.1	$6.8
Gas Transportation Costs (2025$MM/year)	$27.5	$63.9	$46.7	$94.6
Variable O&M (2025$/MWh)	$1.6	$1.6	$1.6	$1.5

Figure 3-28 – Combined Cycle Gas Turbine Technologies (Fired Configuration)

Combined Cycle Gas Turbines - Fired			
Operating Characteristics and Estimated Costs	**1x1 F-Class**	**2x1 G/H-Class**	**2x1 J-Class**
Base Load Net Output (MW)	365	847	1,244
Total Duct-Fired (Peaking) Net Output (MW)	445	1,034	1,454
Base Load Net Heat Rate (HHV Btu/kWh)	6,490	6,260	6,120
Total Duct-Fired Heat Rate (HHV Btu/kWh)	6,843	6,682	6,569
Base Project Costs (2025$/Fired kW)	$2,518	$2,070	$1,808
Fixed O&M Costs (2025$MM/year)	$5.9	$6.7	$6.8
Gas Transportation Costs ($MM/year)	$33.5	$78.0	$109.7
Variable O&M ($/MWh)	$1.6	$1.6	$1.5

3.7.2.5. Aeroderivative and Reciprocating Engines

Aeroderivative and reciprocating internal combustion engines represent smaller-scale, highly flexible natural gas technologies. Aeroderivative turbines are adapted from jet engine technology, while reciprocating engines are most technologically similar to the engine found in a car. These technologies are well-suited to provide peaking and balancing services during periods of system stress or low renewable output. Both engine types have smaller unit sizes, fast start-up times, and strong operational flexibility when compared to large heavy-frame gas plants. Figure 3-29 explains the operating and financial characteristics of these natural gas units.

Figure 3-29 – Aeroderivative and Reciprocating Engines

Operating Characteristics and Estimated Costs	Aeroderivative Engines	Reciprocating Engines
Base Load Net Output (MW)	52 MW (single engine)	110 MW (six 18-MW engines)
Base Load Net Heat Rate (HHV Btu/kWh)	9,310	8,340
Base Project Costs (2025$/kW)	$3,440	$2,650
Fixed O&M Costs (2025$MM/year)	$2.1	$3.1
Gas Transportation Costs (2025$MM/year)	$3.9	$8.3
Variable O&M ($/MWh)	$0.90	$4.0

3.7.2.6. Renewables

Three renewable technologies were evaluated in the IRP. Those technologies were wind energy, solar photovoltaic ("PV"), and hydroelectric. Our base assumptions for renewable tax credits reflect the updates specified in the OBBBA, including the end of solar and wind tax credits by 2030. Wind resources were modeled to include Production Tax Credits, while solar resources included discounts for the Investment Tax Credit. Under the IRA solar resources have the option to choose between the investment tax credit and the production tax credit. Based on the assumed capacity factor of solar resources, the investment tax credits are anticipated to provide more value and therefore were used in the model.

3.7.2.6.1. Wind

Wind turbines convert the kinetic energy of wind into mechanical energy. Typically, wind turbines are used to pump water or generate electrical energy which is supplied to the grid. See Figure 3-30 for further details on wind technologies evaluated. Aside from the hybrid storage price, the following assumptions were based on the 1898 & Co. technology assessment.

Figure 3-30 – Wind Technologies

Operating Characteristics and Estimated Costs	Wind	Wind + 4-Hour Storage
Base Load Net Output (MW) + (MW for Storage)	200	200 + 100
Base Project Costs (2025$/kW) + ($/kW for Storage)	$2,194	$2,194 + $1,436
Fixed O&M Costs (2025$MM/year)[25]	$10.5	$10.5 + $3.3
Annual Capacity Factor	37%	37%

[25] Variable O&M costs are included in the Fixed O&M estimate in this table.

3.7.2.6.2. Solar

The conversion of solar radiation to useful energy, in the form of electricity, is a relatively mature concept with extensive commercial experience that is continually developing into a diverse mix of technological designs. Solar conversion technology is generally grouped into solar PV technology, which directly converts sunlight to electricity due to the electrical properties of the materials comprising the cell.

PV cells consist of a base material (most commonly silicon), which is manufactured into thin slices and then layered with positively and negatively charged materials. At the junction of these oppositely charged materials, a "depletion" layer forms. When sunlight strikes the cell, the separation of charged particles generates an electric field that forces current to flow from the negative material to the positive material. This flow of current is captured via wiring connected to an electrode array on one side of the cell and an aluminum back-plate on the other. See Figure 3-31 for further details on the solar PV technologies evaluated. Base project costs are informed by the 2024 All Source RFP data where available. Where current market pricing was not available, the technology assessment provided a starting point for cost estimates, which was then tailored to current market conditions as seen in the 2024 All Source RFP.

Figure 3-31 – Solar Technologies

Operating Characteristics and Estimated Costs	10 MW Solar PV	100 MW Solar PV	100 MW Solar PV + 4-Hour Storage
Base Load Net Output (MW) + (MW for Storage)	10	100	100 + 50
Base Project Costs (2025$/kW) + (2025$/kW for Storage)	$2,560	$2,351	$2,504 + $1,626
Fixed O&M Costs (2025$MM/year)[26]	$0.1	$1.2	$1.2 + $1.8

3.7.2.6.3. Hydroelectric

Low-head hydroelectric power generation facilities are designed to produce electricity by utilizing water resources with low pressure differences, typically less than 5 feet head but up to 130 feet. This allows the technology to be implemented with a smaller impact to wildlife and environmental surroundings than conventional hydropower. However, power supply is dependent on water supply flow and quality, which are sensitive to adverse environmental conditions like dense vegetation or algae growth, sediment levels and drought. Additionally, low-head hydropower is relatively new and undeveloped, thus resulting in a high capital cost for the relatively small generation output. See Figure 3-32 for further details on the hydroelectric technology evaluated.

[26] Variable O&M costs are included in the Fixed O&M estimate.

Data from a U.S. Army Corps of Engineers report was used to determine the economically feasible output from the Newburgh and John T. Myers dams located locally on the Ohio River. This report showed that, when taking economics into consideration, both dams combined had an average potential output near 50 MW, which was consistent with tech assessment data used in the analysis. A separate publication from the U.S Army Corps of Engineers showed the estimated construction cost of the Cannelton facility was very close to the assumptions used in the analysis.

Figure 3-32 – Hydroelectric Technologies

Operating Characteristics and Estimated Costs	John T. Myers	Newburgh
Base Load Net Output (MW)	36	22
Base Project Costs (2025$/kW)	$6,901	$6,901
Fixed O&M Costs (2025$MM/year)	$3.8	$2.3

3.7.2.7. Storage

In addition to storage resources paired with renewable technologies, standalone storage was evaluated in this IRP. Short duration Lithium-Ion batteries as well as more nascent long duration technologies were considered. These are summarized in Figure 3-33 and Figure 3-34.

Lithium-ion technology represents a significant majority of utility scale, stationary energy storage projects being developed and installed in the current market. It is the most commercially and technically mature battery storage solution in today's market and is commonly the most cost-effective option for grid-scale applications/use cases with a 1-4 hour discharge duration at rated power. Cost and performance information for these resources are informed by the 2024 All-Source RFP where data was available. Where current market pricing was not available, the technology assessment provided a starting point for cost estimates, which was then tailored to current market conditions as seen in the 2024 All Source RFP.

In effort to consider a wide range of resources, additional emerging energy storage options were also considered as long duration (>4 hours) storage. There are numerous technologies of varying commercial and technical maturity, and while CEI South recognizes the desire for technology diversity, two representative technologies were selected to represent the broader category of long duration energy storage ("LDES"). Compressed Air Energy Storage ("CAES") is a maturing technology that is suitable for large, utility scale projects. While CAES will be limited in implementation depending on

certain geologic characteristics, it generally represents the lower end of today's LDES capital cost range and is therefore a representative technology for resource planning. Additionally, following requests from stakeholders, iron-air energy storage technology was also included in this analysis. The cost and performance estimates for the 100 MW/ 100 Hour storage technology is shown in Figure 3-34.

Figure 3-33 – Lithium-Ion Energy Storage

Operating Characteristics and Estimated Costs	Lithium Ion 50 MW / 200 MWh	Lithium Ion 100 MW /400 MWh	Lithium Ion 100 MW /800 MWh
Base Load Net Output (MW)	50	500	100
Storage Duration (hours)	4	4	8
Round-Trip Cycle Efficiency	85%	85%	85%
Base Project Costs (2025$/kW)	$2,461	$2,273	$4,067
Fixed O&M Costs (2025$MM/year)[27]	$2.0	$3.5	$6.3

Figure 3-34 – Emerging Energy Storage Technologies

Operating Characteristics and Estimated Costs	Compressed Air Representative Technology	Iron Air Representative Technology
Base Load Net Output (MW)	100	100
Storage Duration (hours)	10	100
Round-Trip Cycle Efficiency	68%	34%
Base Project Costs (2025$/kW)	$5,020	$2,840
Fixed O&M Costs (2025$MM/year)[27]	$4.2	$5.0

3.7.2.8. Advanced Nuclear

Nuclear power generation technology has been a dependable, carbon-free power resource in the United States for many decades. In a nuclear power plant, nuclear fission, or the splitting of atoms, occurs. This process creates heat energy which is used to generate steam and spin a turbine, which in turn produces electricity. The nuclear technology considered in this evaluation is a small modular reactor ("SMR") design, which is characterized by compact reactor modules that can be deployed individually or in groups to match system needs. The design incorporates passive safety systems, simplified plant configurations, and high thermal efficiency, which enable lower operating costs and enhanced safety as compared to traditional nuclear generators. The assumed economic and operational data can be found in Figure 3-35.

[27] Variable O&M costs are included in the Fixed O&M estimate.

Although commercial SMR projects are still under development, evaluating a nuclear option provides insight into potential long-term strategies for reliable, sustainable power generation. In the near-term, CEI South views the technology as a future-facing resource rather than a near-term build candidate. For the purposes of this IRP, it is assumed that 2035 is the earliest possible in-service date for this technology.

Figure 3-35 – Advanced Nuclear Technology

Operating Characteristics and Estimated Costs	Nuclear
Base Load Net Output (MW)	100
Base Load Net Heat Rate (HHV Btu/kWh)	11,580
Base Project Costs (2025$/kW)	$15,812
Fixed O&M Costs (2025$MM/year)	$21.6MM
Variable O&M Costs (2025$/MWh)	$2.8

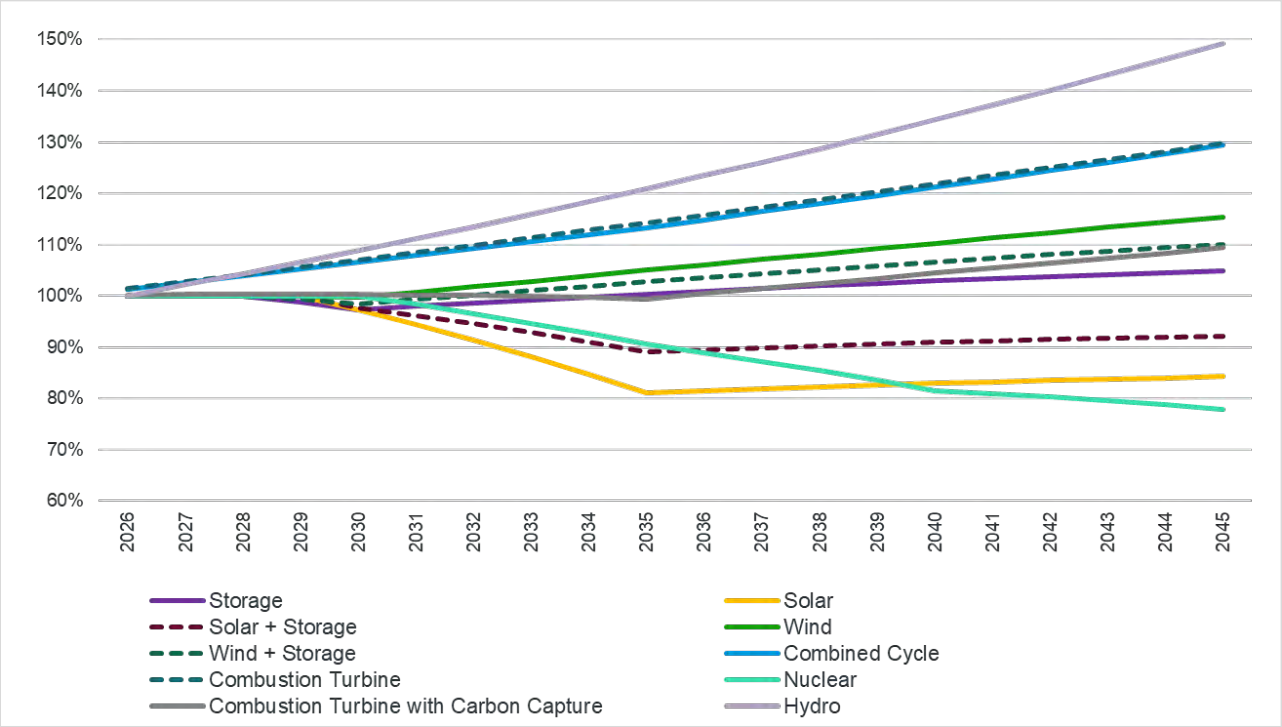
3.7.2.9. Cost Curve Discussion

Forward looking capital cost forecasts were developed and used as part of the 2025 IRP process. Capital cost curves vary based on the generation technology, as shown in Figure 3-36.

Technologies whose capital costs do not decline significantly over the IRP time period, such as wind, natural gas, and coal are generally more mature, while technologies such as advanced nuclear, solar, and hybrid solar plus storage are less mature and expected to experience larger reductions in capital cost over the IRP time period. In the next 20 years, new technological developments and increasing efficiencies for nuclear, solar, and hybrid solar plus storage are expected to decrease capital costs over time. Due to uncertainty associated with these less mature technologies, CEI South relied upon information collected as part of the 2024 All Source RFP as well as cost curves provided by the NREL in their 2024 Annual Technology Baseline ("ATB") Workbook[28] to help project capital costs over the study period.

[28] The NREL ATB Excel workbook can be found here: https://atb.nrel.gov/electricity/2024/data. Capital cost curves were pulled from the "CAPEX ($/kW)" of each included technology.

Figure 3-36 – Forward Looking Capital Cost Curves– Forward Looking Capital Cost Curves



3.7.2.10. Energy Efficiency

In developing a resource plan that integrates demand side and supply side resources, it is incumbent for the energy company to provide the integrating process with a set of DSM options that can be incorporated into the plan. This process aligns with IURC's Rule 170 IAC 4-7-6(b) which states:

> "In describing possible alternative methods of meeting future demand for electric service, a utility must analyze the following resources as alternatives in meeting future electric service requirements:
> (1) Rate design as a resource in meeting future electric service requirements.
> (2) Demand-side resources. For potential demand-side resources, the utility shall include the following:
> (A) A description of the potential demand-side resource, including its costs, characteristics, and parameters.
> (B) The method by which the costs, characteristics, and other parameters of the demand-side resource are determined.
> (C) The customer class or end-use, or both, affected by the demand-side resource.

(D) Estimated annual and lifetime energy (kWh) and demand (kW) savings.
(E) The estimated impact of a demand-side resource on the utility's load, generating capacity, and transmission and distribution requirements.
(F) Whether the program provides an opportunity for all ratepayers to participate, including low-income residential ratepayers."

In addition, this process aligns with IAC 8-1-1.5-3 which requires energy efficiency goals be consistent with an electricity supplier's IRP. Taken together, these jointly supportive requirements direct the energy company to study, similar to supply side resources, available DSM options that may be chosen by the IRP analytical process in arriving at a resource plan. In other words, the level of DSM to be pursued by the energy company should be determined through the IRP process.

3.7.2.10.1. DSM Market Potential Study

The first step in the process is a Market Potential Study ("MPS"). A key purpose of an energy efficiency MPS is to provide energy efficiency planners, decision makers and interested stakeholders with a roadmap to the best opportunities for energy efficiency savings opportunities in the residential, commercial and industrial customer classes. "Energy efficiency potential studies are an effective tool for building the policy case for energy efficiency, evaluating efficiency as an alternative to supply side resources and formulating detailed program design plans. They are typically the first step taken by entities interested in initiating or expanding a portfolio of efficiency programs and serve as the analytic basis for efforts to treat energy efficiency as a high-priority resource equivalent with supply-side options."[29] The results of a potential study pinpoint the energy efficiency measures having the greatest potential for energy savings and identifies the measures that are the most cost effective. Program administrators, regulators and stakeholders can use the results of potential studies to determine the types of programs that should be implemented and how much to invest in energy efficiency as a resource. Potential studies also provide useful information on the benefits and costs of energy efficiency measures and programs from various viewpoints: societally, all customers, the program administrator, program participants and utility rates.

CEI South's MPS completed in 2025 was utilized to both to inform the IRP and support the development of a DSM Action Plan for CEI South, see *Technical Appendix Attachment 3.6 2025 DSM Market Potential Study*. The study included a comprehensive review of current

[29] "Guide for Conducting Energy Efficiency Potential Studies"; Prepared by Philip Mosenthal and Jeffrey Loiter, Optimal Energy, Inc.; https://www.epa.gov/sites/production/files/2015-08/documents/potential_guide_0.pdf ; November 2017; page ES-1

programs, historical savings and projected energy savings opportunities to develop estimates of technical, economic and achievable potential. The study leveraged new primary market research from the *Technical Appendix Attachment 3.7 CEIS 2025 Residential Energy Efficiency Baseline Survey* in the CEI South service area for the saturation of energy-using equipment, building characteristics and the percent of energy using equipment that is already high efficiency. New primary market research from the 2025 study was also leveraged to estimate customer willingness to participate in energy efficiency programs at different incentives levels and targeted end-uses.

Technical potential is the maximum energy efficiency available, assuming cost and market adoption of a technology are not a barrier. Economic potential is the subset of technical potential that is cost effective, meaning the economic benefit outweighs the cost. The economic potential is measured by the total resource cost test, which compares the lifetime energy and capacity benefits to the incremental cost of the energy efficiency measure. While some may contend the full technical or economic potential should be provided as the level of DSM options available in the IRP process, this ignores the fact that 100% of the customers would have to participate. This is not realistic as historical evidence has shown not all customers will adopt a given technology for reasons that range from aesthetic preferences, lack of information about energy efficiency measures, lack of access to capital to perceived comfort concerns. Rather, the potential modeled in the IRP should reflect some consideration of achievability.

To that end, achievable potential considers real-world barriers to encouraging end users to adopt efficiency measures; the non-measure costs of delivering programs (for administration, marketing, analysis and EM&V); and the capability of programs and administrators to boost program activity over time. Barriers include financial, customer awareness and willingness to participate in programs, technical constraints and other barriers the “program intervention” is modeled to overcome. Additional considerations include political and/or regulatory constraints. The potential study evaluated two achievable potential scenarios:

- **Maximum Achievable** Potential estimates achievable potential on paying incentives equal to 100% of measure incremental costs and aggressive adoption rates.
- **Realistic Achievable** Potential estimates achievable potential with CEI South paying incentive levels (as a percent of incremental measure costs) closely calibrated to historical levels but is not constrained by any previously determined spending levels.

It is important to also note the estimates of potential considered in the MPS (and ultimately, in the IRP) exclude potential savings from customers who are eligible and have chosen to actively opt-out of participating in CEI South's energy efficiency programs. In the CEI South service area, approximately 5% of commercial energy sales and 72% of industrial energy sales are associated with customers who have elected to opt-out.

In addition to the energy efficiency potential study, a demand response potential study was also conducted. The methodological approach to the demand response potential study closely mirrored the energy efficiency analysis, with an assessment of the calculation of the demand response technical, economic, and achievable potential. The demand response study analyzed existing programs, such as the Smart Cycle and Residential BYOT programs, as well as potential new programs, such as DR Aggregation, DLC Grid-Enabled Water Heating, DLC Electric Vehicle, Battery Storage, Commercial BYOT, and Critical Peak Pricing rates. The demand response study shows the amount of potential demand that could be realized if customers shift their electric usage from on-peak to off-peak periods.

3.7.2.10.2. Energy Efficiency – IRP Reference Case

Energy Efficiency for the 2025 through 2027 IRP years were informed directly from CEI South DSM Settlement Agreement (2025-2027). These years of energy efficiency were treated as a "going-in" resource in the IRP. For the remaining IRP years (2028-2045), CEI South used the realistic achievable potential identified in the MPS as the starting point for energy efficiency to be modeled in the IRP.

CEI South worked closely with GDS and its stakeholders to formulate an approach to bundling DSM that addressed stakeholder requests, met the IURC rules and fit the EnCompass IRP model requirements. The GDS Team initially provided the energy efficiency IRP inputs across three sector categories (residential, income-qualified, and commercial/industrial). The residential and commercial/industrial bundles were modeled as selectable resources in the EnCompass model. Like 2025-2027 EE levels, the 2028-2045 income-qualified bundle was also treated as a 'going-in' resource as the high costs of program delivery would likely prevent its selection in the IRP, and CEI South anticipates continuing to offer energy efficiency program offerings to their income-qualified customers despite these limitations in cost-effectiveness.

In addition to the sector segmentation, the annual bundles were grouped into three separate time series. The three different vintage bundles: 2028-2030, 2031-2033, and 2034-2045 allow the model to optimize the value of energy efficiency over different time periods. The first two periods were designed to align with the next CEI South DSM program

planning periods, followed by a larger third time series that could provide guidance on DSM selections for the remaining IRP timeframe.

In the process of developing the initial sector-level bundles, two savings adjustments and one cost adjustment were necessary prior to inclusion in the IRP. The first adjustment converted the energy efficiency achievable potential from gross savings to net savings. It is appropriate to model net energy efficiency impacts to remove MWh and MW impacts that would have occurred in the absence of CEI South's programs. Net savings were calculated by applying CEI South's most current Net to Gross ("NTG") ratios to the MPS estimates of gross achievable savings.

The second savings adjustment was to provide the program potential savings at the generator level. The MPS savings are reported at the meter-level. Sector savings were adjusted based on peak system line loss rate of 8.4% to convert savings from the meter level up to the generator level. Figure 3-37 provides a comparison of the total residential, commercial/industrial, and income-qualified sector incremental annual savings from the MPS versus the IRP based on these two adjustments. On the cost side, because the IRP's Capacity Expansion Model does not calculate avoided transmission and distribution ("T&D") benefit associated with DSM measures, the GDS Team provided CEI South with energy efficiency costs that have been adjusted to net out the avoided T&D benefit.

3.7.2.11. Demand Response

CEI South, after working with stakeholders, expanded the number of DR bundles to be included for selection in the IRP Reference Case, from five bundles in the 2022/2023 IRP to thirteen bundles. In the 2025 IRP, to align with MISO's new seasonal structure, cumulative demand MW savings were calculated per the four seasons (Summer, Winter, Spring and Fall).

CEI South included two fixed bundles representing CEI South's DR capabilities for DLC switches on residential air conditioning units and hot water heaters in the CEI South service area. Over the IRP time frame, CEI South anticipates replacing existing DLC switches with smart thermostats that integrate DR capabilities (via the Smart Cycle Program). As CEI focuses on converting switches to smart thermostats, the estimated annual DR savings for the fixed residential air conditioner switch bundle drop from approximately 1.45 MW in 2028, to 0.13 MW by 2045. The estimated annual impacts for the fixed residential water heater switch bundle of DR are approximately 0.41 MW in 2028, decreasing to 0.05 MW by 2045.

Bundles three and four, both selectable resources, represent DR saving capabilities for CEI South's residential DR-enabled smart thermostats. The third bundle represents the Smart Cycle Program, anticipating DR savings from replacing DLC switches with smart thermostats. DR capabilities within the Smart Cycle bundle represents 13.68 MW of peak reduction capabilities in 2028 decreasing to 12.74 MW in 2045. The fourth bundle represents DR savings for customer self-installed DR-enabled smart thermostats in our BYOT program. This bundle represents an additional 12.85 MW of peak reduction capabilities in 2028 increasing to 17.85 MW by 2045.

A fifth bundle also represents DR savings for smart thermostats, but this is a new bundle focused on the commercial sector. CEI South commercial customers wanting to enroll their BYOT thermostats could achieve approximately 0.37 MW in 2028, as historical devices would not yet contribute to DR savings. As participation increases, this bundle shows a potential of 3.56 MW in 2045.

Bundles six and seven, consists of DR savings attributable to a time of use ("TOU") rate option with a critical peak price ("CPP") rate. This program is expected to start in 2026 and build slowly a pilot program through 2030. The sixth bundle, representing residential DR potential from TOU with CPP is expected to achieve approximately 0.57 MW in 2028 and increase to 5.71 MW in 2045. The seventh bundle, accounting for commercial DR savings from TOU with CPP, can achieve around 0.24 MW in 2028 and 2.07 MW in 2045.

Bundles eight and nine, both selectable resources, are new inputs in the 2025 IRP. These bundles represent DR savings for residential and commercial grid-enabled water heaters. Residential grid-enabled water heaters represent an additional 0.63 MW of peak reduction capabilities in 2028 and increases to 5.7 MW in 2045. Commercial grid-enabled water heaters represent an additional 0.31 MW in 2028 and increases to 2.6 MW in 2045.

Per stakeholder requests, two more new bundles for this IRP represent DR savings from EV chargers. One bundle represents residential DR achievable potential and the other represents commercial DR capabilities. Bundle ten, residential EV, represents 0.02 MW in 2028 and increases to 1.2 MW in 2045. The eleventh bundle shows there is very little DR savings potential in CEI South's territory for commercial EV charging, with 0.00003 MW in 2028 increasing to 0.001 MW in 2045.

The final two bundles, also new selectable resources per stakeholder requests, represent inputs for residential battery and commercial battery DR saving potential. The residential battery DR saving inputs provided in bundle twelve, represent 0.03 MW in 2028 and increase to 0.68 MW in 2045. The commercial battery DR potential in bundle thirteen

represents an additional 0.01 MW in 2028 and increases to approximately 0.37 MW in 2045.

3.7.2.12. DSM Resources Optimization Process

Energy Efficiency for the 2026 and 2027 IRP years were informed directly from CEI South DSM Plan (*Technical Appendix Attachment 3.4 CEIS Electric 2025-2027 DSM Plan)* approved in Cause No. 46100. These years of energy efficiency were treated as a "going-in" resource in the IRP. For the remaining IRP years (2028-2045), CEI South used the achievable potential identified in the MPS[30] as the starting point for energy efficiency to be modeled in the IRP.

CEI South worked closely with GDS and its stakeholders to formulate an approach to bundling DSM that addressed stakeholder requests, met the IURC rules and fit the EnCompass IRP model requirements. The GDS Team provided energy efficiency IRP inputs across three sector categories (residential, income-qualified, and commercial/industrial). The residential and commercial/industrial bundles were modeled as selectable resources in the EnCompass model. Like 2026/2027 EE levels, the 2028-2045 income-qualified bundle was also treated as a 'going-in' resource as the high costs of program delivery would likely limit its selection in the IRP, and CEI South anticipates continuing to offer energy efficiency program offerings to their income-qualified customers despite these limitations in cost-effectiveness.

In addition to the sector segmentation, the annual bundles were grouped into three separate time series. The three different vintage bundles: 2028-2030, 2031-2033, and 2034-2045 allow the model to optimize the value of energy efficiency over different time periods. The first two periods were designed to align with the next CEI South DSM program planning periods, followed by a larger third time series that could provide guidance on DSM selections for the remaining IRP timeframe.

In the process of developing the bundles, two savings adjustments and one cost adjustment were necessary prior to inclusion in the IRP. The first adjustment converted the achievable potential from gross savings to net savings. It is appropriate to model net energy efficiency impacts to remove MWh and MW impacts that would have occurred in the absence of CEI South's programs. Net savings were calculated by applying CEI South's most current NTG ratios to the MPS estimates of gross achievable savings.

[30] The IRP inputs used the Enhanced RAP identified in the MPS for the C&I sector, and the RAP for the residential / income-qualified sectors.

The second savings adjustment was to provide the program potential savings at the generator level. The MPS savings are reported at the meter-level. Sector savings were adjusted based on a multiplier of 1.092 to convert savings from the meter level up to the generator level. The table below provides a comparison of the total residential, commercial/industrial, and income-qualified sector incremental annual savings from the MPS versus the IRP based on these two adjustments. On the cost side, because the IRP's Capacity Expansion Model does not calculate avoided T&D benefit associated with DSM measures, the GDS Team provided CEI South with energy efficiency costs that have been adjusted to net out the avoided T&D benefit.

Figure 3-37 – MPS versus Initial IRP Bundles Comparison – Sum of Incremental MWh

	Vintage 1: MPS	Vintage 1: IRP	Vintage 2: MPS	Vintage 2: IRP	Vintage 3: MPS	Vintage 3: IRP
Residential	46,733	45,343	58,227	55,643	310,420	287,399
C&I	76,079	69,786	75,949	69,666	260,052	238,540
IQW	4,640	4,458	6,284	5,895	31,734	29,130

Following an early review of the residential and commercial/industrial energy efficiency savings and costs inputs, the GDS Team further segmented the residential sector savings into high-cost measures (Tier 2), and low/mid cost measure (Tier 1) across each vintage time-series due to concerns that an aggregate residential sector bundle would not get selected. Residential behavioral energy efficiency savings were included in the Tier 1 bundle. Figure 3-38 summarizes the final bundle incremental savings for energy efficiency and associated levelized utility cost per lifetime savings.

In addition to the annual impacts shown in these tables, hourly (or 8,760) shapes that reflect the various measures and end-use mix reflected in each EE resource bundle were provided to CEI South to permit the IRP model to assess the value of energy savings on an hourly basis. These 8,760 shapes were based on residential and commercial end-use load shapes for Indiana from NREL's End-Use Load Profiles database. The ultimate 8,760 shapes are unique for each EE sector and vintage bundle.

Figure 3-38 – Annual MWh EE Savings and Levelized Costs per Lifetime MWh Saved by Bundle

EE Bundles	Enhanced C&I		Res Tier 1 + HER		Res Tier 2		IQW		IQW_HEAR	
	MWh	$/LT-MWh	MWh	$/LT-MWh	MWh	$/LT-MWh	MWh	$/LT-MWh	MWh	$/LT-MWh
2028	22,839	$37.87	10,879	$30.27	2,708	$84.06	1,042	$166.76	293	$332.49
2029	23,439	$38.72	11,893	$31.52	3,257	$85.49	1,120	$174.99	368	$339.69
2030	23,507	$39.63	12,849	$32.69	3,757	$87.40	1,185	$184.76	451	$347.49
2031	24,198	$40.73	13,495	$33.93	4,222	$89.49	1,319	$201.48	539	$355.87
2032	23,406	$41.66	13,938	$35.04	4,673	$91.91	1,347	$213.36	628	$364.92
2033	22,062	$42.43	14,157	$36.20	5,159	$94.47	1,349	$226.10	712	$374.82
2034	23,008	$44.03	15,372	$34.12	6,097	$94.80	1,411	$244.11	786	$385.39
2035	21,998	$45.14	15,487	$35.20	6,499	$97.62	1,377	$257.84	849	$396.47
2036	20,511	$45.88	15,293	$36.12	6,854	$100.57	1,315	$271.91	899	$407.87
2037	19,500	$47.06	15,061	$37.04	7,131	$103.51	1,327	$289.87	936	$419.72
2038	20,898	$49.15	16,246	$36.40	7,624	$106.04	1,565	$268.04	962	$431.29
2039	20,087	$49.89	17,636	$37.43	7,846	$108.39	1,581	$275.56	981	$442.33
2040	19,772	$51.05	17,724	$38.03	7,998	$111.09	1,628	$287.22	993	$452.74
2041	18,773	$51.85	17,550	$38.81	8,004	$113.26	1,569	$295.52	1,000	$462.96
2042	17,685	$52.27	17,369	$39.67	7,996	$115.36	1,520	$303.39	1,005	$472.25
2043	19,434	$50.86	17,234	$40.50	7,904	$118.38	1,539	$316.34	1,000	$480.82
2044	18,923	$51.04	16,825	$40.97	7,639	$121.56	1,477	$322.91	997	$488.83
2045	17,951	$51.39	16,484	$41.61	7,528	$123.45	1,419	$329.24	994	$497.27

3.7.2.13. DSM Improvements Based on Stakeholder Feedback

Review of prior comments from stakeholders and robust stakeholder discussion led to several improvements to DSM modeling since the 2022/2023 IRP. The model has been allowed to make multiple decisions over the 20-year period. The model selects DSM for two three-year periods beginning in 2028 and 2031 and then evaluates the remaining years beginning in 2034 as one collective group. This allows the model to select the appropriate level of DSM based on cost-effectiveness differences and resource needs across the short, mid and long run.

The characterization of the EE and DR bundles included in the IRP modeling was based on a collaborative process with the stakeholders. This led to re-evaluating the sector level budling approach included in the 2022/2023 IRP. CEI South bundled the measures by sector for residential and non-residential consistent with the 2022/2023 IRP to account for

high savings behavioral based efficiency measures to be bundled with low to medium cost measures to help ensure the maximum amount of realistic achievable potential was economically selected. CEI South included the income qualified bundle and added an income qualified HEAR bundle to account for savings through the Indiana Energy Saver program (which will occur outside of DSM filings). CEI South bundled C&I sector savings at an enhanced realistic achievable potential, which allows incentives for some measures to be decreased while increasing incentives for measures that would deliver additional adoption and savings. An improvement to the 2022/2023 IRP was adding more emerging technology measures to be included in bundles across all sectors. Additional sector and end-use specific hourly load shapes were included to more accurately estimate the timing of the energy efficiency impacts throughout the year. Also, based on feedback in the Director's report and working with the OSB, DR bundles were expanded to include six (6) additional DR products as selectable resources even though most were not cost-effective in the MPS.

CEI South also modeled Aggregation as the program is currently being implemented. CEI South explored options and strategies for C&I customers to participate in the program. The aggregator will utilize DR products based on customers industry type and will deploy appropriate curtailment strategies such as process controls and equipment. The aggregator has implemented DR strategies such as lighting controls, thermal energy storage, irrigation controls across utility partners nationwide.

Pricing options modeled in the IRP were based on an opt-in time of use and critical peak pricing design that aligns with CEI South's current pilot program, assuming a broader role out of the rate. Peak time rebates were not modeled as the evaluation, measurement and verification of savings is complex and is specific to each individual customer. Further, such a design would cause CEI South to undergo significant and costly changes to the billing system. Figure 3-39 contains a summary of EE & DR bundles modeled in the 2022/2023 and 2025 IRP with a description of enhancements.

Figure 3-39 – EE and DR Bundle Comparison and Enhancements

Resource Type	2022/2023 Bundles	2025 Bundles	Enhancement
Energy Efficiency	Res Tier 1	Res Tier 1 + Behavioral	Bundled Behavioral with Low/Medium cost Tier 1 to capture large savings high-cost measure
Energy Efficiency	Res Tier 2	Res Tier 2	Introduced an expanded emerging tech measure list for consideration
Energy Efficiency	Res Behavioral		
Energy Efficiency	Res Income Qualified	Res Income Qualified	
Energy Efficiency		Res Income Qualified HEAR	Introduced new bundle to capture impacts of OED IN Energy Saver program, will not be included in utility EE programs
Energy Efficiency	Non-Res Enhanced RAP	Non-Res Enhanced RAP	Modeled the enhanced RAP, where some incentives were decreased for measures and other were increased to drive participation
Demand Response	Res Switches	Res AC Switch	Modeled AC Switch as a "going in" resource, water heater switches were modeled as a separate DR product
Demand Response		Res WH Switch	
Demand Response	Res Smart Cycle & BYOT	Res Smart Cycle	Modeled Smart Cycle as a selectable resource, BYOT thermostats were modeled as a separate DR product
Demand Response		Res BYOT	Bundle was expanded to capture March through November instead of summer only season of June through August
Demand Response		Res WH Grid	Created a new bundle based on stakeholder feedback for grid-enabled water heaters, primarily managed through Wi-Fi
Demand Response		Res EV	Created a new electric vehicle managed charging DR resource using updated saturation & adoption rates based on OSB feedback
Demand Response		Res Battery	Created a new Battery Storage DR resource using updated saturation & adoption rates based on OSB feedback. Ran at multiple incentive levels
Demand Response	Res Rates	Res TOU CPP	Modeled a specific Time-of Use and Critical Peak Pricing resource that aligns with pilot approval in Cause No. 45990

Resource Type	2022/2023 Bundles	2025 Bundles	Enhancement
Demand Response	Non-Res BYOT	Non-Res BYOT	Bundle was expanded to capture March through November instead of summer only season of June through August
Demand Response		Non-Res WH Grid	Created a new bundle based on stakeholder feedback for grid-enabled water heaters, primarily managed through Wi-Fi
Demand Response		Non-Res EV	Created a new electric vehicle managed charging DR resource using updated saturation & adoption rates based on OSB feedback
Demand Response		Non-Res Battery	Created a new Battery Storage DR resource using updated saturation & adoption rates based on OSB feedback. Ran at multiple incentive levels
Demand Response	Non-Res Rates	Non-Res TOU CPP	Modeled a specific Time-of Use and Critical Peak Pricing resource that aligns with Residential pilot approval in Cause No. 45990. Modeling will help inform if TOU & CPP rates are selected for Non-Res
Demand Response	Aggregation	Aggregation	Modeled as a "going in" resource, Aggregation received approval in Cause. No. 45990. CEI South is in the beginning stages of implementing the program and expect 12.5 MWs in 2026 and 25 MWs for 2027-2045

3.7.2.14. Innovative Rate Design

CEI South included innovative rate design in its Preferred Portfolio in its 2022/2023 IRP and the 2025 IRP. Following the IRP, CEI South proposed a CPP with Time of Use (“TOU”) pilot in its recent rate case in Cause No. 45990. The Commission approved the pilot, and CEI South has been actively working to develop the program that is set to begin in Q2 2026.

CEI South’s approved CPP TOU pilot provides an economic price signal for participating customers to lower their energy usage during peak times through rates. The TOU rate will be available to participating customers in the CEI South pilot between June and September with higher prices during the day and lower prices during nights and weekends. Most likely during times of highest usage, CEI South may call a CPP event, similar to a demand response event where prices are raised to the extent that a reduction in demand is induced. The Automated Metering Infrastructure provides the backbone for this program.

CEI South utilized its continuous improvement and project management teams to work collaboratively with business units to build out the necessary infrastructure to support the pilot. CEI South will work through the pilot over the next one to two years in the hopes of expansion, if successful. An expansion of the CPP TOU pilot is included within this IRP, utilizing indicative amounts developed in its most recent Market Potential Study. The CPP pilot will help inform the potential expansion of an innovative rate design for the commercial sector, included in this IRP.

3.8. Transmission Planning & Distribution Planning

CEI South continually assesses the performance of its electric transmission and distribution systems to ensure safe and reliable service for its customers. The primary goals of CEI South's planning process can be summarized as follows:

- Developing an electric system capable of delivering voltage of constant magnitude, duration and frequency at levels which meet CEI South customers' needs during normal conditions and during a system contingency (loss of a system asset) or set of contingencies;
- Minimizing thermal loadings on transmission and distribution facilities to be within operating limits during normal conditions and to be within emergency limits during contingency conditions;
- Analyzing the dynamic stability of the transmission system under various contingency conditions;
- Ensuring the available system fault current imposed on circuit breakers does not exceed the interrupting capability established by the equipment manufacturer;
- Optimizing the system configuration such that costs (capital and operating) are minimized while maintaining reliability and providing a plan for system upgrades to meet performance requirements;
- Coordinating transmission planning activities in broader regional evaluations with the MISO, ReliabilityFirst ("RF") and neighboring transmission owners;
- Performing an annual assessment of the electric transmission system over a ten-year planning horizon;
- Performing analysis of reactive power resources to ensure adequate reserves exist and are available to meet system performance criteria;
- Analyzing the performance of the distribution system to ensure reliability, adequacy to meet future load growth, DER penetration, and to address age/condition of existing facilities; and
- Ensuring compliance with FERC, NERC and RF Reliability Standards.

3.8.1. Transmission Planning Process

At a high level, CEI South's transmission performance planning models include existing facilities at or above 69 kV, critical system conditions, and study years. Modeled Facilities represent, at a minimum, required upgrades and could include future facilities not yet in service. The models may include distribution circuits and substations. The models aid in analyzing More Probable, Less Probable and Extreme Contingency events. The studied time periods may be for near-term (1 to 5 years) or long-term (6 to 10 years) and for peak and off-peak demand periods; however, the planning horizon may be increased to include transmission or generation plans. Using these models, CEI South may study system growth, generator interconnections, transmission interconnections, Load Serving Entity ("LSE") interconnections, and other studies as needed. Additional planning process details are provided in CEI South's VEC-008, Electric Transmission Planning Criteria (*Technical Appendix Attachments 3.9 VEC-008 Electric Transmission Planning Criteria*).

3.8.2. Existing Transmission System

CEI South's transmission system is comprised of 64 miles of 345 kV lines, 430 miles of 138 kV lines, and 563 miles of 69 kV lines.

The existing Transmission system has interconnections with Duke Energy (345 kV-138 kV-69 kV), Hoosier Energy (161 kV-69 kV), Indianapolis Power and Light Co. (138 kV), Big Rivers Electric Company (345kV-138 kV) and LGE/KU (138 kV). Key interconnection points include three 345 kV interconnections to Duke Energy's system in the area of Duke's Gibson Generation Station and Duff Substation, a 345kV interconnection to Big Rivers' Coleman Substation, a 345 kV interconnection to Big Rivers' Reid EHV Substation, a 138 kV interconnection at AES/IPL's Petersburg Generation Station and 161 kV and 138 kV interconnections to Hoosier Energy, LGE/KU and Big Rivers at CEI South's Newtonville Substation.

3.8.3. Import and Export Capability Assessment

As mentioned above, CEI South's transmission system interconnects with neighboring systems, which provides wholesale import and export capability. Transmission planning studies indicate the existing transmission system provides a maximum import capability of approximately 660 MW in peak demand periods and approximately 750 MW in off-peak demand periods (or approximately 35-40% of peak demand). The current import capabilities were used as a maximum threshold for the energy purchases and sales during the Risk Analysis.

Although CEI South has the capability to offset internal generation with imported capacity, this is not a long-term solution; several factors would influence that capability, including:

- MISO resource adequacy requirements
- Availability of firm capacity
- Transmission path availability
- Operating concerns (post-contingent voltage and line flow)
- Anticipated congestion costs
- Real-time binding constraints

Transmission planning's most recent analysis in its internal long-range planning study looked at a sensitivity on import capability around MISO's Long-Range Transmission Plan ("LRTP") Tranche 2.1 and concluded that the maximum import capability in 2031/2032 would increase to 1,280 MW in the peak demand periods.

3.8.4. Transmission Facilities as a Resource

As part of this year's IRP, CEI South retained 1898 & Co to perform transmission planning analyses evaluating 14 potential resource futures (or "Transmission Study Scenarios"). The resulting study report is included in the *Technical Appendix Attachment 2.3, Transmission Study (Confidential)*.

Study Overview:

The Transmission Study Scenarios included analyzing:

- the retirement of additional coal generation and partial replacement of these retirements with Battery Energy Storage System ("BESS"),
- the addition of a synchronous condenser,
- the addition of an aeroderivative, and
- import from the MISO market.

Each of these cases also included the addition of various levels of renewable resources.

The study (Steady-State analysis only) was performed for the Summer peak, Shoulder (off-peak), and Winter peak demand periods. The five-year and ten-year models utilized were from the latest 2024 MISO Transmission Expansion Plan ("MTEP") model series, which includes future transmission system projects and approved generation interconnections. The ten-year models and transmission scenarios were inclusive of MISO's LRTP Tranche 2.1 portfolio for the region. Additionally, given uncertainty of LRTP project #35 meeting the 2032 in-service date prescribed by MISO, a ten-year sensitivity study removing this project from the models was performed. Modeling parameters for the new renewable resource additions were utilized from the latest cycle of the MISO generation interconnection process. These generation projects included known generation replacement projects and those in final negotiations to execute generation interconnection agreements with MISO. Incorporating these projects ensured the use of

the most up-to-date modeling data for generation resources within CEI South's service area. The analysis incorporated renewable resources already in the MISO queue and modeled within MISO systems, along with the new combustion turbines at the A.B. Brown power plant and the Posey Solar project.

Study Results:
Evaluation of the Transmission Study Scenarios found several issues primarily tied to less generation on the system and a shift of additional issues arising in the Shoulder over the Summer period. Under heavy import conditions, severe voltage reinforcements are required in the Shoulder period. The highest magnitude of reinforcement costs is shown in the Winter period under heavy import conditions. Network upgrades needed to mitigate violations observed across all demand periods ranged from $0 million to $242.6 million depending on the transmission scenario.

Under Shoulder and Summer demand periods in the five-year planning horizon, the Culley G2 BESS or aeroderivative conversions evaluated (Transmission Study Scenarios 6 and 9) required no system reinforcements. Under the same demand periods and planning horizon for Culley G3 BESS conversion (Transmission Study Scenario 7), an additional $22.6 million in thermal and voltage reinforcements were required. When evaluating both Culley G2 and G3 BESS conversion (Transmission Study Scenario 8), additional thermal and voltage violations are produced which increases system reinforcements to $39.9 million. Considering the Culley G2 or G3 BESS conversions under heavy import (Transmission Study Scenarios 11 and 12), the system reinforcements ($56.6 million) required for Culley G2 BESS conversion were less severe than under Culley G3 BESS conversion ($156.8 million). In summary, Culley G2 BESS conversion causes less thermal and voltage impacts than Culley G3 BESS conversion.

The magnitude of system reinforcements was the most significant during the five (5) year Winter demand period, driven by heavy import condition. Heavy import conditions represent transmission scenarios when CEI South's dispatchable resources (F.B. Culley 2 and 3, and A.B. Brown CTs) are offline or unavailable. The reinforcements were estimated between $22.1 million and $242.6 million. Major upgrades on the high-end included rebuilding several transmission lines on the 69 kV and 138 kV system, two (2) additional 345/138 kV transformers at A.B. Brown, a 62.4 MVAr capacitor bank at Culley 69kV sub, and an additional 249.6 MVAr of reactive support spread across CEI South's footprint. The need for additional VAR support across the system is correlated to dispatchable generation being unavailable. A new 40-mile Ameren Norris City (IL) 345kV to A.B. Brown 345 kV line was considered as a potential reinforcement and the

preliminary estimate for this potential project is $136 million, accounting for over half of the $242.6 million mentioned above.

Converting Culley Unit 2 to a Synchronous Condenser was reviewed as an option for VAR support and was determined to be unfeasible due to the design of this particular unit.

IRP Impact:
For capacity expansion modeling, CEI South accounted for uncertainty and price volatility by incorporating conservative estimates for transmission upgrades caused by each potential technology added to the F.B. Culley 2 site. In the case that there are no additional units brought online (Transmission Study Scenario 3), the total upgrade cost was $47.9 million. This value was used to represent the cost of transmission system upgrades if a storage resource was assumed to be placed in service (Transmission Study Scenario 2), as well as in the case that the F.B. Culley 2 site interconnection rights were allowed to expire. Because Scenario 2 represents only the shoulder months, the summer transmission cost from Transmission Study Scenario 3 was used as a conservative estimate of the maximum potential upgrade cost. For the addition of a reciprocating engine or aeroderivative engine at the F.B. Culley 2 site, the highest seasonal costs associated with the Culley G2 aeroderivative (Transmission Study Scenario 4) were estimated at $22.8 million.

3.8.5. Distribution Planning Process

In 2025, Transmission Planning and Distribution Planning teams both completed separate but coordinated Long Range Planning reports which assessed future impacts to each system. Both analyses are coordinated to review load growth, generation changes, and overall system limitations and capabilities.

Furthermore, the Distribution Long Range Planning Report discusses further details on CEI South distribution planning criteria used in system analysis. The public version of the Distribution Long Range Planning Report is included in the *Technical Appendix Attachment 3.8*. Additional planning process details are provided in CEI South's VEC-008, Electric Transmission Planning Criteria, see *Technical Appendix Attachment 3.9.*

3.8.6. Evolving Technologies and System Capabilities

Transmission Capacity Investments:
MISO's 2024 Transmission Expansion Plan identified numerous Multi-Value Projects aimed at increasing regional transmission capacity throughout the central portion of MISO's footprint. MISO's Board of Directors approved these transmission investments in

December of 2024. MISO's approved plan includes transmission capacity additions in CEI South's footprint.

FERC Order 881 - Ambient Adjusted Line Ratings:

CEI South is actively engaged in implementing ambient-adjusted transmission facility ratings (AARs). FERC Order 881 was issued in December 2021 and directed Regional Transmission Operators (such as MISO) and Transmission Owners (such as CEI South) to implement AARs. CEI South actions taken to date include:

- Working collectively with MISO and other Transmission Owners on AAR implementation;
- Conducting monthly internal stakeholder meetings to review implementation status;
- Implementation of an advanced facility ratings database (software that enables the use of ambient adjusted ratings); and
- Completing Energy Management System upgrades required to manage ambient adjusted ratings in real-time operations and communicate those values to MISO.

Historically, transmission facility ratings have been static and only adjusted seasonally. AARs provide additional real-time capacity on transmission facilities when outdoor temperatures are lower. Implementing AARs may reduce or alleviate transmission facility congestion by allowing system operators to apply the increase in the facility's rating, when applicable.

FERC Order 2222 - Distributed Energy Resources:

FERC Order 2222 requires Regional Transmission Organizations ("RTOs") and Independent System Operators ("ISOs") to allow aggregated distributed energy resources ("DERs") to participate in wholesale electricity markets. In an effort to prepare for MISO's implementation of order 2222, CEI South has created an internal task force to ensure compliance with FERC's mandate and MISO's tariff. The task force will coordinate with MISO, IURC, and other authorities to align internal DER processes, registration, system readiness, tariffs, and compliance with reliability and cybersecurity standards.

3.9. Other Modeling Assumptions

3.9.1. Resource Availability

A key model input is the availability of new generation resources, which signals how quickly resources can be brought online. For all scenarios except for those with large load additions (large load sensitivity analysis and the alternate reference case), resource availability assumptions remained constant over the modeling period. As shown in Figure 3-40, renewable build constraints were intentionally aggressive as requested by stakeholders.

Resource availability was also informed by the 2024 All-Source RFP, which indicated that solar and storage were more readily accessible than wind facilities in or near Indiana. Finally, it is important to note that 2035 was identified as the earliest reasonable in-service date for advanced nuclear technology, as informed by the technology assessment.

Figure 3-40 – Resource Availability for Core Scenarios[31]

Technology	1st Year Available	Annual Addition Limit (per Year)	Cumulative Addition Limit (Entire Study Period)
Thermal			
F Class CT	2030	1 Project, 246 MW	1 Project, 246 MW
J Class CT	2030	2 Projects, 874 MW	2 Project, 874 MW
Reciprocating Engine	2030	2 Projects, 220 MW	4 Projects, 440 MW
Aeroderivative	2030	2 Projects, 114 MW	4 Projects, 228 MW
1x1 F Class CC	2032	1 Project, 454 MW	1 Project, 454 MW
1x1 J Class CC	2032	1 Project, 624 MW	1 Project, 624 MW
Renewables			
Solar	2028	4 Projects, 400 MW	18 Projects, 1,800 MW
Solar + Storage	2028	3 Projects, 300 + 150 MW	10 Projects, 500 + 250 MW
Wind	2030	4 Projects, 800 MW	10 Projects, 2,000 MW
Wind + Storage	2030	3 Projects, 600 + 300 MW	5 Projects, 1,000 + 500 MW
Hydro	2032	2 Projects, 58 MW	2 Projects, 58 MW
Storage			
4-hour 50 MW Storage	2028	5 Projects, 250 MW	10 Projects, 500 MW
4-hour 100 MW Storage	2028	5 Projects, 500 MW	10 Projects, 500 MW
8-hour 100 MW Storage	2028	3 Projects, 300 MW	5 Projects, 500 MW
Nuclear			
Nuclear	2035	1 Project, 100 MW	1 Project, 100 MW

For the simulations that included a large load addition, such as the alternate reference case and the large load sensitivity runs, resource build constraints were expanded. As shown in Figure 3-41**,** the constraints for most technologies were expanded to at least twice their base levels. After running the simulations, it was confirmed that these cumulative limits were not binding for either the core scenarios or in the large load addition cases as the model did not select the maximum number of any units.

[31] During a sensitivity analysis, long-duration iron-air storage was not selected in any scenario portfolio. When the resource was included in the capacity expansion model, it consistently produced higher-cost outcomes. Based on these results, it was not carried forward in subsequent capacity expansion modeling.

Figure 3-41 – Resource Availability for Large Load Addition Cases[32]

Technology	1st Year Available	Annual Addition Limit (per Year)	Cumulative Addition Limit (Entire Study Period)
Thermal			
F Class CT	2030	3 Projects, 737 MW	6 Projects, 1,475 MW
J Class CT	2030	3 Projects, 1,311 MW	6 Projects, 2,623 MW
Reciprocating Engine	2030	4 Projects, 439 MW	8 Projects, 878 MW
Aeroderivative	2030	4 Projects, 228 MW	8 Projects, 457 MW
1x1 F Class CC	2032	2 Projects, 908 MW	2 Projects, 908 MW
2x1 G/H Class CC	2032	4 Projects, 3,825 MW	4 Projects, 3,825 MW
1x1 J Class CC	2032	2 Projects, 1,248 MW	2 Projects, 1,248 MW
2x1 J Class CC	2032	4 Projects, 5,477 MW	4 Projects, 5,477 MW
Renewables			
Solar	2028	10 Projects, 1,000 MW	20 Projects, 2,000 MW
Solar + Storage	2028	6 Projects, 600 + 300 MW	20 Projects, 2,000 + 1,000 MW
Wind	2030	8 Projects, 1,600 MW	20 Projects, 4,000 MW
Wind + Storage	2030	6 Projects, 1,200 + 600 MW	10 Projects, 2,000 + 1,000 MW
Hydro	2032	4 Projects, 116 MW	4 Projects, 116 MW
Storage			
4-hour 50 MW Storage	2028	10 Projects, 500 MW	20 Projects, 1,000 MW
4-hour 100 MW Storage	2028	10 Projects, 1,000 MW	20 Projects, 2,000 MW
8-hour 100 MW Storage	2028	6 Projects, 600 MW	10 Projects, 1,000 MW
Nuclear			
Nuclear	2035	2 Projects, 200 MW	2 Projects, 200 MW

3.9.2. MISO Direct Loss of Load Modeling

Beginning with the 2028/2029 Planning Year, MISO is transitioning its capacity accreditation methodology from the SAC construct to the DLOL framework. The DLOL approach represents a significant evolution in how MISO measures resource adequacy, shifting from fixed, technology-specific capacity factors to a probabilistic model based on each resource's performance during periods of highest reliability risk. Under this construct, accreditation is determined by a resource's contribution to avoiding loss-of-load events rather than its average seasonal availability.

[32] During a sensitivity analysis, long-duration iron-air storage was not selected in any scenario portfolio. When the resource was included in the capacity expansion model, it consistently produced higher-cost outcomes. Based on these results, it was not carried forward in subsequent capacity expansion modeling.

3.9.2.1. Data Sources and Modeling Approach

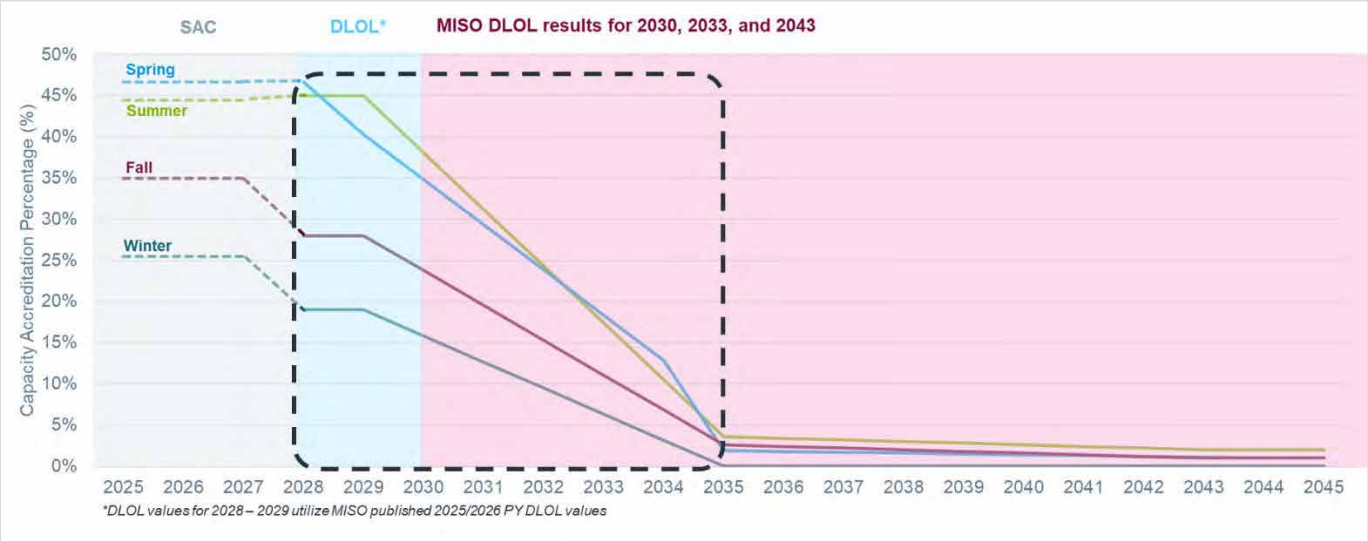
CEI South incorporated MISO's updated DLOL methodology into its 2025 IRP modeling to ensure consistency with the evolving regional framework. The most current publicly available MISO sources were used to obtain capacity accreditation values for each technology type. SAC accreditation percentages for wind and solar were taken from MISO's 2025/2026 Planning Year ("PY") Loss of Load Expectation ("LOLE") Report[33], while accreditation for all other technologies was sourced from MISO's 2023/2024 PY Effective Load Carrying Capability ("ELCC") data[34]. SAC values were applied through Summer 2027, after which DLOL implementation is expected to begin in Summer 2028. MISO's 2025/2026 PY Indicative DLOL Results[35] were used from 2028 through 2030. DLOL values for 2030, 2033, and 2043 were obtained from MISO's Regional Resource Assessment ("RRA") Technical Appendix[36], with interpolation used to determine values for intermediate years, and post-2043 values held constant through 2045.

3.9.2.2. Transition from SAC to DLOL

To ensure a consistent and realistic transition from SAC to DLOL accreditation, CEI South applied a smoothing process to the DLOL values across all resource types. Initial DLOL results from MISO indicated steep accreditation declines during the early implementation years. Following stakeholder feedback regarding this shift, CEI South introduced a moderated adjustment between 2028 and 2035. Figure 3-42 shows the change to the solar capacity accreditation. This smoothing approach preserves the overall downward trend observed in MISO's published data while providing a more stable near-term trajectory for planning and cost modeling purposes.

[33] Planning Year 2025 – 2026 Loss of Load Expectation Study Report. MISO. https://cdn.misoenergy.org/PY%202025-2026%20LOLE%20Study%20Report685316.pdf?v=20250313114401. March 2025. Page 21.
[34] Market Redefinition: Accreditation Reform. MISO. https://cdn.misoenergy.org/20240228%20RASC%20Item%2005a%20Accreditation%20Presentation%20RASC-2020-4%202019-2631885.pdf. February 28, 2024. Page 33.
[35] Planning Year 2025 – 2026 Indicative Direct Loss of Load (DLOL) Results. MISO. https://cdn.misoenergy.org/PY%2025-26%20Indicative%20DLOL%20Results657893.pdf. April 2025. Page 3.
[36] Technical Appendix: 2024 Regional Resource Assessment Assumptions and Methodology. MISO. https://cdn.misoenergy.org/2024%20RRA_Technical%20Appendix676208.pdf. November 2024. Page 11. Accreditation values between 2028 and 2035 were adjusted for the smoothing process; the 2030 values were not utilized, and the 2033 values were incorporated in 2035.

Figure 3-42 – Example of Smoothed Transition from SAC to DLOL for Solar Resources





Portfolio Development and Evaluation

Chapter 4

4.1. Portfolio Development

CEI South developed a wide range of portfolios for scenario modeling in the dispatch module of EnCompass and ultimately for the probabilistic modeling portion of this IRP process. In collaboration with external stakeholders and informed by feedback provided in the IURC Director's Report on the 2022/2023 IRP, CEI South developed 12 portfolios for final evaluation. These included a status quo case, where F.B. Culley 3 continues to run on coal throughout the study period for benchmarking purposes, scenario-based portfolios optimized under varying market conditions, portfolios focused on existing resource decisions, diversified portfolios with a balanced mix of generation technologies, and renewables-focused portfolios incorporating stakeholder input. Each portfolio was designed with the flexibility to include near-term solar, wind, and battery storage resources identified through the All-Source RFP. Mid- and long-term resource options were drawn from both the 2024 All Source RFP and a comprehensive technology assessment performed by 1898 & Co., which provided cost and performance data for technologies not represented in the 2024 All Source RFP. Values trended forward using available NREL cost curves. All portfolios were designed to include energy efficiency and demand response programs. DSM programs were selected for cost-effectiveness during the first stage of deterministic runs; runs that were selected 95% of the time were then included in all portfolios. All near-term programs included in the previously approved 2025-2027 plan were included in the model.

4.1.1. Optimization Runs

4.1.1.1. Deterministic Portfolio Results

Deterministic modeling was conducted to evaluate individual conversion options at existing CEI South generation sites. In each case, the model was directed to include a specific conversion configuration and optimize a portfolio surrounding that decision. This approach allowed CEI South to compare the cost, performance, and operational outcomes of each option under Reference Case conditions, establishing baseline expectations for cost, capacity, and operational performance across all conversion and retirement pathways.

Several consistent trends emerged from these model runs. In more than half of the simulations, the model selected the conversion of the existing A.B. Brown 5 and 6 combustion turbines to a 2x1 Combined Cycle, indicating the capacity and energy need, as well as the high firm capacity value associated with the thermal units. At the F.B. Culley 3 site, the model generally favored retirement of the unit, although this outcome is heavily influenced by the path selected at the A.B. Brown site.

4.1.1.1.1. F.B. Culley 2 Replacement

In anticipation of the suspension of F.B. Culley 2 at the end of 2025, CEI South evaluated four potential replacement options for this unit: installing natural gas aeroderivative or reciprocating engines, building a lithium-ion storage facility, or allowing the interconnection rights to expire. Each option was modeled individually under Reference Case assumptions to assess relative cost and system performance. The results of these model optimization runs are summarized below in Figure 4-1.

The deterministic analysis showed that allowing the interconnection rights to expire resulted in the lowest-cost outcome, within approximately one percent of the cost of constructing a lithium-ion storage facility. Due to the similar portfolio cost of each pathway, the decision for future pathways at F.B. Culley 2 remained unconstrained in subsequent model runs and portfolio development, with the exception of portfolio 12, the delayed reference case.

Figure 4-1 – F.B. Culley 2 Deterministic Model Results

Year	F.B. Culley 2 Aeroderivative	F.B. Culley 2 No Interconnect Re-Use	F.B. Culley 2 Reciprocating Engines	F.B. Culley 2 Storage
2028	+1 FBC2 Aero (86 MW)	1 FBC2 Do Nothing	+1FBC2 Recip Engines (110 MW)	+1 FBC2 Storage (90 MW)
2030	+1 AB Brown7: Fired CCGT 2030 (850 MW)	+1 AB Brown7: Fired CCGT 2030 (850 MW)	+1 AB Brown7: Fired CCGT 2030 (850 MW)	+1 AB Brown7: Fired CCGT 2030 (850 MW)
2031				
2032	-1 FB Culley:3 Retire 2032 (-270 MW) +1 50 MW 4 Hour Storage (50 MW)	-1 FB Culley:3 Retire 2032 (-270 MW)	-1 FB Culley:3 Retire 2032 (-270 MW)	-1 FB Culley:3 Retire 2032 (-270 MW)
2033		+1 100 MW 4 Hour Storage (100 MW)		+1 50 MW 4 Hour Storage (50 MW)
2034				
2035				
2038				
2039				
2040				
2041	+1 Non IRA Solar PV (100 MW)		+1 50 MW 4 Hour Storage (50 MW)	
2042	+1 50 MW 4 Hour Storage (50 MW)	+1 50 MW 4 Hour Storage (50 MW)		
2043				+1 50 MW 4 Hour Storage (50 MW)
2044				
2045	+1 50 MW 4 Hour Storage (50 MW)	+1 50 MW 4 Hour Storage (50 MW)	+1 50 MW 4 Hour Storage (50 MW)	
% Delta to Min NPV	**8.1%**	**0.0%**	**5.3%**	**1.0%**

4.1.1.1.2. Demand Side Management Deterministic Runs

Deterministic model runs conducted for conversion decisions at existing sites, together with the reference case and scenario-based runs, were used to evaluate the selection frequency of Energy Efficiency and Demand Response programs. In total, 15 runs were analyzed to identify which DSM programs were most consistently selected by the model. The Near-term ("NT") programs shown in Figure 4-2, which cover the years 2025 through 2027, were part of the previously approved plan and were included as fixed programs in this analysis. In addition, other programs, such as the Demand Response Aggregator program ("DR

Industrial") approved in Cause No. 45990, were also fixed programs consistent with the approved plan.

Figure 4-2 summarizes how frequently each program was selected across the DSM Deterministic runs. Programs that were selected more than 95% of the time were deemed consistently cost-effective and subsequently treated as a fixed resource in all future portfolio optimizations. The remaining programs were allowed to be selected, but not fixed, in each portfolio.

Figure 4-2 – Demand Side Management Deterministic Results

Program Name	Fixed or Selectable	Selection Frequency	Selection Percent
DR Industrial (DR Aggregation Program)	**Fixed**	**19/19**	**100%**
DR_CI Battery	Selectable	0/19	0%
DR_CI BYOT	**Selectable**	**19/19**	**100%**
DR_CI EV	Selectable	0/19	0%
DR_CI TOU CPP	Selectable	18/19	94%
DR_CI WH Grid	Selectable	9/19	47%
DR_Res AC Switch	**Fixed**	**19/19**	**100%**
DR_Res AC Switch_NT	**Fixed**	**19/19**	**100%**
DR_Res Battery	Selectable	1/19	5%
DR_Res BYOT	Selectable	4/19	21%
DR_Res BYOT_NT	**Fixed**	**19/19**	**100%**
DR_Res EV	Selectable	1/19	5%
DR_Res Smart Cycle	Selectable	1/19	5%
DR_Res Smart Cycle_NT	**Fixed**	**19/19**	**100%**
DR_Res TOU CPP	**Selectable**	**19/19**	**100%**
DR_Res WH Grid	Selectable	1/19	5%
DR_Res WH Switch	**Fixed**	**19/19**	**100%**
DR_Res WH Switch_NT	**Fixed**	**19/19**	**100%**
EE_CI_ERAP_NT, V1, V2, V3	**Selectable**	**19/19**	**100%**
EE_IQ HEAR_NT, V1, V2, V3	**Fixed**	**19/19**	**100%**
EE_IQW_V1, V2, V3	**Fixed**	**19/19**	**100%**
EE_Res_HER_V1, V2, V3	Selectable	0/19	0%
EE_Res_Tier 1_HER_NT, V1, V2, V3	**Selectable**	**19/19**	**100%**
EE_Res_Tier1_V1, V2, V3	Selectable	0/19	0%
EE_Res_Tier2_V1, V2, V3	Selectable	2/19 - 3/19	11-16%

A supplemental sensitivity analysis was also conducted to assess the impact of a shorter program horizon for Demand Response programs. This case evaluated only the first six

years of cost and production, relative to the 18-year study period used in the deterministic runs. No additional DR programs were selected when evaluated based on the first 6 years.

4.1.1.1.3. Distributed Generation Resource Portfolios

CEI South also evaluated a potential distributed generation solar incentive program intended to encourage customers to install behind-the-meter solar resources, thereby reducing system energy requirements. CEI South worked with Itron to update its solar payback model to include a $500 per kW incentive, to increase the adoption rate of behind-the-meter solar. Based on a solar PV adoption forecast developed by Itron, the program was estimated to reduce system load by a cumulative 137 MW (non-coincident) by 2045 and increase the net present value of portfolio revenue requirements by approximately $34.6 million.

When the IRP EnCompass model performed an optimized capacity expansion simulation under Reference Case conditions with this reduced load, the resulting portfolio was nearly identical to the Reference Case. The only difference was a one-year delay in the addition of storage resources, from 2039 to 2040 and from 2042 to 2043. This result indicates that while the incentive program would reduce energy requirements, long-term planning needs remain primarily driven by capacity. Furthermore, cost savings from reduced operational costs to serve the reduced load were insufficient to offset the cost of the incentive program, as the all-in cost of the optimized distributed generation portfolio was approximately $10 million higher than the Reference Case portfolio. Therefore, a distributed generation portfolio was excluded from the risk analysis.

4.1.1.2. Scenario-Based Portfolios

Scenario-Based portfolios (Reference Case, Low Regulatory, High Regulatory, Alternate High Regulatory) were developed to evaluate various regulatory constructs, economic and market conditions, and levels of electricity demand. The scenario-based portfolios move from Low to High Regulatory, with increasing levels of regulation and higher or lower economic drivers. While the Reference Case is considered the most likely future, the alternative scenario-based portfolios were developed to produce and test portfolios in plausible future states that differ from the reference case.

Following stakeholder feedback, the exact model outputs from these scenario optimization runs were used to produce scenario-driven portfolios. Note that these portfolios are developed under varying load conditions (as per the scenario definitions) but are then simulated using the same load inputs as all other portfolios during the risk analysis. These scenario-based portfolios are shown in Figure 4-3.

Figure 4-3 – Scenario Optimization Model Outputs

Year	Optimized Reference Case *(Portfolio 1)*	Optimized Low Reg *(Portfolio 8)*	Optimized High Reg *(Portfolio 9)*	Optimized Alt High Reg *(Portfolio 10)*
2028	1 FBC2 Do Nothing	+1 FBC2 Storage (90 MW)	1 FBC2 Do Nothing	1 FBC2 Do Nothing
2030	+1 AB Brown7: Fired CCGT 2030 (850 MW)	+1 AB Brown7: Fired CCGT 2030 (850 MW)	1 ABB5/6 Continue +3 Non IRA Wind + Storage (600 + 300 MW)	+1 Non IRA Wind (200 MW)
2032	-1 FB Culley:3 Retire 2032 (-270 MW)	-1 FB Culley:3 Retire 2032 (-270 MW)	-1 FB Culley:3 Retire 2032 (-270 MW) +1 Non IRA Wind + Storage (200 + 100 MW)	-1 FB Culley:3 Retire 2032 (-270 MW) +1 Non IRA Solar PV (100 MW) +2 Non IRA Wind + Storage (400 + 200 MW)
2033	+1 100 MW 4 Hour Storage (100 MW)			
2034				+1 AB Brown7: Fired CCGT 2034 (850 MW)
2038		+1 50 MW 4 Hour Storage (50 MW)		
2040	+1 50 MW 4 Hour Storage (50 MW)			
2042		+1 50 MW 4 Hour Storage (50 MW)		
2043	+1 50 MW 4 Hour Storage (50 MW)			
2045		+1 Non IRA Solar PV + Storage (100 + 50 MW)		

4.1.2. Final Portfolios for Risk Analysis

With these early modeling results in mind, additional portfolios and iterations were developed based on 1) stakeholder feedback, 2) lessons learned from preliminary portfolio optimization results, and 3) examining tradeoffs in different existing resource decision timing. Once all twelve of these diverse portfolios were created, they were run through the EnCompass model to be considered in the Risk Analysis portion of this IRP.

Figure 4-4 summarizes the resource buildouts for the portfolios selected for inclusion in the risk analysis[37].

[37] Portfolio 12 (Delayed Reference Case) was updated from the fourth stakeholder meeting held on 10/23/2025. In that meeting, the 50 MW 4-hour storage resource was presented to come online in 2042; the table entry was corrected to 2040. The slide deck on the CenterPoint IRP website (Integrated Resource Plan (IRP)) reflects this update.

Figure 4-4 – Final Risk Analysis Portfolios

Year	Portfolio1_Reference Case Portfolio	Portfolio2_Convert FBC3 to NG by 2035	Portfolio3_FBC3 on Coal without ABB7	Portfolio4_FBC3 on Coal to SMR	Portfolio5_FBC3 to Simple Cycle Gas Turbine	Portfolio6_Renewable Heavy Portfolio
2028	1 FBC2 Do Nothing	1 FBC2 Do Nothing	1 FBC2 Do Nothing	1 FBC2 Do Nothing	1 FBC2 Do Nothing	1 FBC2 Do Nothing
2030	+1 AB Brown7: Fired CCGT 2030 (850 MW)	+1 AB Brown7: Fired CCGT 2030 (850 MW)	1 ABB5/6 Continue	+1 AB Brown7: Fired CCGT 2030 (850 MW)	1 ABB5/6 Continue	1 ABB5/6 Continue
2032	-1 FB Culley:3 Retire 2032 (-270 MW)		+1 100 MW 4 Hour Storage (100 MW)			-1 FB Culley:3 Retire 2032 (-270 MW) +3 100 MW 4 Hour Storage (300 MW)
2033	+1 100 MW 4 Hour Storage (100 MW)		+2 100 MW 4 Hour Storage (200 MW)		+1 100 MW 4 Hour Storage (100 MW)	+2 100 MW 4 Hour Storage (200 MW)
2034						
2035		+1 FB Culley:3 NG 2035 (270 MW)		-1 FB Culley:3 Retire 2035 (-270 MW) +1 Nuclear - SMR (100 MW)	-1 FB Culley:3 Retire 2035 (-270 MW) +1 J Class SCGT (385 MW)	
2038						
2039						
2040	+1 50 MW 4 Hour Storage (50 MW)					
2041					+1 Non IRA Wind + Storage (200 + 100 MW)	+1 Non IRA Wind (200 MW)
2042			+1 50 MW 4 Hour Storage (50 MW)	+1 100 MW 4 Hour Storage (100 MW)		+1 Non IRA Wind + Storage (200 + 100 MW)
2043	+1 50 MW 4 Hour Storage (50 MW)					
2044						
2045			+1 FB Culley:3 thru 2045 (270 MW) +2 Non IRA Solar PV (200 MW) +1 Non IRA Wind (200 MW)		+1 Non IRA Wind (200 MW)	

Year	Portfolio7_FBC3 Gas Conversion with Renewables	Portfolio8_Low Reg Approach	Portfolio9_High Reg Approach	Portfolio10_Alt High Reg Approach	Portfolio11_FBC3 Co-Fire 2030	Portfolio12_Delayed Reference Case
2028	1 FBC2 Do Nothing	+1 FBC2 Storage (90 MW)	1 FBC2 Do Nothing	1 FBC2 Do Nothing	1 FBC2 Do Nothing	+1 FBC2 Storage (90 MW)
2030	+1 FB Culley:3 NG 2030 (270 MW) 1 ABB5/6 Continue	+1 AB Brown7: Fired CCGT 2030 (850 MW)	1 ABB5/6 Continue +3 Non IRA Wind + Storage (600 + 300 MW)	+1 Non IRA Wind (200 MW)	+1 FB Culley:3 Co-Fire 2030 (270 MW) +1 AB Brown7: Fired CCGT 2030 (850 MW)	
2032		-1 FB Culley:3 Retire 2032 (-270 MW)	-1 FB Culley:3 Retire 2032 (-270 MW) +1 Non IRA Wind + Storage (200 + 100 MW)	-1 FB Culley:3 Retire 2032 (-270 MW) +1 Non IRA Solar PV (100 MW) +2 Non IRA Wind + Storage (400 + 200 MW)		
2033	+2 100 MW 4 Hour Storage (200 MW) +1 50 MW 4 Hour Storage (50 MW)					
2034				+1 AB Brown7: Fired CCGT 2034 (850 MW)		+1 AB Brown7: Fired CCGT 2034 (850 MW)
2035						-1 FB Culley:3 Retire 2035 (-270 MW)
2038		+1 50 MW 4 Hour Storage (50 MW)			-1 FB Culley:3 Retire (270 MW)	
2039					+2 50 MW 4 Hour Storage (100 MW)	
2040	+1 Non IRA Wind (200 MW)				+1 50 MW 4 Hour Storage (50 MW)	+1 50 MW 4 Hour Storage (50 MW)
2041						
2042	+1 50 MW 4 Hour Storage (50 MW)	+1 50 MW 4 Hour Storage (50 MW)				
2043						
2044					+1 50 MW 4 Hour Storage (50 MW)	
2045	+1 100 MW 4 Hour Storage (100 MW) +2 Non IRA Wind (400 MW)	+1 Non IRA Solar PV + Storage (100 + 50 MW)				+1 50 MW 4 Hour Storage (50 MW)

Moreover, Figure 4-5 explicitly states the motivation behind the development of these twelve portfolios. The first group includes the portfolios informed by the deterministic optimization results and explores various existing unit decisions. The second group, as mentioned in Section 4.1.1.2, is the scenario-based portfolios. The final group reflects portfolios shaped by stakeholder input. These portfolios include the two portfolios with an increased renewable penetration in CEI South's resources mix as well as a portfolio with a Small Modular Reactor as a potential resource option.

Figure 4-5 – Description of Portfolio Motivations

Portfolio Name	Motivation
2-Convert FB Culley 3 to NG by 2035	Deterministic Portfolios (economically optimized model given fixed existing site decisions and potential replacement options for F.B. Culley 3)
3-Continue FB Culley 3 on Coal through 2045	
5-FB Culley 3 to Simple Cycle Gas Turbine	
11-FB Culley 3 Co-Fire	
12-Delayed Reference Case	
1-Reference Case Portfolio	Scenario-Based Portfolios (economically optimized model for each scenario)
8-Low Regulatory Approach	
9-High Regulatory Approach	
10-Alternate High Regulatory Approach	
4-FB Culley 3 to Small Modular Reactor	Stakeholder Input Portfolios
6-Renewable Heavy	
7-FB Culley 3 Gas Conversion with Renewables	

4.2. Evaluation Of Portfolio Performance

Each of the risk analysis candidate portfolios were subjected to two different forms of risk modeling. One was scenario-based (deterministic), and one was based on probabilistic modeling (200 iterations), which serves as the basis for the balanced scorecard. The inputs into the EnCompass model that were used to generate the following results are given in the *Technical Appendix Attachment 4.1 CEIS 2025 IRP Model with Scenarios & Stochastics Model (Confidential)*.

4.2.1. Scenario Risk Analysis (Simulated Dispatch in Each Scenario)

The IRP requires scenario-based modeling be performed as a part of the risk analysis. In the scenario-based risk analysis, the twelve candidate portfolios selected for further analysis were modeled under each of the four core scenarios with their respective market inputs. The following provides a summary of the results of this scenario-based risk analysis. The results shown in Figure 4-6 and Figure 4-7 are NPVRR and the cumulative carbon-dioxide emissions of each portfolio under each scenario. In the alternative high regulatory and high regulatory scenarios, capacity factor limitations associated with the CAA 111(b) and (d) legislation tend to increase the operating costs of portfolios while also limiting the portfolio emissions. The Preferred Portfolio performs fairly consistently across all four scenarios, avoiding extreme outcomes while allowing time for re-evaluation in a future IRP before the F.B. Culley 3 decision must be finalized.

Figure 4-6 – Portfolio NPVRR (Million $)

Portfolio	Reference Case	Alt High Regulatory	High Regulatory	Low Regulatory
1-Reference Case	$3,455	$4,613	$4,093	$3,458
2-FBC3 NG 2035	$3,430	$4,338	$4,119	$3,338
3-FBC3 on Coal	$3,959	$4,639	$4,435	$4,211
4-FBC3 to SMR	$4,126	$5,164	$4,464	$4,433
5-FBC3 to SCGT	$4,145	$5,009	$4,620	$4,128
6-Renewable Heavy	$4,144	$5,417	$4,315	$4,536
7-FBC3 NG with Renewables	$4,174	$5,336	$4,604	$4,193
8-Low Reg	$3,497	$4,572	$4,047	$3,431
9-High Reg	$4,247	$4,185	$2,970	$4,721
10-Alt High Reg	$3,960	$4,057	$3,294	$4,389
11-FBC3 Co-Fire	$3,556	$4,557	$4,181	$3,485
12-Delayed Reference	$3,625	$4,572	$4,175	$3,572

Figure 4-7 – Portfolio Total CO_2 Emissions Over Study Period (Million Tons)

Portfolio	Reference Case	Alt High Regulatory	High Regulatory	Low Regulatory
1-Reference Case	61	46	39	63
2-FBC3 NG 2035	69	55	46	72
3-FBC3 on Coal	69	78	57	70
4-FBC3 to SMR	66	53	44	66
5-FBC3 to SCGT	51	61	46	58
6-Renewable Heavy	35	44	34	39
7-FBC3 NG with Renewables	42	49	36	50
8-Low Reg	61	46	39	63
9-High Reg	34	43	32	38
10-Alt High Reg	51	44	37	53
11-FBC3 Co-Fire	68	50	43	69
12-Delayed Reference	62	52	43	65

4.2.2. Probabilistic Risk Analysis (Simulated Dispatch 200 Runs Scorecard)

After selecting the twelve portfolios for further consideration and completion of the scenario-based risk assessment, the remaining steps are to conduct the 200 iteration stochastic risk assessment, complete the balanced scorecard, and consider "other" relevant factors to select the Preferred Portfolio.

A comprehensive risk analysis using 200 iterations provides a more thorough understanding of how the different portfolios perform under a range of scenarios. As with any analysis, the risk assessment and subsequent balanced scorecard do not provide CEI South with an answer but instead offer insights into tradeoffs associated with the portfolios across a range of possible future conditions. Among other things, the results of this evaluation help CEI South get a clearer picture of the balance between total portfolio cost, the cost uncertainty (measured by the 5^{th} and 95^{th} percentile of cost outcomes over the planning horizon), the carbon equivalent profile, the percentage dependence on energy and capacity purchases and sales, and the stability, reliability, and resilience of the portfolios based on the probabilistic range of potential outcomes.

A color-coded comparison (shaded automatically by the Microsoft Excel spreadsheet) of the balanced scorecard is shown below in Figure 4-8[38]. The color coding represents the relative ranking among the portfolios. Green generally indicates scoring well relative to other portfolios within the same metric, and red generally indicates scoring poorly relative to other portfolios within the same metric. The color scheme is purely for illustrative purposes to show where differences between the best-performing portfolio and the worst-performing portfolio for that metric. Since the color coding is purely relative to the other portfolios, red does not necessarily mean that a portfolio performed poorly on that metric, but relatively worse than other portfolios. For more information on this analysis, please see the final stakeholder presentation in *Technical Appendix Attachment 4.2 Stakeholder Materials*.

[38] The Capacity Purchases NPV ($M) shown in the scorecard and presented during the fourth stakeholder meeting held on 10/23/2025 have been updated and posted to the CenterPoint IRP website.

Figure 4-8 – IRP Portfolio Balanced Scorecard Color-Coded Comparison

Objective	Affordability					Environmental Sustainability				Reliability/Resiliency/Stability					Risk/Other			
Portfolio Description	20 Year NPVRR ($M)	Delta From Reference (%)	5% Value of NPVRR ($M)	95% Value of NPVRR ($M)	Incremental Energy Burden (%) 2030 - 2035	CO_2 Intensity (Tons CO_2e/MWh)	CO_2 Equivalent Emissions (Stack Emissions) (1000s Tons CO_2e)	SOx Emissions (Tons)	NOx Emissions (Tons)	Unserved Energy (MWh)	Spinning Reserve (MW)	Fast Start Capability (MW)	Transmission Reliability Analysis MVAR	Transmission Reliability Analysis SCR	Energy Market Sales (%)	Energy Market Purchases (%)	Capacity Sales NPV ($M)	Capacity Purchases NPV ($M)
2-FBC3 NG 2035	$3,718	0%	$2,941	$4,464	0.13% - 0.22%	0.368	48,696	18,017	13,091	119	1,031	253	753	3.5	26%	9%	$217	$6
1-Reference Case	$3,726	0%	$2,963	$4,439	0.11% - 0.25%	0.346	44,302	12,877	10,650	61	842	340	665	3.5	26%	10%	$140	$14
8-Low Reg	$3,764	1%	$2,983	$4,475	0.15% - 0.20%	0.345	44,199	12,908	10,582	49	842	366	665	3.5	26%	10%	$167	$6
12-Delayed Reference	$3,836	3%	$3,195	$4,467	0.16% - 0.26%	0.391	46,535	21,885	14,539	56	701	444	665	3.5	23%	12%	$115	$18
11-FBC3 Co-Fire	$3,854	3%	$3,064	$4,587	0.18% - 0.17%	0.354	46,317	14,397	11,812	61	937	308	753	3.5	26%	10%	$192	$12
3-FBC3 on Coal	$4,034	8%	$3,511	$4,630	0.03% - 0.29%	0.522	53,636	51,793	25,931	43	302	835	626	3.5	15%	19%	$117	$22
10-Alt High Reg	$4,211	13%	$3,444	$4,829	0.17% - 0.48%	0.280	34,415	14,226	10,985	29	660	486	665	3.5	25%	9%	$159	$19
9-High Reg	$4,297	15%	$3,543	$4,926	0.43% - 0.44%	0.234	25,913	13,701	12,322	15	113	935	605	3.5	20%	14%	$128	$23
5-FBC3 to SCGT	$4,306	16%	$3,857	$4,770	0.14% - 0.59%	0.408	41,016	22,763	16,698	73	154	955	665	3.5	14%	21%	$93	$26
6-Renewable Heavy	$4,309	16%	$3,756	$4,723	0.10% - 0.62%	0.329	28,966	14,385	14,597	38	113	985	605	3.5	11%	30%	$95	$22
7-FBC3 NG with Renewables	$4,375	17%	$3,912	$4,771	0.26% - 0.49%	0.357	34,642	8,289	18,780	76	302	802	626	3.5	14%	23%	$106	$24
4-FBC3 to SMR	$4,456	20%	$3,674	$5,185	0.15% - 0.76%	0.342	45,224	18,653	11,950	52	938	273	665	3.5	26%	9%	$171	$13

1: Average net present value of portfolio revenue requirements from 2026 to 2045
2: Percent difference between average NPVRR of portfolio and reference
3-4: Fifth and ninety-fifth percentiles of net present value of NPVRR to show cost uncertainty
5: Increase in residential bill impact since 2026 as a percentage of median Vanderburg county resident forecasted annual income in 2030 and 2035
6: Quotient of average CO_2e from generation and average fleet generation from 2026 to 2045
7-9: Total CO_2 equivalent, SO_x, and NO_x emissions from 2026-2045
10: Total emergency unserved energy purchased from 2026 to 2045
11: Capacity from “spinning” thermal assets that can be ramped up or down (combined cycle, coal, nuclear)
12: Capacity from “fast start” assets that can be dispatched quickly (combustion turbine, battery)
13-14: Dynamic VAR support and short circuit ratio from transmission reliability analysis
15: Total energy sales as a percentage of total energy generation from 2026 to 2045
16: Total energy purchases as a percentage of total load from 2026 to 2045
17-18: Net present value of capacity sales and purchases from 2026 to 2045

4.3. Results By Portfolio

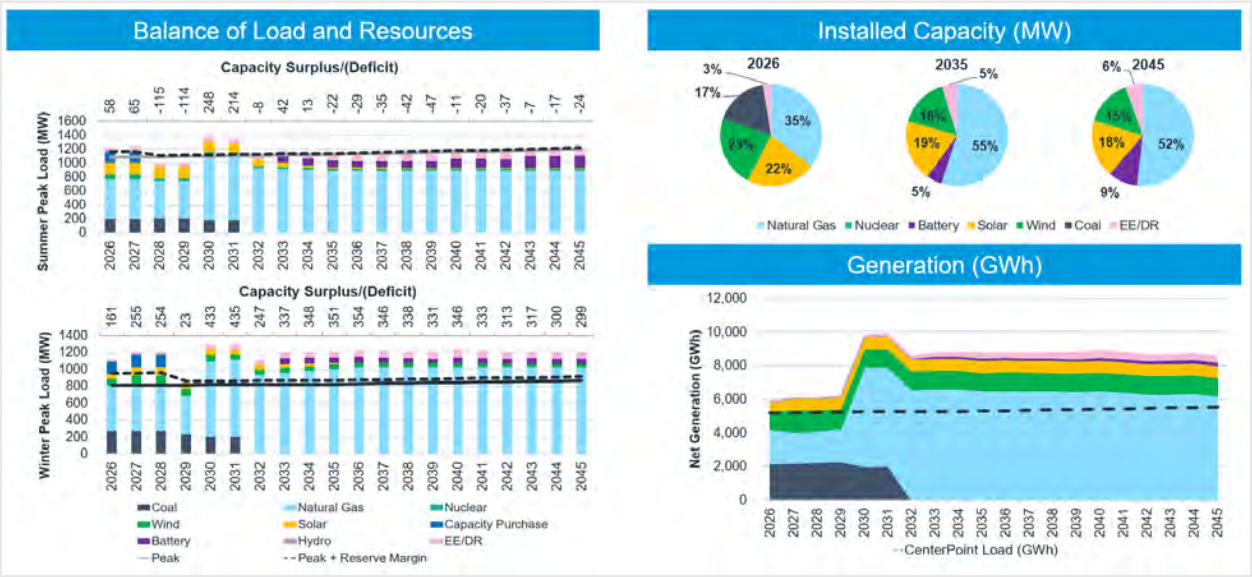
4.3.1. Reference Case Portfolio

The Reference Case portfolio represents the capacity expansion results from the Reference Case scenario. While this portfolio is the least cost in the capacity expansion (reference case) run, the portfolio becomes the second-lowest cost during the Risk Analysis (200 runs) portion of the analysis, as previously seen in Section 4.2.2. This portfolio allows for the expiration of interconnect rights at F.B. Culley 2 ("FBC2 Do Nothing"), conversion of the A.B. Brown 5 and 6 combustion turbines into a 2x1 Duct-Fired Combined Cycle ("A.B. Brown 7"), and retires CEI South's last remaining coal unit that it operates, F.B. Culley 3, at the end of 2031. In addition, the model builds a cumulative 200 MW of 4-hour battery energy storage resources beginning in 2033 through the end of the study period. The selection of batteries in the model is indicative of the need for long-term capacity on CEI South's system, especially following the implementation of MISO's DLOL methodology, which reduces the accreditation of intermittent resources.

The retirement of F.B. Culley 3 and the conversion of A.B. Brown 5 and 6 result in a highly efficient and relatively environmentally friendly portfolio, achieving among the lowest NO_x emissions compared to other portfolios. However, the early investment in A.B. Brown's conversion also necessitates a near-term rate increase, and the trend of increased demand for HRSGs and turbines creates a near-term price risk. The early A.B. Brown conversion and loss of the F.B. Culley 2 and F.B. Culley 3 interconnections also make the portfolio relatively inflexible, as it is less adaptable to changes in regulations, market conditions, and fuel costs.

The results dashboard for the reference case, shown in Figure 4-9, displays the Balance of Load and Resources on the left-hand side. This figure shows the need for capacity in the near-term, which makes the A.B. Brown conversion favorable, as it adds about 400 MW of firm capacity to the system. The installed capacity pie charts on the top right of the figure display the diverse mix of renewable, thermal, and demand-side resources included in the reference case. For all portfolio dashboards, the 32 MW of coal generation from Kyger Creek Generating Station, owned by the Ohio Valley Electric Corporation ("OVEC") and purchased by CenterPoint, is assumed to convert to natural gas in 2030. Finally, in the bottom left, it is observed that for the two years that A.B. Brown 7 and F.B. Culley 3 are online, CEI South's system produces significant excess energy, which it can sell to the MISO market and lower portfolio costs, ultimately benefiting CenterPoint customers but also introduces revenue risk if market conditions change.

Figure 4-9 - Reference Case Portfolio Results Dashboard



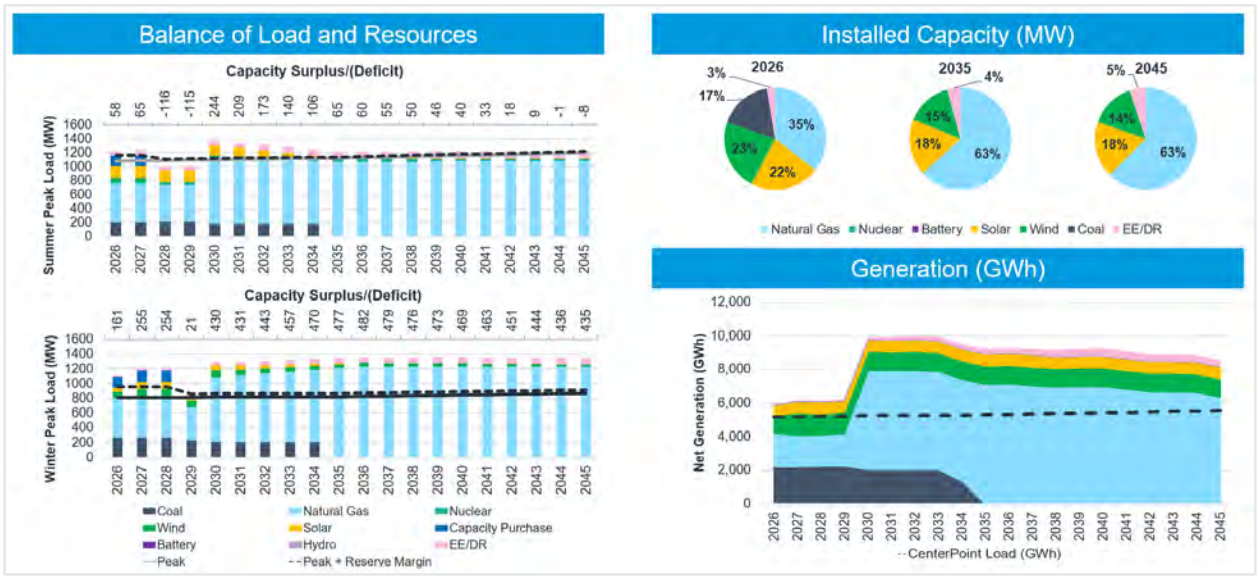
4.3.2. Convert F.B. Culley 3 to Natural Gas by 2035

This portfolio was designed to include the conversion of F.B. Culley 3 from a baseload coal-fired plant to a natural gas peaking plant beginning in 2035 and continuing through the end of the study period. This conversion preserves and repurposes much of the existing site infrastructure while maintaining valuable firm capacity on CEI South's system and lowering CO_2 emission rates. While the model was optimized around the conversion of F.B. Culley 3 to natural gas and the conversion of A.B. Brown 5 and 6 to A.B. Brown 7, no additional resources were necessary to meet all energy and capacity needs.

As seen in Figure 4-10, the inclusion of F.B. Culley 3 and A.B. Brown 7 results in CEI South being long on both capacity and energy, which can be sold to the MISO market to reduce the NPVRR and provide opportunities for economic development. While this portfolio has the lowest NPVRR across 200 draws of varying market conditions, it also relies on the highest levels of both energy and capacity sales, creating a revenue risk if market conditions differ. Moreover, the conversion of A.B. Brown in 2030 necessitates a potential near-term rate increase and introduces price risk from the increased demand for HRSGs and turbines, which could challenge the overall affordability of this portfolio. With natural gas resources comprising over 60% of total installed capacity, this portfolio is sensitive to changing regulations and volatility in fuel costs. Moreover, during the Risk Analysis, this portfolio showed the greatest amount of unserved energy along with the lowest amount of

fast start resources, suggesting potential challenges for the reliability and resiliency of the system, absent potential mitigations.

Figure 4-10 – Convert F.B. Culley to Natural Gas by 2035 Results Dashboard



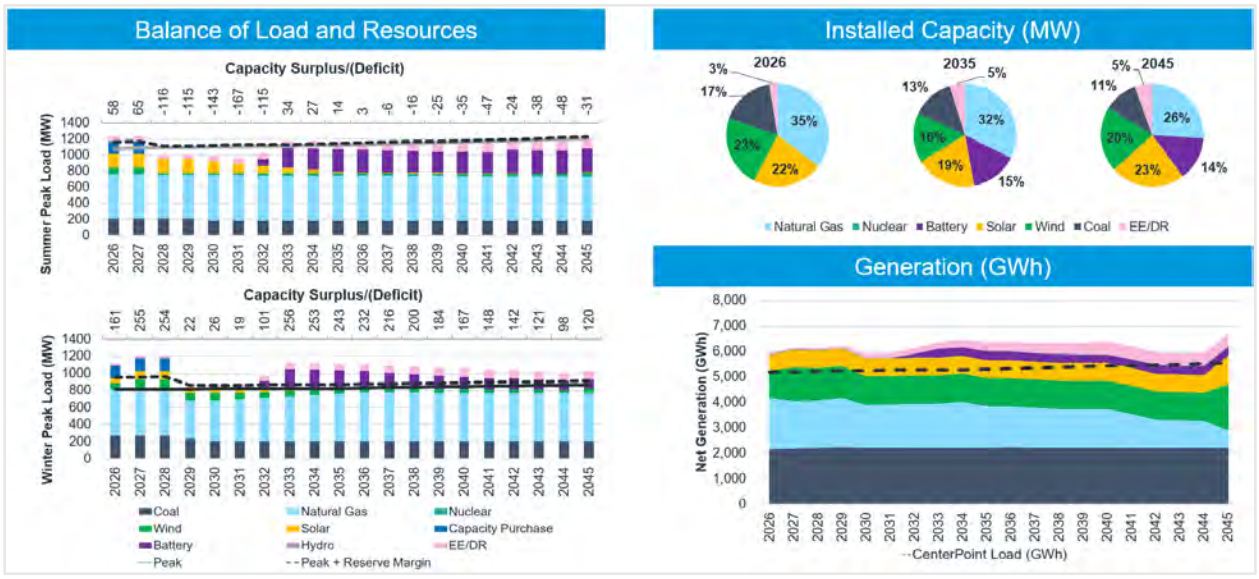
4.3.3. Continue F.B. Culley 3 on Coal through 2045

The F.B. Culley 3 on Coal portfolio serves as a Business As Usual ("BAU") case as it assumes no conversion of existing units and allows for the expiration of the interconnection rights at F.B. Culley 2. Without the conversion of the existing A.B. Brown units, the model chooses to build a cumulative 350 MW of storage facilities to maintain resource adequacy requirements. Moreover, in the final year of the planning horizon, additional solar and wind units are built to address energy needs. As shown in Figure 4-11 this portfolio relies on a significant amount of near-term capacity purchases until the additional storage resources are built.

The continuation of F.B. Culley 3 and the A.B. Brown CTs through the rest of the study period minimizes the need for near-term capital investment, which provides relative rate stability. To conform with environmental regulations included in the reference case, running F.B. Culley 3 on coal throughout the entire study period would require costly efficiency upgrades. Since this portfolio is unique in running F.B. Culley 3 on coal through 2045, the upgrades raise the base year (2026) revenue requirement, making the 2030 incremental energy burden appear lower than other portfolios in the near to midterm. Overall, this portfolio has a moderate NPVRR, approximately 8% greater than the least cost portfolio. As shown in the installed capacity graphs below, this portfolio is well diversified and

therefore less susceptible to cost risk from fuel prices. However, the reliance on inefficient coal generation makes this portfolio environmentally unsustainable, with the highest emissions rates for all considered environmental scoring metrics. These high emissions present a regulatory risk if state and federal objectives change to focus on emissions reduction.

Figure 4-11 – F.B. Culley 3 on Coal through 2045 Results Dashboard



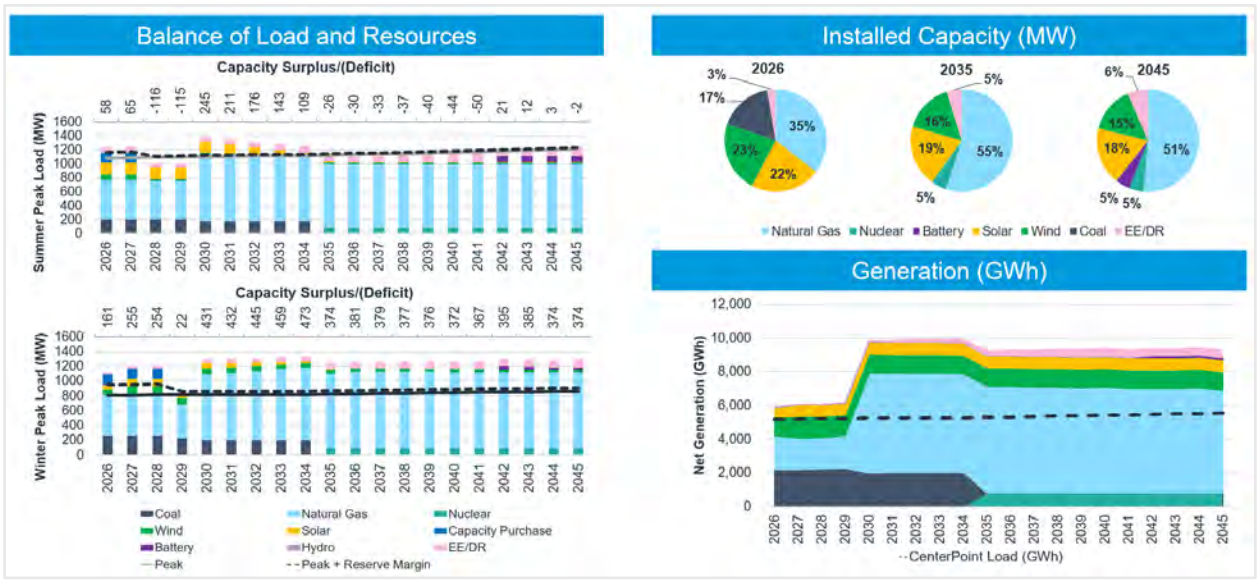
4.3.4. F.B. Culley 3 on Coal to Small Modular Reactor ("SMR")

Including an advanced nuclear portfolio allows CEI South to evaluate a long-term, zero-carbon firm resource that could support reliability as conventional coal resources continue to retire. Therefore, this portfolio retires F.B. Culley 3 at the end of 2034, while assuming that a small modular reactor ("SMR") would be brought online at the beginning of 2035. As shown in Figure 4-12, this portfolio is long on capacity from 2030 through 2034 as both F.B. Culley 3 and the A.B. Brown 7 are online.

This portfolio aligns with state and federal desire for nuclear energy, but the SMRs are also a new and unproven technology, which introduces significant long-term cost risk. The conversion of A.B. Brown 5 and 6 to a CCGT in 2030 would increase costs, making a rate increase necessary in the near-term. Moreover, the inclusion of the SMR in 2035 with CEI South as an off taker makes this portfolio the highest cost portfolio, approximately 20% higher than the least cost portfolio. The temporary capacity surplus from 2030 to 2034 allows the opportunity for significant capacity and energy sales, helping offset a portion of the cost of this advanced nuclear technology. This portfolio is among the highest ranking

in terms of capacity and energy sales, thus representing a significant cost risk with potential for the NPVRR to increase even further if revenues do not materialize.

Figure 4-12 – F.B. Culley 3 on Coal to Small Modular Reactor Results Dashboard



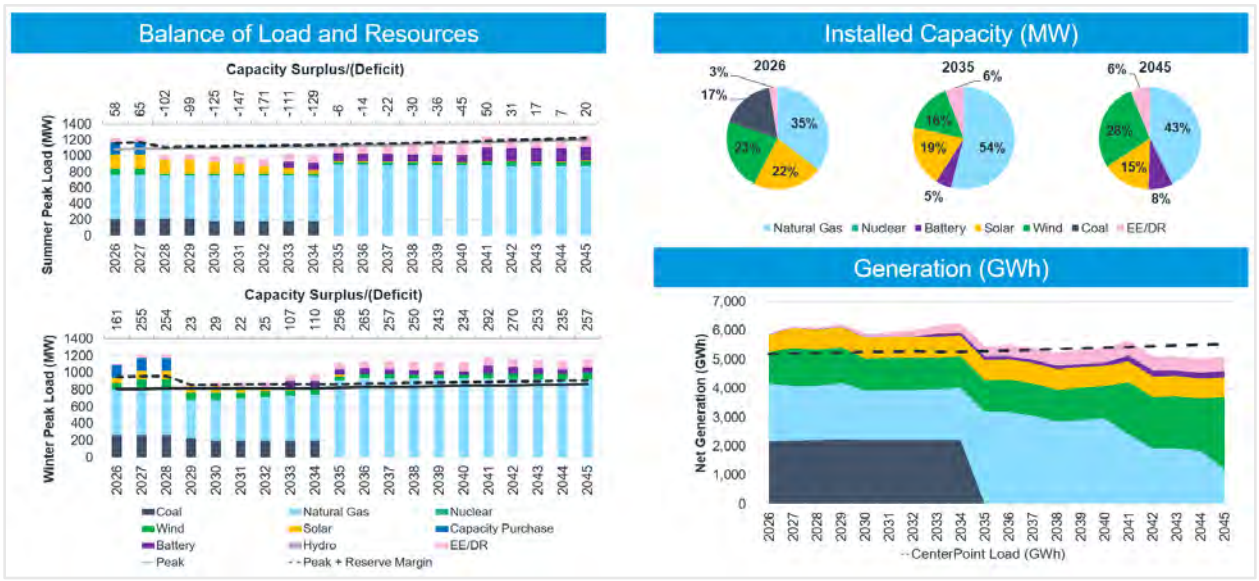
4.3.5. F.B. Culley 3 to Simple Cycle Gas Turbine

This fifth portfolio examines the replacement of CEI South's final coal-fired generating unit that it operates, F.B. Culley 3, with a new 385 MW SCGT. The retirement of F.B. Culley 3 at the end of 2034 is intentionally aligned with the in-service date of the new gas unit, which would begin operation in early 2035. In the absence of converting A.B. Brown 5 and 6 to a combined-cycle configuration (A.B. Brown 7), the portfolio experiences a temporary capacity shortfall that is addressed through the addition of a 100 MW battery storage resource in 2033. Additional wind and battery resources are introduced in the later years of the study to meet growing energy and capacity requirements. Figure 4-13 summarizes the simulated results for this portfolio under Reference Case conditions.

This portfolio maintains flexibility by keeping A.B. Brown 5 and 6 units as combustion turbines and deferring the replacement of F.B. Culley 3 to the beginning of 2035. This reduces risk from changes in regulations and market conditions, reduces the need for near-term investment, and keeps the near-term incremental energy burden low. The addition of storage and wind resources to meet capacity and energy needs over time allows for increased renewable reliance but also increases cost in the long-term, leading to a 20-year NPVRR that is 16% greater than the least-cost portfolio. Because the portfolio is highly reliant on gas combustion turbines, it faces risk associated with gas cost, capacity,

availability of gas, and pipeline regulations that could potentially increase the portfolio's already high long-term cost.

Figure 4-13 – F.B. Culley 3 to Simple Cycle Gas Turbine Results Dashboard



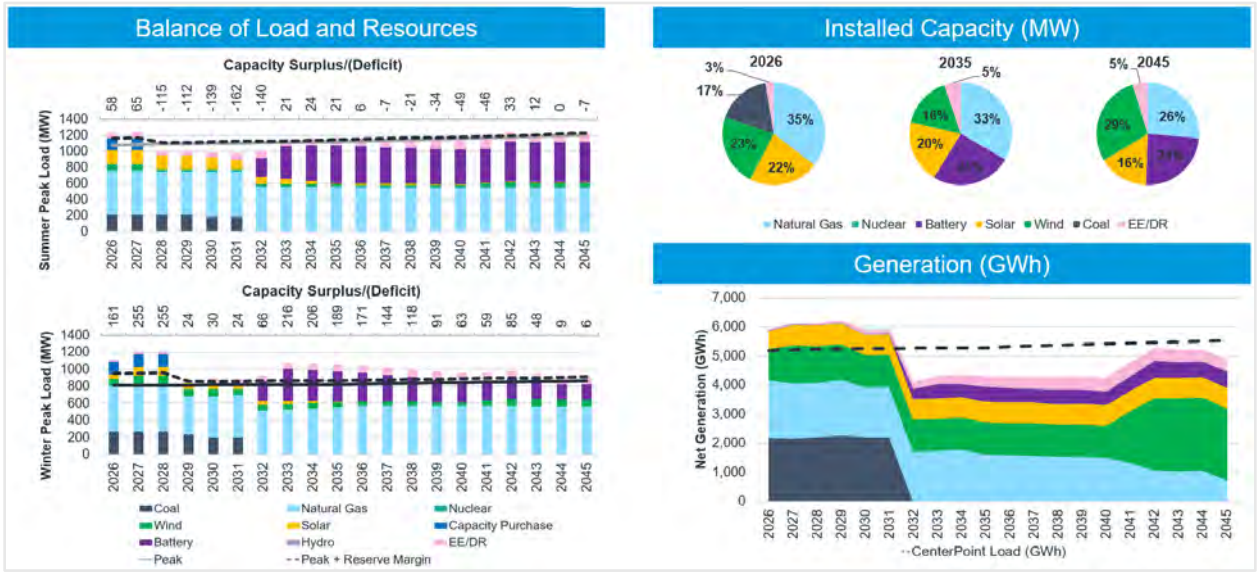
4.3.6. Renewable Heavy Portfolio

This portfolio examines a pathway in which CEI South meets its long-term capacity and energy needs primarily through renewable and storage resources while still maintaining existing thermal gas units. In this portfolio, F.B. Culley 3 retires at the end of 2031, and the model immediately replaces that capacity with 300 MW of 4-hour storage resources in 2032. As the study period continues, the model adds additional storage and wind resources for a cumulative total of 600 MW of storage capacity and 400 MW of wind capacity. The balance of load and resources shown in Figure 4-14 illustrates that this portfolio is generally short on capacity during the summer despite substantial renewable additions. This reflects the declining capacity accreditation of intermittent technologies, which is accelerated under MISO's Direct-Loss-of-Load methodology. The figure also shows that the portfolio is reliant on energy purchases from the retirement of F.B. Culley 3 at the end of 2031 until the end of the planning horizon.

While the rate impact of this portfolio is limited until 2032 due to minimal capital investments and the inclusion of tax incentives before IRA sunset, the long-term cost and cost risk in this portfolio are high. The portfolio is heavily reliant on market capacity purchases in the near-term and energy market purchases in the long-term, a major risk associated with this portfolio. Future uncertainty around MISO's accreditation could result in even greater

capacity deficits. The portfolio is relatively environmentally friendly with low CO_2 emissions, but that comes with execution risk from procuring the amounts of storage and wind needed for this portfolio to function. The loss of interconnections at F.B. Culley 2 and F.B. Culley 3 also make this portfolio inflexible and less able to adapt to regulatory and market conditions.

Figure 4-14 – Renewable Heavy Portfolio Results Dashboard



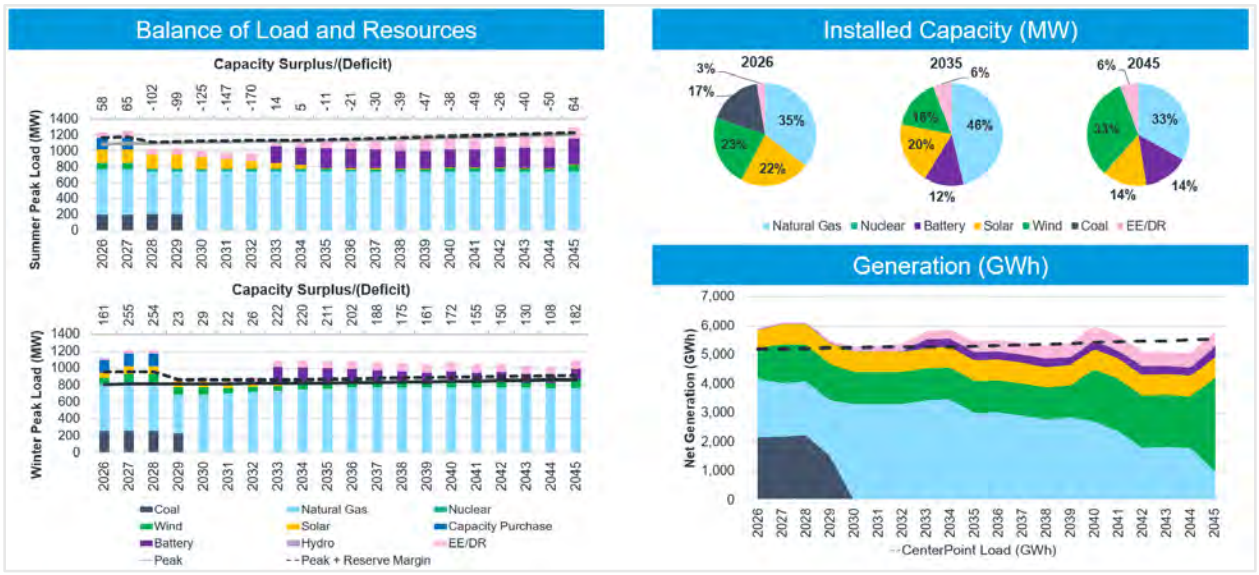
4.3.7. F.B. Culley 3 Gas Conversion with Renewables

This portfolio evaluates the conversion of F.B. Culley 3 from a coal resource to a natural gas-fired unit at the beginning of 2030. This portfolio does not utilize the interconnect at F.B. Culley 2 and does not convert the A.B. Brown 5 and 6 combustion turbines to A.B. Brown 7. Without additional capacity at those existing sites, this portfolio adds firm capacity to the portfolio through additional storage resources in 2033. Similar to previous portfolios, additional wind and storage resources are built in the later years of the study period to meet future energy and capacity needs. As shown in Figure 4-15, as the new resources continue to come online, the generation from F.B. Culley 3 generally declines.

This portfolio has moderate overall emissions released, with the lowest SO_x emissions but the second highest NO_x emissions. Despite the high NO_x emissions, the portfolio is generally well positioned in case environmental regulations change because of its renewable emphasis and the early conversion of F.B. Culley 3. However, the portfolio is among the highest cost portfolios with a high incremental energy burden in both the near and long-term. Additionally, for most years of the planning horizon, this portfolio falls short

on accredited capacity, which exposes CEI South to capacity market price swings and represents a risk as renewable accreditation continues to change.

Figure 4-15 – F.B. Culley 3 Gas Conversion with Renewables Results Dashboard



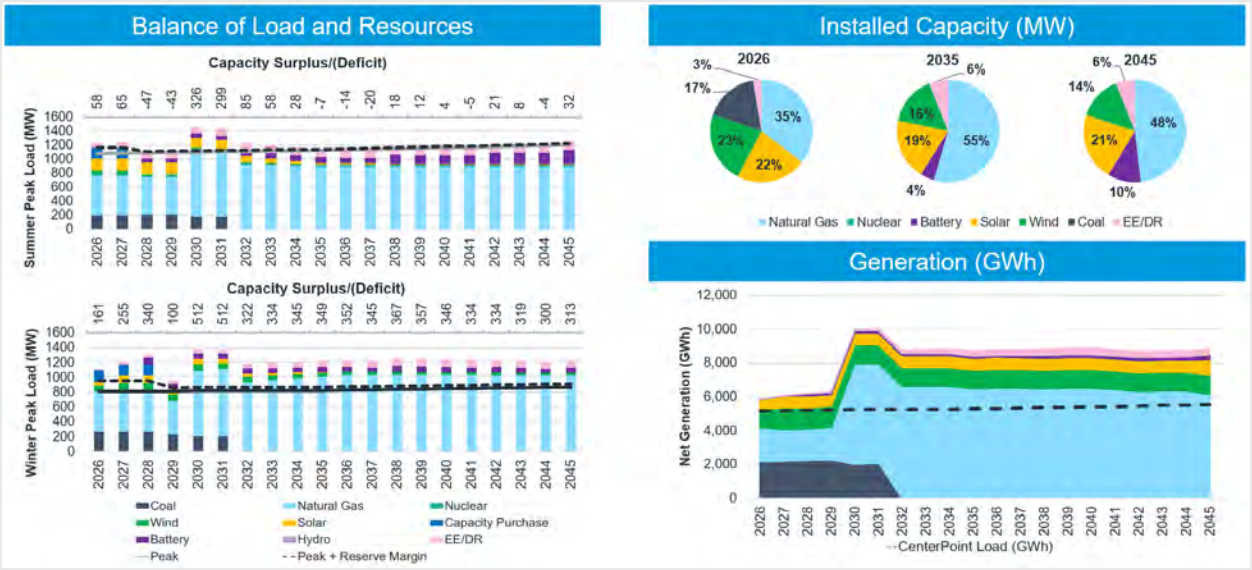
4.3.8. Low Regulatory Portfolio

As mentioned previously, there are three scenario-driven portfolios that are the optimized model results from running the various scenarios. This portfolio represents the optimized outcome under the Low Regulatory scenario, which assumes higher load growth and lower capital costs relative to the Reference Case, driven by reduced regulatory pressure and stronger economic forecasts. Under this scenario, natural gas prices grow modestly while capital cost curves for new construction remain comparatively low.

This portfolio reuses the interconnection at F.B. Culley 2 for a 90 MW battery storage project, which comes online at the beginning of 2028. This portfolio also selects to convert the A.B. Brown 5 and 6 to A.B. Brown 7 in 2030 while retiring F.B. Culley 3 at the end of 2031. Similar to the reference case, additional storage resources are added to the system in 2038 and 2042, indicating the need for long-term capacity on CEI South's system. Finally, in the last year of the study, the model selects a hybrid solar plus storage resource to address the accelerated load growth in this scenario. Pairing the solar resource with storage allows for additional solar produced during the midday hours to be stored and used during peak times. Figure 4-16 displays the results of how the low regulatory portfolio performs under reference case assumptions.

Because it relies heavily on a highly efficient combined cycle gas turbine (“CCGT”) at A.B. Brown and reuses the F.B. Culley 2 interconnection for storage, portfolio 8 is relatively inexpensive. Although its NPVRR is only 1% greater than the lowest NPVRR portfolio, the early conversion of A.B. Brown does necessitate a near-term rate increase. The portfolio has among the highest energy sales, which introduces a risk that NPVRR could increase if MISO energy market conditions change. This portfolio has moderate overall emissions, though it has the lowest NO_x emissions rate.

Figure 4-16 – Low Regulatory Portfolio Results Dashboard



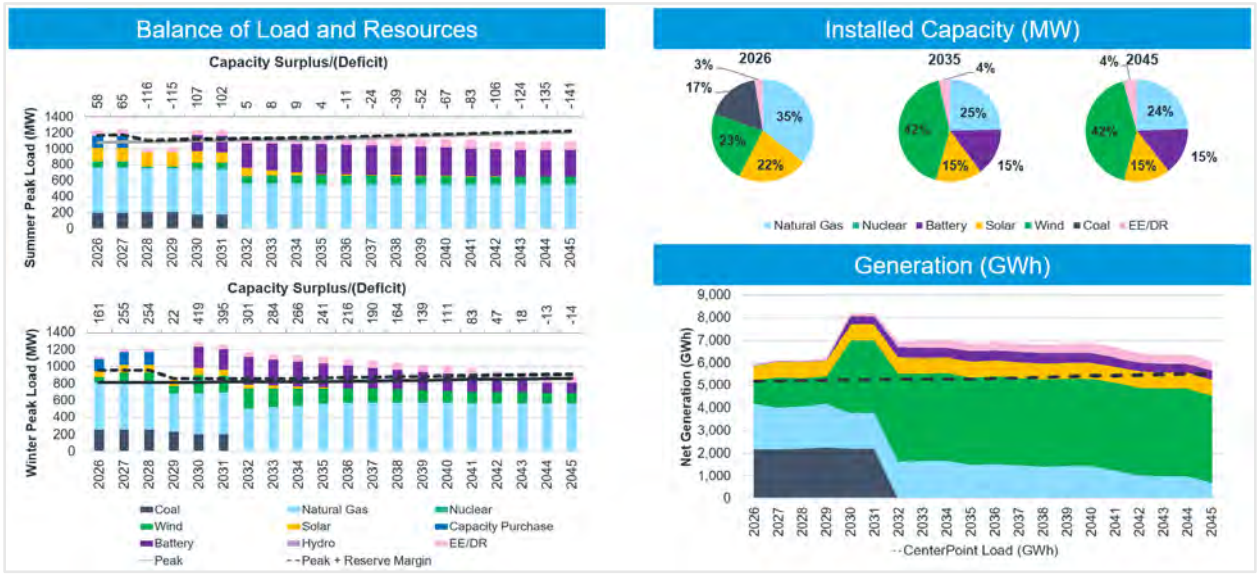
4.3.9. High Regulatory Portfolio

In the High Regulatory scenario, load is assumed to grow at a reduced rate compared to the Reference Case. It has increased fuel prices and lower capital costs for generation resources. Additionally, this scenario includes environmental regulation based on the Clean Air Act (CAA) 111(b) for new gas resources and includes its expansion to existing gas resources, limiting all new and existing gas resources to a 40% annual maximum capacity factor. Moreover, the inclusion of the CAA 111(d) restricts the options for F.B. Culley 3 to either co-fire or convert to natural gas by 2030 or retire by 2032. During the optimization under this scenario, the model selected to retire F.B. Culley 3 at the end of 2031 and continue operating A.B. Brown 5 and 6 without a conversion. The model chooses to fill the capacity and energy gap entirely through hybrid wind and storage resources, for a cumulative total of 800 MW of wind and 400 MW of storage by 2032. Figure 4-17 shows the performance of the high regulatory portfolio under reference case assumptions. Note that since this portfolio is developed to meet a lower load growth, when it is simulated with

Reference Case assumptions, it has a significant shortfall on capacity in the later years of the study.

The High Regulatory portfolio is environmentally friendly with the lowest CO_2e emissions rate and CO_2e intensity. It is well positioned in case environmental regulations change with minimal fuel cost and regulatory compliance risk because of its strong renewable emphasis and F.B. Culley 3 retirement. With 400 MW of storage resources, this portfolio high relatively high fast start capabilities. However, this portfolio is expensive across all affordability metrics, with a high near- and long-term incremental energy burden and NPVRR. Moreover, the inclusion of such large additions (800 MW of wind and 400 MW of storage) across two years brings a significant execution risk, capacity accreditation risk, and likely congestion risk.

Figure 4-17 – High Regulatory Portfolio Results Dashboard



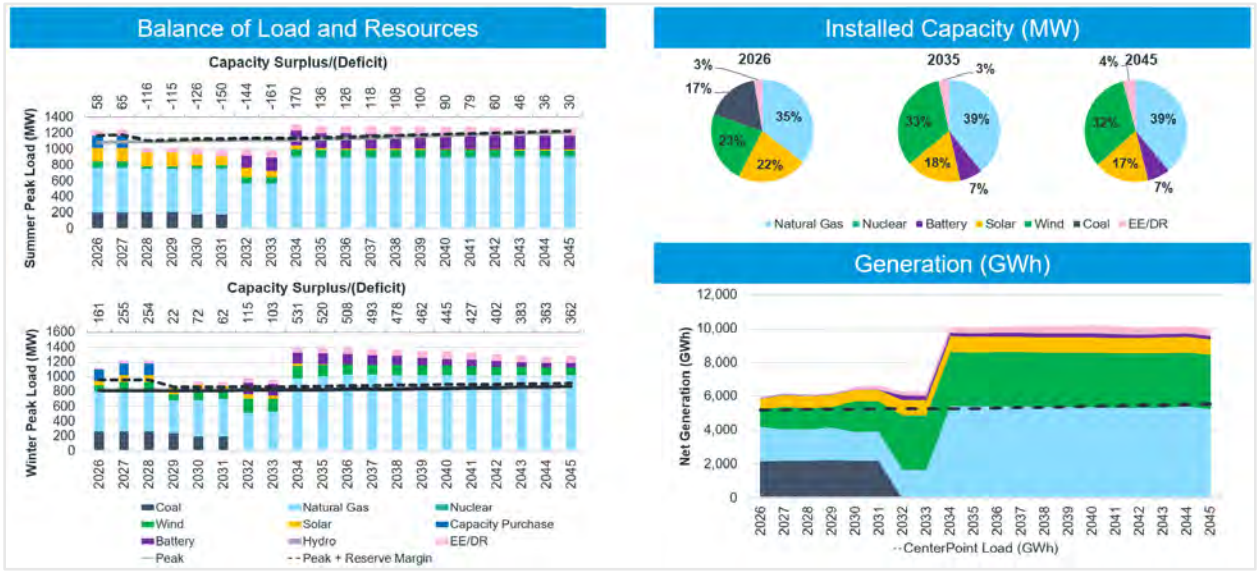
4.3.10. Alternate High Regulatory Portfolio

This portfolio reflects the optimized outcome under the Alternate High Regulatory scenario, which assumes the highest load growth among the scenarios, combined with elevated fuel prices and new resource capital costs. In this portfolio, the interconnection rights expire at F.B. Culley 2 and F.B. Culley 3 retires by 2032 without replacement. The A.B. Brown 5 and 6 combustion turbines are selected to convert to A.B. Brown 7 at the beginning of 2034. To meet long-term energy and capacity needs, the model also selects additional renewable resources, specifically, 600 MW of wind, 200 MW of storage, and 100 MW of solar. As shown in the Balance of Load and Resources chart given in Figure 4-18, the portfolio is

long on capacity when simulated under Reference Case assumptions, reflecting the lower load forecast relative to the Alternate High Regulatory scenario.

The Alternate High Regulatory portfolio is moderately high in cost in both near-term energy burden and 20-year NPVRR. It has the third lowest total CO_2e emissions and second lowest CO_2e intensity because of the renewable emphasis and efficiency of the CCGT at A.B. Brown, minimizing environmental regulatory risk. The need for renewables and storage in the near-term does present execution risk, and the portfolio is generally reliant on capacity purchases until the A.B. Brown conversion takes place in 2034.

Figure 4-18 – Alternate High Regulatory Results Dashboard



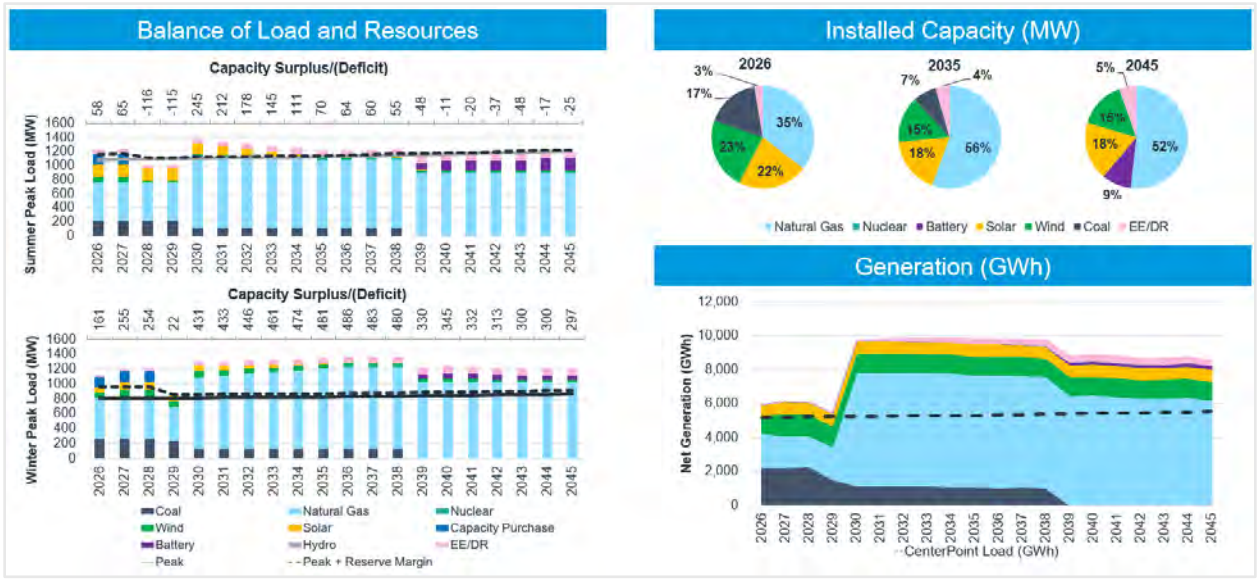
4.3.11. F.B. Culley 3 Co-Fire Portfolio

This portfolio, largely inspired by the regulatory requirements with the Clean Air Act 111, investigates retrofitting F.B. Culley 3 to co-fire with 40% natural gas and 60% coal, until its retirement at the end of 2038. A.B. Brown 5 and 6 convert to A.B. Brown 7 in 2030, which adds additional dispatchability and firm capacity to the portfolio. As illustrated in Figure 4-19, there is excess capacity on the system during the 8 year period in which F.B. Culley 3 is online with A.B. Brown 7. Following the retirement of F.B. Culley 3, the model fills the capacity need with storage resources.

This portfolio is relatively inexpensive as its NPVRR is within 3% of the least-cost portfolio. It is the only portfolio where the incremental energy burden decreases from 2030 to 2035,

so while it has a moderate energy burden in 2030, it has the lowest energy burden by 2035. Despite the low overall costs, the two conversion projects are susceptible to execution risk as well as near-term rate increases due to the large capital investments. While the portfolio is consistent with current state and federal near-term objectives to maintain coal, the continuation of F.B. Culley 3 on coal renders this portfolio exposed to future regulatory risk. Additionally, there are operational risks associated with blending fuels.

Figure 4-19 – F.B. Culley 3 Co-Fire Portfolio Results Dashboard



4.3.12. Delayed Reference Case Portfolio

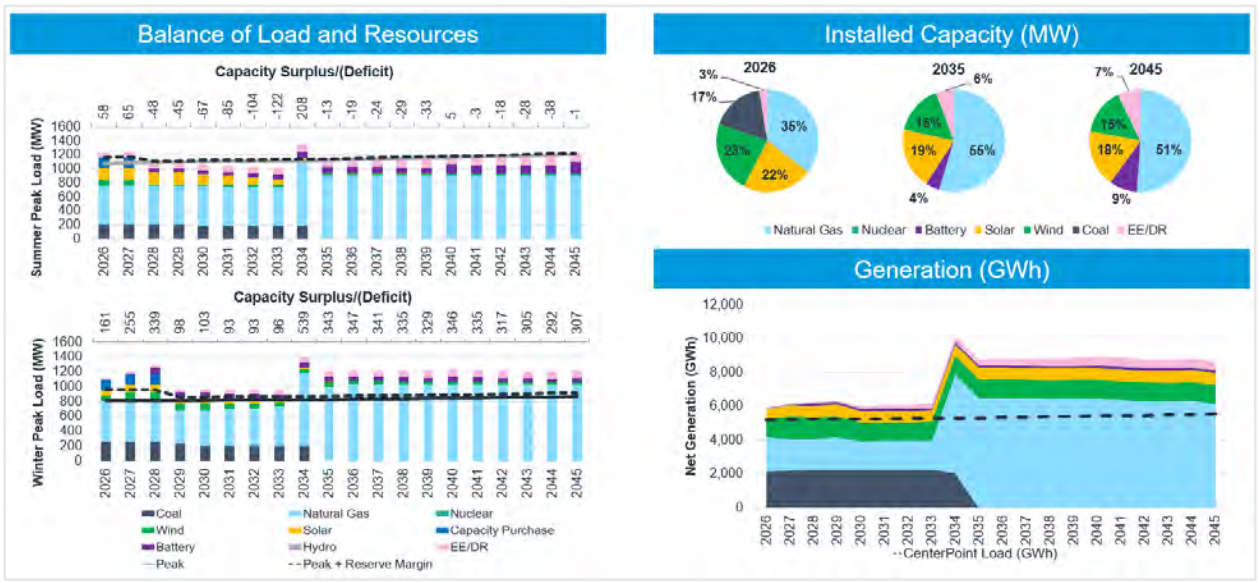
This final portfolio reflects a similar resource plan to the reference case but with delayed timing for major resource decisions to be determined in a future IRP, particularly A.B. Brown 7 which begins operations in early 2034 and F.B. Culley 3 that retires at the end of that same year. By aligning the A.B. Brown 7 conversion date to occur within the same year as the retirement of F.B. Culley 3, the delayed conversion minimizes near-term capital spending and results in less overbuild than the reference case, as illustrated in the Balance of Load and Resources in Figure 4-20.

Additionally, installing a 90 MW battery energy storage resource at F.B. Culley 2 in 2028 leverages existing site infrastructure and interconnection, avoiding future cost risk, while deferring the need for additional capital expenditures for capacity resources until 2040, seven years after the Reference Case begins investing in additional storage. The inclusion of the 4-hour battery at F.B. Culley 2 was tested through a sensitivity analysis, which found that storage resources are more cost-effective than gas options at the site. Furthermore,

pursuing a battery at F.B. Culley 2 or a generic storage resource later in the study period resulted in less than a 0.1% difference in total portfolio costs. As such, the F.B. Culley 2 battery project is included in this portfolio.

The delayed reference case is relatively inexpensive with an NPVRR within 3% of the reference case. It has a moderately low incremental energy burden in the near-term and a moderate CO_2e emissions rate. The delay of the conversion for A.B. Brown and retirement of F.B. Culley 3 makes this portfolio highly flexible, awarding additional time to reassess and adapt to changing regulatory, economic, and market landscape.

Figure 4-20 – Delayed Reference Case Portfolio Results Dashboard





The Preferred Portfolio

Chapter 5

5.1. Preferred Portfolio Recommendation

Based upon several factors, CEI South's Preferred Portfolio is the Delayed Reference Case.

5.1.1. Description of the Preferred Portfolio

The Preferred Portfolio includes a combination of new and existing supply- and demand-side resources designed to balance affordability, reliability, and environmental performance. Supply-side additions include a 90 MW battery at F.B. Culley 2 by 2028, conversion of A.B. Brown 5 and 6 (850 MW) in 2034, and retirement of F.B. Culley 3 (270 MW) by 2035, along with an additional 100 MW of storage between 2040 and 2045. These supply-side resources are complemented by demand-side resources: demand response and energy efficiency. These demand-side resources include seven near-term programs (2026–2027) from the approved plan, along with twenty additional programs across the commercial, residential, and income-qualified sectors over the remainder of the planning horizon. Collectively, these programs account for 46 MW of capacity in the first year of the study period and increase steadily to 156 MW by 2045.

The Preferred Portfolio (Delayed Reference Case) performs well across a range of metrics, both in absolute terms and relative to the other candidate portfolios. The Preferred Portfolio was within 3 percent of the lowest-cost portfolio. It ranked 3rd out of 12 portfolios in the 95th percentile cost risk metric. It does not over-rely on purchases or sales of energy or capacity. The Preferred Portfolio maintains 270 MW of reasonably low-cost, dispatchable capacity to support CEI South customers during the worst weeks of each season, providing a physical hedge against high energy prices during peak periods. It also capitalizes on the ability to reuse the interconnection at F.B. Culley 2 while allowing time to reassess regulatory and market conditions during the next IRP.

Importantly, it provides flexibility and optionality as MISO adapts to higher future levels of renewables across the system, allowing more time for other technologies, like long-duration battery storage and small modular reactors, to be commercialized. The ability to retire F.B. Culley 3 provides CEI South with a structured pathway to shift toward a lower-carbon portfolio as technology and regulatory conditions evolve.

The Preferred Portfolio is among the best performing portfolios across multiple measures on the scorecard and provides several additional benefits to CEI South customers and other stakeholders, including that it:

- Presents an affordable portfolio for customers as it limits near-term capital investment resulting in a relatively low incremental energy burden. Of the top five

least-cost portfolios, the Preferred Portfolio shows the smallest range of expected revenue requirements, indicating that it has less price volatility.

- Includes a diverse mix of resources—solar, wind, and energy efficiency—supported by dispatchable generation, storage, and demand response resources; protects against overreliance on the market for energy and capacity.
- Maintains flexibility with multiple off-ramps to adapt to a rapidly evolving industry, including a multi-year resource buildout across several sites and the option to replace F.B. Culley 3 as technology and market conditions change. This flexibility also enables CEI South to respond to new economic development opportunities.
- Hedges against future cost risks and uncertainty by maintaining the F.B. Culley 2 and F.B. Culley 3 interconnection rights.
- Maintains tax base in Warrick County, which is particularly important to the local school system in that county. Moreover, the Preferred Portfolio adds jobs and tax base to Posey County in 2034.
- Allows for continued use of existing plant assets, helping to avoid future potential stranded assets.
- Continues CEI South's energy efficiency programs with near-term energy savings of 1.18% of eligible sales over the next 6 years, and further long-term energy savings opportunities of 1.17% of eligible sales identified over the remaining 14 years of the 20-year period. CEI South is committed to Energy Efficiency to help customers save money on their energy bills and will continue to evaluate this option in future IRPs.
- Continues existing demand response programs, including the DLC Residential AC Switch Program, Residential Bring Your Own Thermostat ("BYOT", also known as the Thermostat Load Control Rider), and the approved Aggregation Demand Response Program launched in September 2025. The portfolio also continues implementation of CPP Time-of-Use rates beginning in 2028; note that the residential pilot is expected to begin in Q2 2026. In addition, a new Commercial Bring Your Own Thermostat program will be introduced, operating consistently with the existing residential thermostat program.

5.1.2. Reliability

Reliability is commonly measured by the ability of a system to meet load without unserved energy. In the probabilistic Risk Analysis, the Preferred Portfolio was tested through Reference Case assumptions as well as different elements from the three alternative scenarios, each of which had widely varying market assumptions for fuel prices, emissions prices, load, and capital costs. In each of these simulations, the Preferred Portfolio consistently met MISO's seasonal PRMR and experienced negligible hours of unserved energy. These results confirm that the portfolio provides reliable service under both expected and stressed operating conditions over the 20-year study horizon.

In the near-term, the portfolio contains two highly dispatchable combustion turbines totaling 460 MW. These units provide fast-ramping capability and can reach full output within ten minutes, offering essential backup to variable renewable generation and serving as a hedge against volatility in both the energy and capacity markets. Following the conversion of these combustion turbines to a combined cycle in 2034, ramp times will lengthen to about 30 minutes, but overall thermal efficiency will increase significantly and have the ability to follow load.

Complementing these units is 90 MW of storage beginning in 2028 along with an additional 100 MW of storage by the end of the study period. These storage resources can dispatch at full output in less than one minute, providing immediate response to fluctuations in renewable output or system contingencies. The portfolio also retains 180 MW of existing combustion turbines, one of which provides black start capability, ensuring resilience during grid restoration or multi-day low-renewable conditions. Collectively, these resources enable the system to meet peak demand during periods of limited solar and wind production and to maintain service during seasonal high-risk weeks.

While not an explicit objective in the balanced scorecard, resource diversity supports reliability by reducing dependence on any single fuel or technology. The Preferred Portfolio achieves a balanced mix of peaking and baseload natural gas, solar, wind, battery storage, and demand-side resources. This diversity mitigates risks such as an extended cloudy period (reducing solar generation) or a fuel disruption that can come from a force majeure event on a gas pipeline that could otherwise compromise system reliability.

CEI South has signed a contract with Enel X to add commercial and industrial demand response resources through the approved Aggregation Demand Response rider. 12 MW were included in the Preferred Portfolio in 2026, increasing to 25 MW in 2027, and CEI South has received twenty customer letters of authorization to begin sharing interval meter data for potential program enrollment. Additionally, CEI South’s AMI system is being further developed to allow for a time-based rate. CEI South is currently developing a pilot program for a voluntary critical peak pricing rate. CPP better aligns the price customers pay for electricity with the cost of producing it by varying the price of electricity based on the time it’s consumed. Customers are charged more for electricity during certain periods of peak demand, encouraging customers to use less energy during critical times. Customers who participate have the opportunity to lower their overall electricity spending by shifting load to lower cost hours. As generation becomes more intermittent and less controllable, it will be more important to shape load in the future. These demand-based options will help to further diversify CEI South’s resource mix.

The Preferred Portfolio also includes a significant amount of local resources, namely the assets at the F.B. Culley and A.B. Brown sites. Local projects provide voltage support, physical hedging against high market prices, and reliability for CEI South's large industrial customers, who comprise nearly half of total load. Local generation also reduces the need to construct new high voltage power lines to bring clean renewable power to our area. These transmission projects take years to complete, often require eminent domain and ultimately cost customers money.

CEI South worked with 1898 & Co. to conduct an analysis and review reliability for several alternative paths at existing CenterPoint sites. This near-term assessment reviewed thermal loadings, voltage, VAR support, and transfer capability. Minimal mitigations were identified in the case of F.B. Culley 2 storage, F.B. Culley 3 remaining operational, and the A.B. Brown generation conversion to a combined cycle. For additional study details, see *Technical Appendix Attachment 2.3 Transmission Study (Confidential)*.

5.1.3. Resilience

The Preferred Portfolio offers CEI South customers a blend of renewable energy along with highly efficient, dispatchable thermal generation to maintain system reliability under a range of operating conditions. The combustion turbines currently at A.B. Brown will continue to offer fast ramping capability when needed. When they transition to baseload resources, following the conversion, they will provide additional spinning reserve benefits by supporting system frequency and replacing generation during sudden outages. The continuation of F.B. Culley 3 through the end of 2034 enhances near-term resilience by supplying dependable, dispatchable capacity and spinning reserve benefits. These dispatchable resources are critical to grid resilience, particularly when intermittent resources experience long duration droughts, periods of sustained high demand, or potential future winter weather events. The Preferred Portfolio also includes a combustion turbine with black start capability, offering an additional degree of increased resiliency and operational flexibility.

The chosen portfolio also maintains both of the existing interconnection rights at F.B. Culley 2 and 3, for 90 MW and 270 MW, respectively. This protects customers from untimely delays associated with a generation resource at another location, especially with the extensive MISO queue delays in recent years due to the record amount of interconnection requests submitted. In addition, it shields customers from potential transmission upgrade costs because the increase in interconnection requests is exhausting available transmission capacity. In addition to preserving these rights for future replacement resources, the continued operation of F.B. Culley 3 provides valuable spinning mass on

CEI South's system, supporting local grid frequency. This makes the local grid more resilient to sudden system disturbances.

5.1.4. Stability

A transmission analysis was performed on four unique groups defined by the operational status of F.B. Culley 3 (retirement or continued operation) and A.B. Brown 5 and 6 (conversion or no conversion). As described in Section 2.8.3.1, short circuit ratio ("SCR") and dynamic reactive power ("VAR") support were used as the primary transmission metrics to assess system stability. The Preferred Portfolio, which includes the conversion of A.B. Brown 5 and 6 at the beginning of 2034 as well as the retirement of F.B. Culley 3 at the end of that same year, performed well in both stability metrics. Notably, the Preferred Portfolio has the second highest dynamic VAR support, indicating strong voltage stability during and after major grid disturbances.

In addition to the scoring assessment, a more detailed transmission study evaluated the system impacts of individual unit retirements and additions. The study found that if F.B. Culley 2 were to retire and no other units were brought online, the transmission system would require about $47.9 million in upgrade costs. These upgrade costs were incorporated into the Preferred Portfolio's NPVRR, recognizing that these expenses could be incurred if the site's planned battery storage remains idle. Including this assumption ensures that the Preferred Portfolio reflects a prudent estimate of potential transmission investment needs.

5.1.5. Environmental Sustainability

The Environmental Sustainability objective was evaluated utilizing the stochastic analysis and is quantified using four metrics:

- CO_2 equivalent emissions (stack emissions) intensity (tons of CO_2e/kWh)
- CO_2 equivalent emissions (tons of CO_2e)
- SO_x emissions (tons of SO_x)
- NO_x emissions (tons of NO_x)

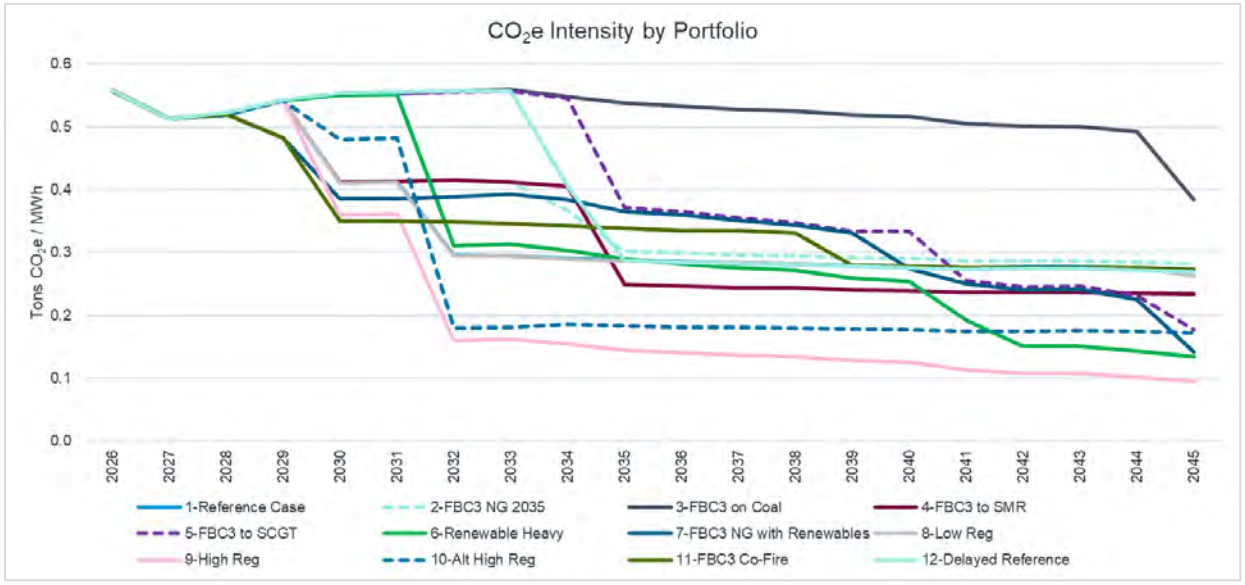
The inclusion of CO_2e is useful as it measures not only CO_2 but other emissions, such as methane and nitrous oxide. Conversion factors were applied to CO_2 from the Electronic Code of Federal Regulations ("eCFR")[39,40] to convert to CO_2 equivalence. All metrics measure the total amount of pollutants that go into the atmosphere over the 20-year planning period rather than at a given point in time.

[39] Methane (CH4) and nitrous oxide (N2O) emission factors for coal (bituminous) and natural gas taken from Table C-1 to Subpart C of 40 CFR Part 98. December 9, 2016.
[40] Chemical-specific Global Warming Potentials ("GWPs") taken from Table A-1 to 40 CFR Part 98 Subpart A for a 100-year time horizon. December 11, 2014.

The Preferred Portfolio performs moderately well in the Environmental Sustainability objective, reducing annual CO_2e emissions by more than 7 million tons over the 2026-2045 study period compared to the BAU portfolio (Portfolio 3). As illustrated by Figure 5-1, the retirement of F.B. Culley 3 at the end of 2034 causes a significant drop in total emissions. During the same year, the conversion of A.B. Brown 5 and 6 combustion turbines to a highly efficient combined cycle also contributes to declining emissions.

By 2035, the Preferred Portfolio was found to reduce CO_2 emissions in the reference case by approximately 72% compared to the baseline year of 2005. This represents an annual reduction of approximately 7.5 million tons of CO_2 from the baseline of 9.6 million tons of CO_2, with the small remainder driven mostly by the A.B. Brown units.

Figure 5-1 – Average CO_2e Emissions Intensity across 200 Draws



5.1.6. Affordability

Affordability is a key objective in the balanced scorecard that is measured as part of the stochastic analysis. The primary measure for affordability is the 20-year NPVRR, which comes from the stochastic mean (average) of 200 iterations of a portfolio as it is simulated in the dispatch model under varying market conditions. Each iteration provides the total annual cost of each component of total portfolio cost, including fuel costs, emissions costs, variable operations and maintenance costs, fixed operations and maintenance costs, energy export revenues (sales), energy import costs (purchases), capacity market sales revenues, and capacity market purchase costs. Each annual cost category is then summed

into a total portfolio cost and discounted by CEI South's weighted average cost of capital to arrive at the NPVRR. The lower the NPVRR is for a portfolio, the lower the rates can be to recoup the cost to serve load over the next 20 years. The stochastic methodology allows for a rigorous analytical framework to determine the affordability of a portfolio.

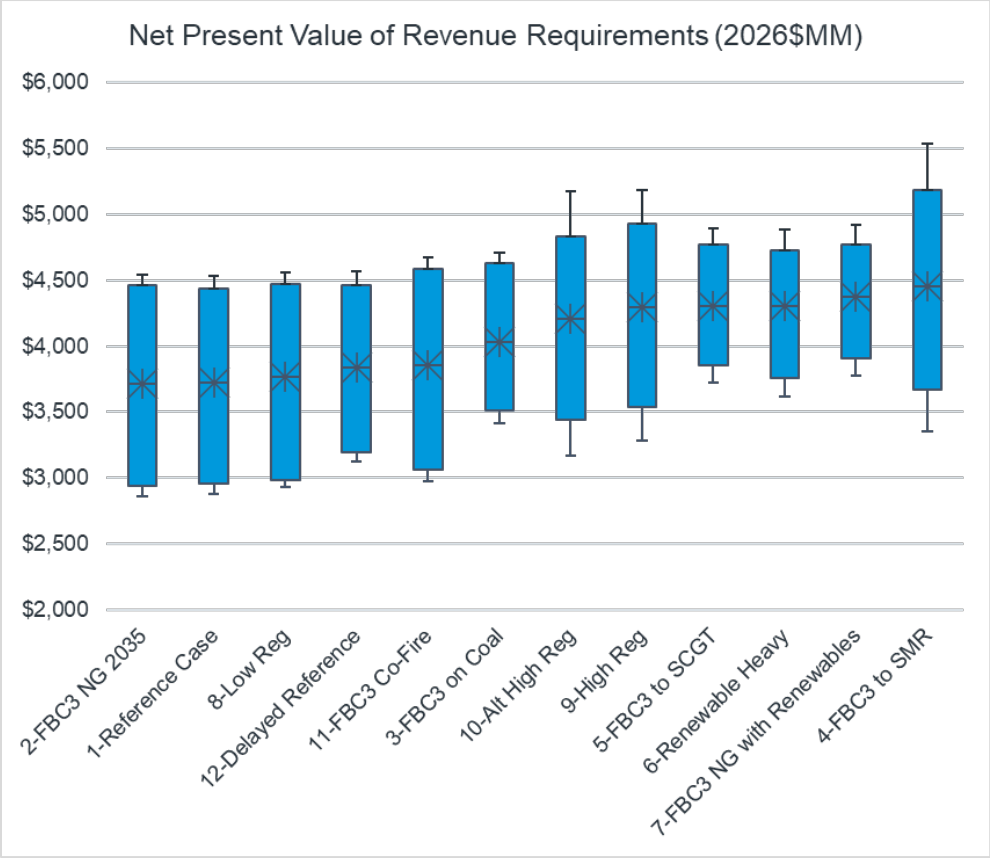
The Preferred Portfolio is within the least-cost portfolios and performs well in the other quantitative affordability metrics including 5th and 95th percentiles of NPVRR and incremental energy burden. Beyond the NPVRR, the Preferred Portfolio mitigates future cost risk through moderate reliance on energy and capacity market sales and using local resources, which have an additional benefit.

5.1.6.1. Portfolio Cost Comparison

Figure 5-2 summarizes NPVRR outcomes from 200 stochastic iterations for each portfolio, showing the minimum, the fifth percentile, the average (indicated by the star), the ninety-fifth percentile, and the absolute maximum. As illustrated in the figure, the Preferred Portfolio has the narrowest range of possible NPVRRs of the top 5 least-cost portfolios. This indicates less variability in future portfolio costs, revealing cost stability among changing market conditions. The 5th percentile of costs is approximately $3.2 billion while the 95th percentile is approximately $4.5 billion, meaning that 90% of the 200 runs created a total net present value of revenue requirements between those two values.

The Preferred Portfolio is among the lowest cost portfolios across the 12 candidates, with a 20-year average NPVRR of $3,836 million. This NPVRR is within 2.9% of the Reference Case portfolio and 3.2% of the least cost portfolio. The Preferred Portfolio is nearly $200 million less expensive than BAU which continues F.B. Culley 3 on coal (the sixth most expensive portfolio in this objective category), which saves customers money in the long-term. Moreover, if sales revenues come in as modeled, the incremental energy burden shows a minimal increase in affordability over both the near and long-term.

Figure 5-2 – Net Present Value of Revenue Requirements for All Portfolios



5.1.6.2. Future Affordability

Moreover, of the top 5 least-cost portfolios, the Preferred Portfolio shows the least reliance on future energy and capacity market sales to lower the NPVRR and make the portfolio more competitive. The greater the energy market sales by a candidate portfolio, the greater the exposure to the risk that energy prices will be lower than the short-run marginal cost of energy production from the CEI South fleet. Similarly, the greater the capacity market purchases that are required by a candidate portfolio, the greater the exposure to the risk that capacity market purchase prices will be higher than the cost of adding capacity to the CEI South fleet.

Figure 5-3 displays the near-term maximum, short-term maximum, and planning horizon average energy market sales expressed as a percent of total generation as well as the net present value of total capacity market sales in dollars. As seen in the Figure 5-3, four of the top five portfolios have an average of 26% of generation contributing to sales and a near-term maximum of 32%. As explained above and validated by the Indiana Commission in

Cause No. 45052, this is a risky proposition for a company of this size. In contrast, CEI South's Preferred Portfolio (12-Delayed Reference) sells a maximum of 17% of total generation in the near-term and averages 23% over the entire study period. Thus, even with lower energy market sales exposure, the Preferred Portfolio's total cost (NPVRR) remains within 3% of the least-cost portfolio.

Figure 5-3 – Portfolio Exposure to Market Sales

Portfolio	Energy Market Sales (%)			Capacity Sales NPV ($M)
	Average	Short Term Max	Long-term Max	
2-FBC3 NG 2035	26%	32%	31%	$217
1-Reference Case	26%	32%	30%	$140
8-Low Reg	26%	32%	30%	$167
12-Delayed Reference	23%	17%	31%	$115
11-FBC3 Co-Fire	26%	32%	31%	$192
3-FBC3 on Coal	15%	18%	18%	$117
10-Alt High Reg	25%	20%	32%	$159
9-High Reg	20%	26%	23%	$128
5-FBC3 to SCGT	14%	17%	18%	$93
6-Renewable Heavy	11%	16%	13%	$95
7-FBC3 NG with Renewables	14%	17%	19%	$106
4-FBC3 to SMR	26%	32%	31%	$171

In contrast, overreliance on market purchases also carries inherent risk. The greater the energy market purchases that are required by a candidate portfolio, the greater the exposure to the risk that energy prices will be higher than the short-run marginal cost of energy production from the CEI South fleet. Similarly, the greater the capacity market sales by a candidate portfolio, the greater the exposure to the risk, if capacity market prices are lower than forecasts the NPV reduction from capacity sales would be lower.

As shown in Figure 5-4, the Preferred Portfolio is moderately reliant on energy market purchases, which, on average over the planning horizon, was about 12% of total generation. While the other least-cost portfolios only had about 10% of total generation from market sales, this is due to the earlier conversion of A.B. Brown, which necessitates

a near-term rate increase. With regard to capacity market purchases, the Preferred Portfolio also performs moderately well. In the first four years of the study, this portfolio has the smallest capacity deficit, largely due to the addition of the firm capacity associated with the F.B. Culley 2 battery. While the ten portfolios that allow for the interconnection rights to expire at F.B. Culley 2 are forecasted to purchase nearly $5 million worth of capacity in 2028 and 2029, the Preferred Portfolio purchases are about half of that during the same time period. Thus, while the Preferred Portfolio includes moderate capacity purchases over the long-term, CEI South will continue to evaluate this path and prioritize affordability following submission of this IRP.

Figure 5-4 – Portfolio Exposure to Market Purchases

Portfolio	Energy Market Purchases (%)			Capacity Purchases NPV ($M)
	Average	Short Term Max	Long-term Max	
2-FBC3 NG 2035	9%	16%	9%	$6
1-Reference Case	10%	17%	11%	$14
8-Low Reg	10%	17%	11%	$6
12-Delayed Reference	12%	21%	11%	$18
11-FBC3 Co-Fire	10%	22%	11%	$12
3-FBC3 on Coal	19%	21%	26%	$22
10-Alt High Reg	9%	17%	5%	$19
9-High Reg	14%	17%	16%	$23
5-FBC3 to SCGT	21%	20%	29%	$26
6-Renewable Heavy	30%	37%	40%	$22
7-FBC3 NG with Renewables	23%	26%	30%	$24
4-FBC3 to SMR	9%	16%	8%	$13

5.1.6.3. Broader Affordability Impacts

Moreover, since the Preferred Portfolio proposes a significant amount of resources located within CEI South's service territory, the customers benefit from reduced congestion cost risk and additional tax base and jobs. Local generation helps to minimize the risks of differences in cost between where power is produced and where it is consumed. When

power is produced on system, customers minimize the likelihood of congestion charges, which can occur when delivering power via the transmission system.

Investing in local projects also helps produce tax base and jobs, which directly benefit the communities CEI South serves. Currently, CEI South primarily operates generation assets in two counties, generating tax revenues in Posey and Warrick counties. The Preferred Portfolio replaces F.B. Culley 2 with a battery storage system, which provides economic benefit to the local community, whereas simply purchasing the capacity from the market does not. Moreover, the Preferred Portfolio provides additional tax base in Posey County due to the A.B. Brown 5 and 6 conversion. Communities where CEI South customers live can utilize this money to support school systems, police, parks and recreation, and other critical support services. Additionally, these projects will continue to be operated by local employees that contribute to the local economy. Finally, the continued operation of F.B. Culley 3 on coal preserves the local tax base and contributes to Indiana's economy through the use of Indiana-mined coal and the associated mining employment.

5.1.7. Other

5.1.7.1. Future Flexibility

The Preferred Portfolio provides a low-cost plan with a great deal of forward-looking flexibility. The inclusion of the battery storage resource at F.B. Culley 2 addresses CEI South's capacity need while also maintaining a valuable MISO interconnection. Maintaining the interconnection avoids future cost risk. This portfolio provides time for other technologies to advance and potentially become more cost competitive as CEI South will reevaluate decisions at F.B. Culley 3 and at A.B. Brown 5 and 6, in a future IRP. This time also allows CEI South to adapt to changing regulatory and market conditions. Until such time, CEI South customers will benefit from the minimal capital investments in the near-term, providing rate stability.

5.1.7.2. Operational Flexibility

In the near term, the Preferred Portfolio includes Variable Energy Resources ("VER") in the form of nearly 400 MW each of solar and wind, balanced by 190 MW of energy storage resources and two 230 MW natural gas combustion turbines that transition into an 850 MW combined cycle gas turbine in 2034. The CT units, batteries, and CCGT can help to smooth out the intermittency of the VERs. The fast-ramping requirements of a system increase as the balance shifts toward increased VERs, particularly solar resources. The phenomenon known colloquially as the "duck curve" demonstrates the need for fast-ramping capability, a role that fast-start resources perform well, to handle the onset of evening peak demand concurrent with rapidly declining solar output. Moreover, the dispatchable CCGT will

provide critical baseload and load-following capability along with a lower emission profile. The high thermal efficiency and quick ramping capability of the unit will stabilize the net load variability and deliver reliable power during extended periods of low wind or solar production. This portfolio is expected to meet all operational flexibility requirements.

Following the conversion of the A.B. Brown combustion turbine units 5 and 6 to a CCGT, CEI South will retain a diverse and flexible set of natural gas units as it will maintain its' existing two 80 MW CT's. These peaking units can be brought online relatively quickly to address short-term fluctuations in demand, complementing the steady output of the CCGT. One of the two peaking units includes black start capability, providing operational flexibility. Maintaining both technologies strengthens operational flexibility, ensuring reliable service across a range of potential market and system conditions.

CEI South considers maintaining an adequate amount of dispatchable generation essential to ensuring reliable service for customers throughout all seasons and operating conditions. CEI South's experience shows that renewable generation can be unpredictable, therefore, a portion of generation should (a) provide a dispatchable (controllable) output (b) be able to start and stop more than once daily and be placed in service quickly and (c) respond to rapid changes in renewable output. Given the healthy number of dispatchable resources in the Preferred Portfolio, CEI South is not only able to meet current system needs but is positioned well to continue to investigate the addition of more intermittent generators on the system should the need arise.

5.1.7.3. Economic Development

The Preferred Portfolio positions CEI South well to provide relatively low-cost power to industrial customers and other large load users. The current plan offers flexibility and a hedge assurance, reducing market risk for customers. Specifically, CEI South must remain nimble and dynamic for prospective industrial customers and planning for the conversion of A.B. Brown 5 and 6 to a CCGT in 2034 provides this agility. CEI South aggressively pursues manufacturing opportunities which have direct, indirect, and induced economic benefits for the region and state of Indiana. CEI South's ability to attract and retain these types of customers is vital to the region's economic wellbeing. Job growth leads to increased earning opportunities for residents and at the same time raises state revenue and tax base. Additionally, large power users can assist all CEI South customers with lower utility rates by spreading the fixed cost recovery requirements for the rate base.

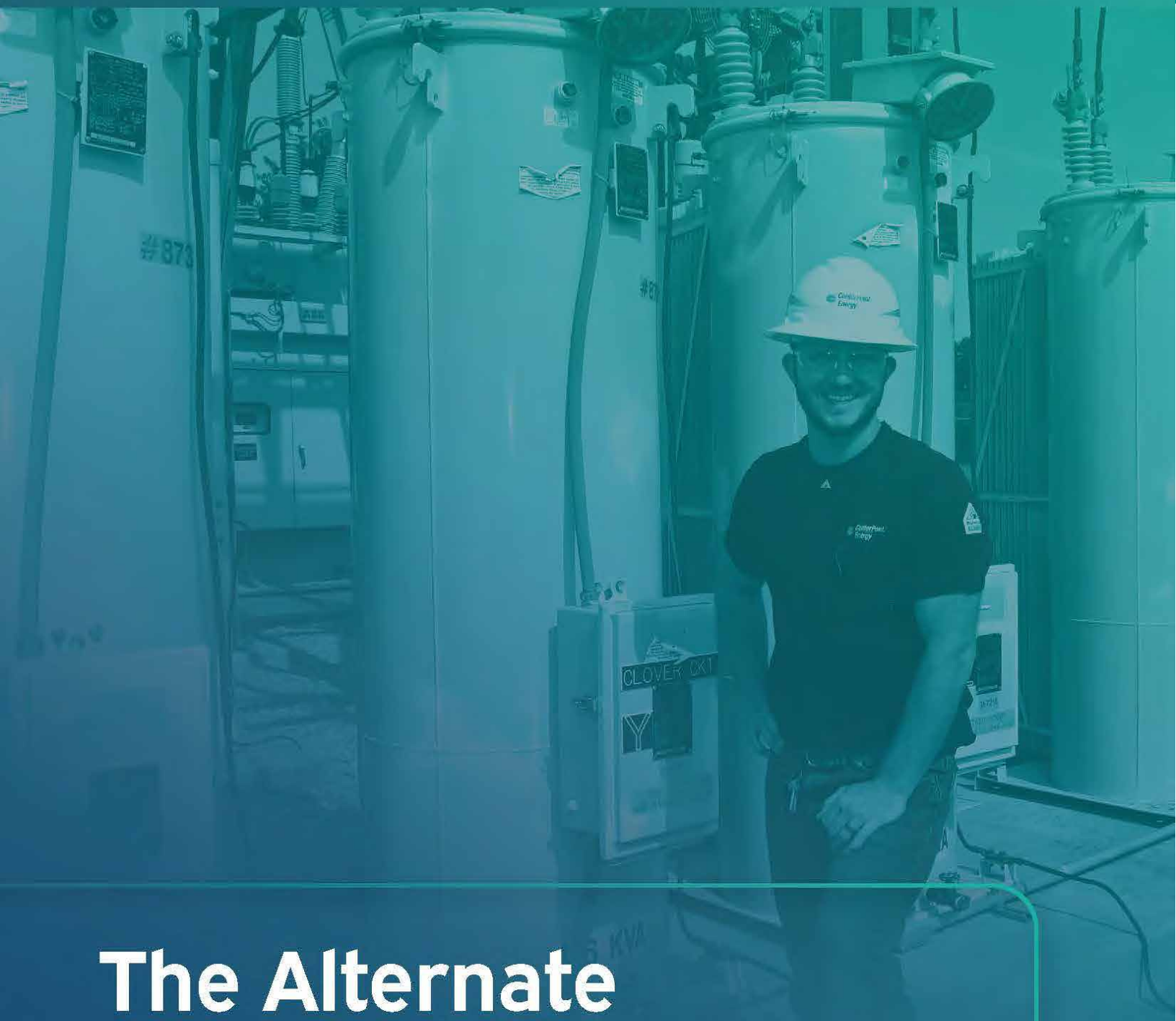
For industrial customers to maintain their required voltage level, the CEI South system must be able to supply an adequate amount of reactive power ("VARs"). Transmission planning studies have shown that this cannot be accomplished without on-network reactive power

supplying facilities, such as local synchronous generation. The CTs in the Preferred Portfolio provide reactive power support. Even when they are not dispatched normally, CTs are able to be started and brought online quickly if needed for CEI South system reliability. Moreover, when the A.B. Brown CTs are converted to a baseload combined cycle in 2034, the dynamic reactive power on the system increases. The A.B. Brown CTs as well as the CCGT also prevents CEI South from entering into Reactive Power Payments through the MISO market, which would impact CEI South customers' bills.

In addition, large customers and site selectors understand the comprehensive risks of market rate pricing and the corresponding volatility. The current IRP plan and the opportunity for future baseload generation allows for customers to remain confident in CEI South's ability to provide safe, reliable, and cost-effective service. CEI South's generation strategy is an essential service for customers and the region's economic growth capability.

5.1.8. Fuel Inventory and Procurement Planning

Prices for commodities such as coal and natural gas are influenced by market conditions and can vary significantly over time, introducing uncertainty into long-term planning. CEI South manages short-term price volatility through coal contract strategies that lock in prices to stabilize costs. Coal suppliers and transportation providers generally require firm commitments on quantities; however, CEI South coal contracts include optionality to adjust tonnage up or down to help manage operational variability which impacts inventory levels. Currently CEI South utilizes non-firm pipeline delivery and gas storage for the existing 80 MW peaking units and firm pipeline delivery and gas storage for the new A.B. Brown CTs. It is planned that the combustion turbines at A.B. Brown, if converted, will continue to utilize firm pipeline supply contracts.



The Alternate Preferred Portfolio

Chapter 6

6.1. Alternate Reference Case Portfolio Development

Following stakeholder feedback, the Alternate Reference Case was developed to evaluate the potential for a large load addition that scales over time. In this scenario, the new, additional load increases in 250 MW increments until it reaches 1,500 MW, while all other market assumptions remain consistent with the Reference Case. To support potential economic development opportunities in Southwestern Indiana, CEI South developed multiple portfolios to explore different pathways for serving future large load growth.

Specifically, five portfolios were considered, each designed to test alternate development pathways under the large load growth assumptions included in the Alternate Reference Case. One portfolio, similar to the scenario-based portfolios discussed earlier, was produced by allowing the model to freely optimize resource additions to create the least-cost portfolio that meets input assumptions. The remaining four portfolios were developed to explore different ways to serve an increased load by directing the model toward specified resource selections and then allowing optimization around those decisions.

The resulting portfolios are summarized in Figure 6-1. Across all portfolios, the model selected to reuse the interconnection rights at F.B. Culley 2 to construct a 90 MW storage facility in 2028, securing capacity to meet load growth and taking advantage of the investment tax credit benefits. The model also exclusively chose to convert the A.B. Brown 5 and 6 CTs to a 2x1 CCGT at the earliest opportunity (2030). This conversion is favorable as it converts the peaking CTs to an efficient CCGT that can serve as a baseload resource, while adding nearly 400 MW of firm capacity to the portfolio. Finally, all portfolios also preferred to keep F.B. Culley 3 operational in some capacity, either as a baseload coal resource or a peaking natural gas unit.

Figure 6-1 – Alternate Reference Case Portfolios

Year	1: Optimization Run	2: 1x1 J Class in 2032	3: Renewables + CT's	4: FB Culley 3 NG Conversion 2030	5: FB Culley 3 NG Conversion 2035
2028	+1 FBC2 Storage (90 MW)	+1 FBC2 Storage (90 MW)	+1 FBC2 Storage (90 MW)	+1 FBC2 Storage (90 MW)	+1 FBC2 Storage (90 MW)
2030	+1 AB Brown7: Fired CCGT 2030 (850 MW)	+1 FB Culley:3 NG 2030 (270 MW) +1 AB Brown7: Fired CCGT 2030 (850 MW)	+1 AB Brown7: Fired CCGT 2030 (850 MW)	+1 FB Culley:3 NG 2030 (270 MW) +1 AB Brown7: Fired CCGT 2030 (850 MW)	+1 AB Brown7: Fired CCGT 2030 (850 MW)
2031			+1 Non IRA Wind + Storage (200 + 100 MW)		
2032	+1 2x1 J Class Fired CCGT (1361 MW)	+1 1x1 J Class Unfired CCGT (568 MW)	+1 Non IRA Wind + Storage (200 + 100 MW)	+1 2x1 J Class Fired CCGT (1361 MW)	+1 2x1 J Class Unfired CCGT (1144 MW)
2033			+5 Non IRA Wind + Storage (1,000 + 500 MW)		+1 2x1 J Class Fired CCGT (1361 MW)
2034		+1 2x1 J Class Unfired CCGT (1144 MW)	+2 Non IRA Wind + Storage (400 + 200 MW)		
2035	+1 J Class SCGT (385 MW)		+1 J Class SCGT (385 MW)	+1 J Class SCGT (385 MW)	+1 FB Culley:3 NG 2035 (270 MW) +1 Non IRA Wind + Storage (200 + 100 MW)
2036					
2037			+1 50 MW 4 Hour Storage (50 MW)		
2039		+1 50 MW 4 Hour Storage (50 MW)			
2040	+1 50 MW 4 Hour Storage (50 MW)		+1 F Class SCGT (222 MW)	+1 Non IRA Wind (Battery) (100 MW) +1 Non IRA Wind (Hybrid) (200 MW)	
2041					+1 50 MW 4 Hour Storage (50 MW)
2042	+1 100 MW 4 Hour Storage (100 MW)	+1 50 MW 4 Hour Storage (50 MW)			
2043					+1 50 MW 4 Hour Storage (50 MW)
2044		+1 50 MW 4 Hour Storage (50 MW)	+1 Non IRA Wind (200 MW)		
2045	+1 FB Culley:3 thru 2045 (270 MW) +1 Non IRA Wind + Storage (200 + 100 MW)	+1 Non IRA Wind + Storage (200 + 100 MW)	+1 FB Culley:3 thru 2045 (270 MW) +1 Non IRA Solar + Storage (100 + 50 MW) +1 Reciprocating Engine (110 MW)	+1 100 MW 4 Hour Storage (100 MW) +1 50 MW 4 Hour Storage (50 MW)	+1 100 MW 4 Hour Storage (100 MW) +1 50 MW 4 Hour Storage (50 MW)

6.2. Portfolio Performance

The five portfolios were evaluated through a similar risk analysis framework as the traditional portfolios in order to test operational performance and affordability under a range of potential market conditions. The market conditions that were varied include fuel costs, capital costs, inclusion of a CO_2 tax, market prices, and allowable energy sales. The methodology and calculations underlying these variations are described in the Risk Appendix section Risk Appendix. The relative performance of each portfolio across these conditions is detailed in Figure 6-2. The inputs into the EnCompass model that were used to generate the following results is given in the *Technical Appendix Attachment 6.1 CEIS 2025 IRP Alternate Reference Stochastics Model (Confidential)*.

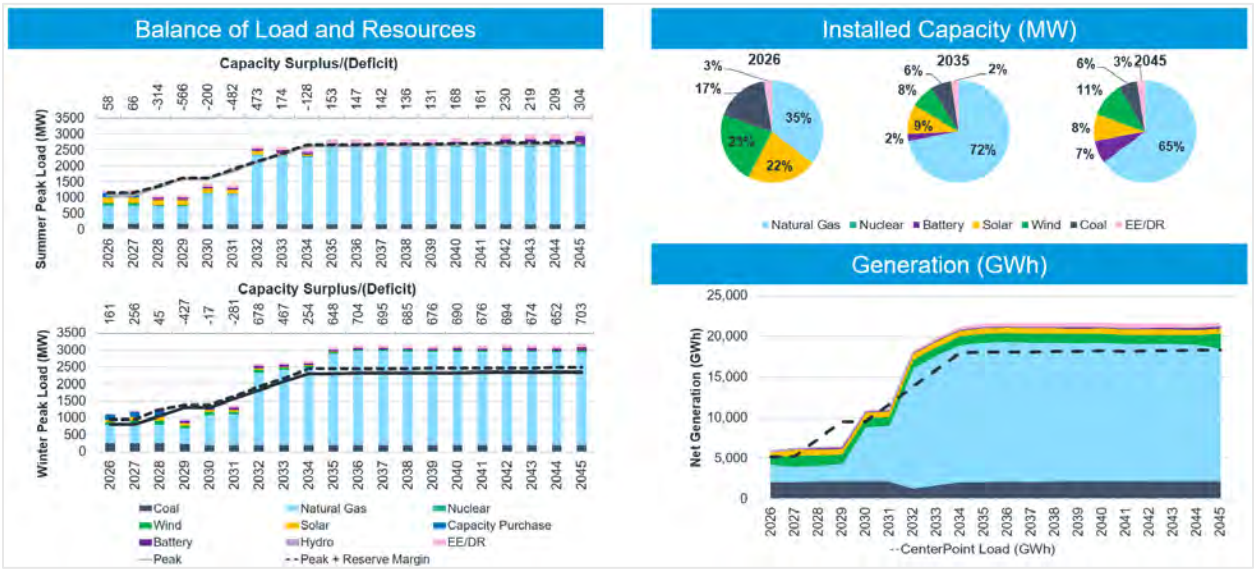
Figure 6-2 – Alternate Reference Case Risk Analysis Scorecard

Objective	Affordability				Environmental Sustainability				Reliability/Resiliency/Stability			Risk/Other			
Portfolio Description	20 Year NPVRR ($M)	Delta From Reference (%)	5% Value of NPVRR ($M)	95% Value of NPVRR ($M)	CO_2 Intensity (Tons CO_2e/MWh)	CO_2 Equivalent Emissions (Stack Emissions) (000s Tons CO_2e)	SOx Emissions (Tons)	NOx Emissions (Tons)	Unserved Energy (MWh)	Spinning Reserve (MW)	Fast Start Capability (MW)	Energy Market Sales (%)	Energy Market Purchases (%)	Capacity Sales NPV ($M)	Capacity Purchases NPV ($M)
1- Optimized Case	$11,652	0%	$10,197	$13,257	0.427	121,201	47,708	26,303	33,860	2,063	614	10.1%	14.2%	$163	$80
2- 1x1 J Class 2032	$12,242	5%	$10,899	$13,674	0.304	93,487	8,890	17,617	41,307	2,227	371	9.7%	14.8%	$122	$112
3- Renewables + CT's	$12,024	3%	$10,510	$13,288	0.335	84,915	51,563	26,813	5,386	1,031	1,269	7.5%	18.1%	$45	$120
4- FBC3 NG 2030	$11,893	2%	$10,573	$13,355	0.304	92,840	9,123	17,187	38,787	2,063	612	9.7%	14.9%	$168	$79
5- FBC3 NG 2035	$11,659	0%	$10,401	$13,119	0.296	82,899	21,563	10,358	25,466	1,868	556	9.7%	14.3%	$130	$100

1: Average net present value of portfolio revenue requirements from 2026 to 2045
2: Percent difference between average NPVRR of portfolio and reference
3-4: Fifth and ninety-fifth percentiles of net present value of NPVRR to show cost uncertainty
5: Quotient of average CO_2e from generation and average fleet generation from 2026 to 2045
6-8: Total CO_2 equivalent, SO_x, and NO_x emissions from 2026-2045
9: Total emergency unserved energy purchased from 2026 to 2045
10: Capacity from “spinning” thermal assets that can be ramped up or down (combined cycle, coal, nuclear)
11: Capacity from “fast start” assets that can be dispatched quickly (combustion turbine, battery)
12-13: Dynamic VAR support and short circuit ratio from transmission reliability analysis
14: Total energy sales as a percentage of total energy generation from 2026 to 2045
15: Total energy purchases as a percentage of total load from 2026 to 2045
16-17: Net present value of capacity sales and purchases from 2026 to 2045

The optimized portfolio (Preferred Portfolio) developed for the Alternate Reference Case ranks as the least-cost option for meeting rapid load growth. This portfolio retains the F.B. Culley 2 interconnection rights by installation of a battery energy storage resource by 2028, avoiding future cost risk and providing additional reliability to the system. It also maintains the operation of F.B. Culley 3 on coal throughout the entire study period. Though this outcome is less favorable from an environmental perspective, it preserves flexibility for CEI South to revisit this critical decision point in a future IRP cycle as regulatory, market, and technology conditions evolve. The 2030 conversion of A.B. Brown 5 and 6 provides benefits beyond energy and capacity, including the creation of additional jobs and tax base in Posey County. As seen in Figure 6-3, the portfolio, similar to all alternate reference case portfolios, relies on market capacity and energy purchases in the short-term. These needs would most likely be filled by fixed capacity or energy contracts.

Figure 6-3 - Alternate Reference Case Preferred Portfolio Results Dashboard



6.2.1. Transmission System Impact of the Large Load Additions

To assess system reliability, a thorough transmission study evaluated the shoulder, summer, and winter scenarios for various possible large loads. This includes a near-term addition of 300 MW and a 1,000 MW on the West side of the transmission system along with a long-term study of 300 MW and a 1,500 MW on either the West or East side of the system. Similar to previously mentioned studies, this was performed using the MTEP 2024 model, PSS/E software for power flow analysis, and the MISO MTEP 2025 cost guide for component price estimates.

The results indicated that the addition of a 300 MW load on either side of CEI South's system did not require upgrades to the transmission system, while the larger loads did necessitate transmission mitigation (See *Technical Appendix Attachment 6.2 Large Load Study Results (Confidential)*). The Preferred Portfolio's inclusion of the A.B. Brown 2x1 combined cycle and additional large thermal resources located on CenterPoint's system led to required transmission mitigation and upgrade costs of $15.2 to $16.4 million. In contrast, if a large thermal resource were not added to the local system, transmission costs would increase roughly tenfold due to the need for major system reinforcements to accommodate heavy power imports from neighboring regions. Specifically, on the West side of the system, a cost of $152 million would be required to serve a near-term 1,000 MW load while a cost of $147 million would be required to serve a long-term 1,500 MW load. These estimates are for the transmission upgrade costs studied in the transmission portfolio and do not include the costs associated with on- or off-system generation needed to meet the energy and capacity needs of the large load.

For a large load located on the East side of the system, there are unresolvable low-voltage issues, indicating a need for a large generator on the system. The costs resulting from this transmission analysis were not factored into the NPVRR, as the location and timing of the load are speculative. Since the costs would affect all generation portfolios evenly, the relative ranking of portfolio performance stands.

6.2.2. Generation Planning for Large Loads

In addition to the Alternate Reference Case portfolios, a series of large load sensitivities were also conducted to evaluate how the timing and magnitude of new load additions influence resource decisions. Load increases of 100 MW, 300 MW, and 1,000 MW were evaluated. The sensitivities were constructed primarily to provide insight into model behavior and were not included in the Risk Analysis. Three important trends emerged during this sensitivity analysis:

1. In all cases, the model selected the conversion of A.B. Brown from combustion turbines to a combined cycle natural gas plant. This conversion adds nearly 400 MW of firm capacity and provides a reliable baseload resource to support opportunities for economic development.
2. For future load additions greater than 300 MW, the preferred pathway at F.B. Culley 3 shifted from retirement to continued operation throughout the entire study period, preserving flexibility for future replacement or conversion.
3. For future load additions greater than 1,000 MW, the decision to install a battery at F.B. Culley 2 became part of the least-cost portfolio. The early procurement of additional capacity increases system flexibility and contributes valuable firm capacity to CEI South.

6.3. Description of the Alternate Reference Case Preferred Portfolio

The Alternate Preferred Portfolio utilizes the interconnection at F.B. Culley 2 for a 90 MW battery storage unit by 2028, calls for the conversion of A.B. Brown units 5 and 6 gas turbines to an efficient CCGT unit by 2030, and continues to operate F.B. Culley 3 on coal. Beyond these resources, the portfolio calls for the addition of a large natural gas combined cycle in 2032 as the load continues to rapidly increase. In the latter years of the planning horizon, a smaller simple cycle gas unit is added in 2035, and a cumulative 150 MW of standalone storage is procured. In the final study year, an additional hybrid wind plus storage facility is brought online to fill energy and capacity needs.

This generation fleet is complemented by energy efficiency and demand response programs. These demand-side resources include the seven near-term (2026-2027) programs included in the previously approved plan, as well as nineteen additional programs across the commercial, residential, and income-qualified sectors throughout the rest of the planning horizon. Collectively, these programs account for 46 MW of capacity in the first year of the study period and scale up to 118 MW by 2045.

The alternate preferred portfolio offers a least-cost and extremely flexible pathway to meeting additional load. The critical decisions at existing assets match those made in the Preferred Portfolio: F.B. Culley 2 storage, A.B. Brown conversion, and maintaining the F.B. Culley 3 interconnection. This consistency between the two preferred pathways highlights the flexibility in the plan.

It provides a number of benefits to CEI South customers and other stakeholders, beyond what is seen on the balance scorecard, including that it:

- Preserves maximum future flexibility, keeping Southwestern Indiana competitive and able to quickly adapt to support economic development and growth.
- Adds tax base and jobs in our community, helping customers thrive. Both the addition of prospective customers and the additional infrastructure necessary to support it drives economic growth.
- Aligns with current Federal and State goals.
- Utilizes the existing asset at F.B. Culley 3 until future replacement or conversion to natural gas is decided, which will be re-analyzed in subsequent IRPs.
- Adds efficient on-system base load generation through the conversion of A.B. Brown 5 and 6 to a CCGT, which promotes system reliability and provides competitively priced energy that is projected to be consistently lower than market prices.
- Maintains future flexibility with several off ramps to accommodate a rapidly evolving industry and includes a multi-year build out of resources on several sites,

maintaining the option to replace Culley 3 in the future when appropriate, based on continual evaluation of changing technology and conditions.

- Maintains tax base in Warrick County, which is particularly important to the local school system in that county.
- Allows for continued use of existing plant assets, helping to avoid future potential stranded assets.
- Continues CEI South's energy efficiency programs with near-term energy savings of 1.18% of eligible sales over the next 6 years, and further long-term energy savings opportunities of 1.17% of eligible sales identified over the remaining 14 years of the 20-year period. CEI South is committed to energy efficiency to help customers save money on their energy bills and will continue to evaluate this option in future IRPs.
- Continues existing demand response programs, including the DLC Residential AC Switch Program, Residential Bring Your Own Thermostat ("BYOT", also known as the Thermostat Load Control Rider), and the approved Aggregation Demand Response Program launched in September 2025. The portfolio also continues implementation of Residential CPP Time-of-Use rates; the pilot is expected to begin in Q2 2026. In addition, a new Commercial Bring Your Own Thermostat program will be introduced, operating consistently with the existing residential thermostat program.

At this time, no contract to secure a large load has been executed. CEI South will continue ongoing conversations with prospective customers. This large load analysis will continue to evolve as the company continues to evaluate possible load additions, timelines, and costs necessary to serve. While the alternate preferred portfolio provides great insight into a possible path, the resource mix used to serve the potential customer will be heavily influenced by the balance of the customer's needs and priorities. As discussions continue, CEI South will work to prioritize affordability for its existing customers and minimize future cost risk should conversations advance to negotiations or contracting.



Short Term Action Plan

Chapter 7

7.1. Differences Between the Last Short Term Action Plan from What Transpired

Since the last IRP was filed there have been significant challenges in moving forward with key pieces of the last two IRP Preferred Portfolios. First, several solar projects have been terminated due to market dynamics that caused prices to escalate beyond what the Commission approved and beyond where CEI South believed to be affordable for its customers. As such, the Crosstrack Solar Project, a 130 MW Build Transfer Agreement ("BTA") approved in Cause No. 45754, was terminated on March 15, 2024. Subsequently, two solar PPAs were also canceled on July 1, 2025, due to cost increases beyond the approved agreements, the 100 MW Warrick County Solar Project and the 185 MW Vermillion Solar Project, both approved in Cause No. 45839. Similarly, a 200 MW wind BTA also had similar upward pricing pressure; after years of negotiation and a re-evaluation of this project in this IRP, CEI South opted to walk away from this project in an effort to keep customer rates as affordable as possible in the near to mid-term.

CEI South conducts the IRP process every three years and each IRP, necessarily builds on the previous IRP and the generation resource investments that have come before. The Preferred Portfolio in CEI South's previous 2022/2023 IRP concluded that a generation transition with the conversion of F.B. Culley 3 from coal to natural gas, along with DSM, wind, and solar resources. CEI South began implementing this 2022/2023 IRP by filing two cases seeking approval for (1) signed purchase power agreements ("PPA") for two wind facilities totaling 317 MWs, the Galesburg Wind Project and the Salt Creek Wind Project. (2) CEI South sought and received approval for the 2025-2027 DSM Plan. Each of these filings was consistent with the 2022/2023 IRP, and as noted below, this IRP affirms the direction taken by CEI South. These remaining renewable resources from prior IRPs still qualify for Federal incentives, which dramatically lowered the cost of these renewable resources relative to what could be acquired in the future, post elimination of IRA tax incentives for wind and solar resources.

In preparation for retirement, CEI South submitted an Attachment Y to MISO to suspend operations of its smallest, least efficient coal unit, F.B. Culley 2. This unit is slated for retirement at the end of 2025, consistent with the last IRP. A key decision in this IRP is to determine how to replace this unit and whether or not to preserve the existing interconnection to the grid. CEI South will have approximately three years to replace the unit, preserving the interconnection. Options that were available, meeting limited space requirements, were small gas units (reciprocal engines or aero derivative) or battery storage.

7.1.1. Culley 3 Conversion

In the last IRP CEI South selected a Preferred Portfolio that converted F.B. Culley 3, a 270 MW coal plant, to natural gas by 2027. Given the inputs and likely potential future at that time, this was a competitive option. As CEI South observed increased change and uncertainty, it decided to pause on the conversion and not seek a certificate of convenience and necessity to gain approval from the IURC. CEI South chose to re-evaluate this option within this IRP. While coal to gas conversion may make sense in the future, it does not today. As discussed in this IRP, the conversion with renewables today is projected to be 14% higher cost than the Preferred Portfolio. CEI South will reevaluate this option in its next IRP.

7.1.2. Posey Solar and Two New CTs

CEI South brought Posey solar (191 MW) and A.B. Brown unit 6 (230 MW) online at the end of May 2025. A.B. Brown unit 5 (230 MW) came online at the end of August, consistent with expectations from the last IRP. All three new units have been performing well since coming online.

7.1.3. DSM

The 2022/2023 IRP did support continued energy efficiency programs designed to save 1.1% of eligible retail sales. CEI South proposed the 2025-2027 Electric DSM Plan (*Technical Appendix Attachment 3.4*) to obtain approval of programs to achieve this level of savings. The Commission approved this plan on March 26, 2025 in Cause No. 46100. Consistent with the 2022/2023 IRP, the framework for the 2025-2027 filed plan was modeled at a savings level of 1.1% of retail sales adjusted for an opt-out rate of 77% eligible load. Additionally, CEI South updated all of its DR tariffs in Cause No. 45990 to provide more consistency, to open them to a wider range of potential customers, and to align with changes in the MISO Business Practices Manual. Additionally, CEI South received approval in the same cause to offer DR aggregation to C&I customers and have signed a contract to begin working with Enel X as the program implementer. Enel X began outreach and enrollment in October and has signed a letter of authorization with twenty customers to begin sharing meter data to explore energy plans and contracts and has five customers with a signed contract.

7.2. Discussion Of Plans For The Next 3 Years

7.2.1. Procurement of Resources

CEI South has continued to diversify its portfolio of resources with two wind projects identified in its last IRP. On November 5, 2005 the Commission approved the Salt Creek Wind Project purchase power agreements (“PPA”). That, along with the Galesburg Wind

PPA is expected to come online in 2026, bringing a total of 317 MW of additional clean renewable wind energy to serve our customers. Additionally, the Wheatland solar PPA project is expected to come online at the end of Q1 2026.

7.2.2. RFPs and Continued Evaluation of F.B. Culley 2 interconnection

At the end of 2025 CEI South will place F.B. Culley 2 in suspension with the plans of transferring the interconnection to a 90 MW battery storage unit before the end of 2028. This will require CEI South to replace its existing Attachment Y with an Attachment X. CEI South plans to utilize the results of RFPs for capacity and for a new RFP for battery storage unit to further evaluate the economics and reliability attributes of this option relative to purchasing required capacity to maintain reliability. Pending the results of this analysis, CEI South may file a CPCN for a 90 MW battery storage unit at F.B. Culley and have a COD by the end of 2028.

7.2.3. DSM

CEI South filed for and received approval on March 26, 2025 for a 3-year DSM Plan for 2025-2027 with energy efficiency savings guided by the 2022/2023 IRP process. The CEI South Oversight Board, including the OUCC, CAC and CEI South, will oversee the implementation of energy efficiency programs. CEI South will file a 3-year DSM Plan for 2028-2030 the first half of 2027 consistent with energy efficiency savings guided by the Preferred Portfolio in the 2025 IRP. The Aggregation Demand Response Rider is a 5-year contract and will be ongoing until the end of the contract in 2030, at which time the program will be re-evaluated.

7.2.4. Other Innovative Rate Design

CEI South has been actively working to develop a TOU CPP Pilot program that is set to begin in Q2 2026. CEI South utilized its continuous improvement and project management teams to work collaboratively with business units to build out the necessary infrastructure to support the pilot, including development of a new system to execute CPP events and help facilitate customer enrollment. CEI South will work through the pilot over the next one to two years in the hopes of expansion, if the pilot is successful. Results of the pilot will be included in the next IRP; if the pilot is successful and the next IRP continues to indicate that the program is beneficial for customers, CEI South will propose to expand the rate to the majority of its residential customers in the next general rate case following the next IRP.

7.2.5. Demand Response

CEI South will continue to work with its demand response aggregator in the hopes of attracting C&I customers to participate. This IRP included an indicative amount of industrial DR for this program.

7.2.6. Ability to Finance the Preferred Portfolio

The Company expects to have sufficient funds to finance the Preferred Portfolio through a combination of internally generated cash flow from operations, external capital markets activity, and capital contributions from its parent company. CEI South's secured debt ratings are currently A1/A with a stable outlook from Moody's Investors Services and S&P Global Ratings, respectively.

7.2.7. Continuous Improvement

CEI South works hard on continuous improvement and will take the feedback that we receive on this IRP into consideration as we develop the next IRP. We appreciate formal or informal comments from active stakeholders and what is received through the Director's report. They will be used as the basis for continuous improvement going forward.

7.3. Schedule

Below is a general timeline for implementation of the Preferred Resource Portfolio, subject to change.

Figure 7-1 - Implementation Schedule

Timing	Activity Type	Actions
Q3 2025	Demand Response	Initiation of DR aggregator program
Q1 2026	Generation Transition	Salt Creek Wind (170 MW PPA) online Wheatland Solar (150 MW PPA) online
Q1 – Q2 2026	Storage RFP	Conduct an RFP for storage at F.B. Culley 2. If determined to be affordable, submit a Certificate of Public Convenience and Necessity (CPCN) for 90 MW battery storage in Q3.
Q1 – Q2 2026	Demand Response	Planned implementation of DR aggregator program
Q2 2026	Rate Design	Planned implementation of TOU CPP Pilot program
Q2 – Q3 2026	Generation Transition	Galesburg Wind (147 MW PPA) online
Q1 – Q2 2027	DSM Plan	File a 3-year DSM plan for 2028 through 2030 informed by the 2025 IRP in the first half of 2027
Ongoing	Large Load Addition	Continue to work through due diligence for possible large load addition



Technical Appendix

Chapter 8

8.1. Load Forecast Appendix

8.1.1. Forecast Inputs

8.1.1.1. Energy Data

Historical CEI South sales and revenues data were obtained through the billing system. The billing system contains detailed customer information including rate, service, North American Industrial Classification System ("NAICS") codes (if applicable), usage and billing records for all customer classes (more than 15 different rate and customer classes). These consumption records were compiled in a spreadsheet on a monthly basis. The data was then organized by rate code and imported into the load forecasting software.

8.1.1.2. Economic and Demographic Data

Economic and demographic data was obtained from S&P Global (formerly IHS Markit) for the state of Indiana and the Evansville Metropolitan Statistical Area ("MSA"). S&P Global is a trusted source for economic data that is commonly utilized by utilities for forecasting electric sales. The monthly data provided to CEI South contains both historical results and projected data throughout the IRP forecast period. This information is input into the load forecasting software and used to project residential, commercial (GS) and industrial (large) sales.

8.1.1.3. Weather Data

Historical and normal Heating Degree Days ("HDD") and Cooling Degree Days ("CDD") are derived from daily temperature data for the Evansville airport. HDDs are defined as the number of degrees below a base temperature for a given day. CDDs are defined as the number of degrees above a base temperature for a given day. Normal degree-days are calculated by averaging the historical daily HDD and CDD over the last twenty years. Historical weather data is imported into the load forecasting software and is used to normalize the past usage of residential and GS customers. Similarly, the projected normal weather data is used to help forecast the future weather normalized loads of these customers.

In reviewing historical weather data, Itron found a statistically significant positive, but slow, increase in average temperature. This translated into fewer HDD and more CDD over time. Itron's analysis showed HDD are decreasing 0.4% per year while CDD are increasing 0.5% per year. These trends were incorporated into the forecast. Starting normal HDD were allowed to decrease 0.4% over the forecast period while CDD increased 0.5% per year through 2045. Figure 8-1 and Figure 8-2 show historical and forecasted monthly HDD and CDD.

Figure 8-1 - Heating Degree Days

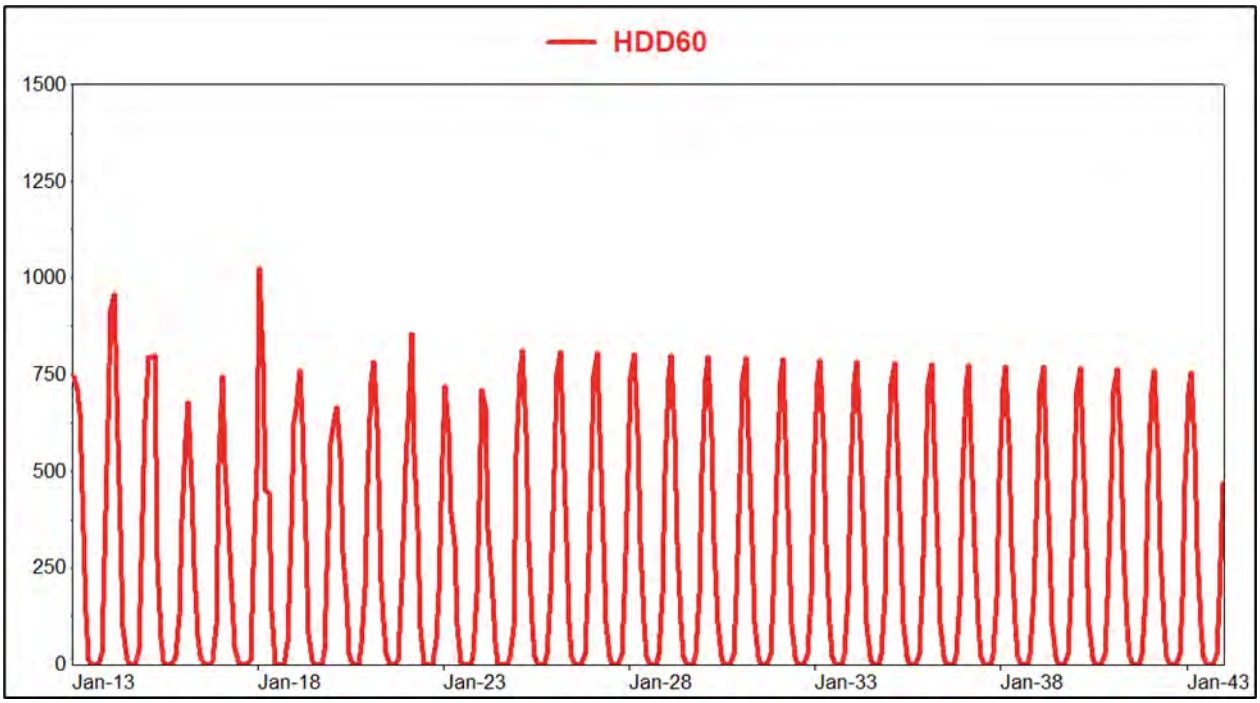
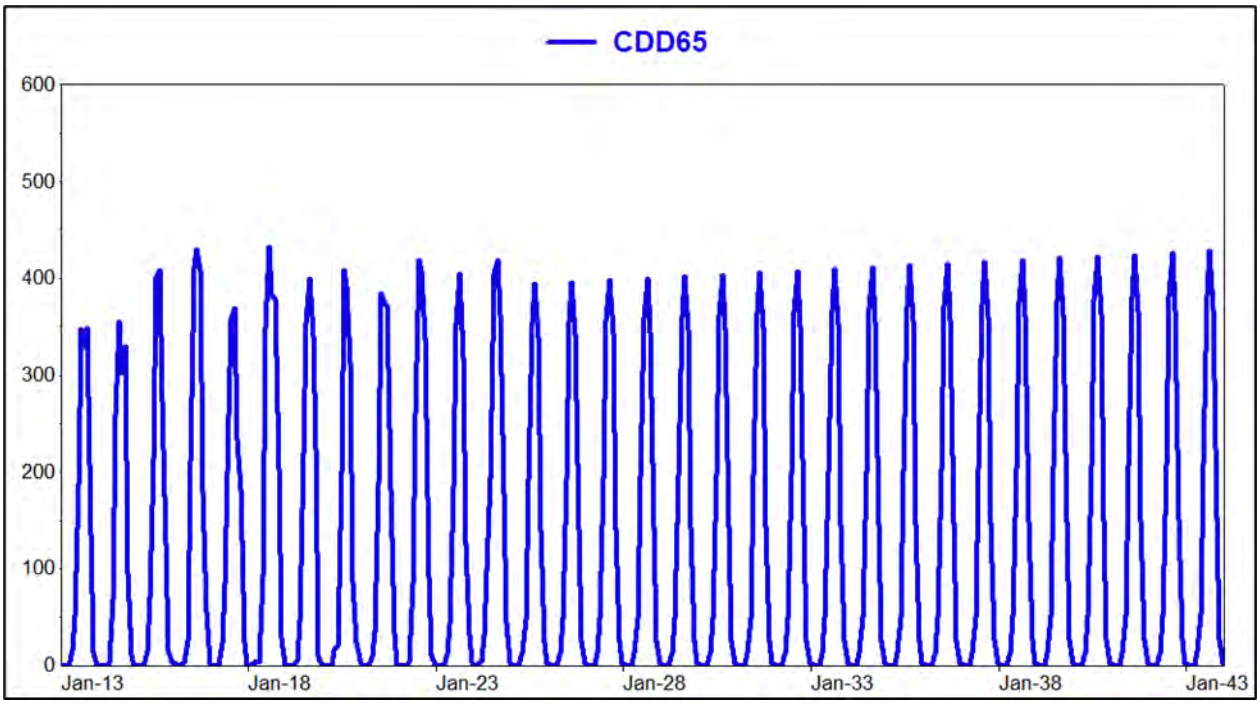


Figure 8-2 - Cooling Degree Days



8.1.1.4. Equipment Efficiencies and Market Shares Data

Itron Inc. provides regional EIA historic and projected data for equipment efficiencies and market shares. This information is used in the residential average use model and GS sales model. CEI South conducted an Electric Baseline survey in the third quarter of 2016 of CEI South's residential customers. This data was utilized to compare its territory market share data with the regional EIA data. To increase the accuracy of the residential average use model, regional equipment market shares were altered to reflect those of CEI South's actual territory.

8.1.1.5. Load Forecast Continuous Improvement

Itron continues to improve and evolve the SAE modeling framework. In addition to annually updating efficiency and saturation projections with the latest estimates from the EIA the framework has evolved to include utility specific DSM program activity data. The inclusion of a utility specific DSM variable in the modeling specification greatly improves model fit and enables the model to produce a baseline forecast excluding the impact of future DSM program activity. Additionally, Itron built a framework for the inclusion and use of trended normal weather where historical weather patterns show this to be appropriate. The CEI South forecast now considers emerging technologies: customer distributed generation and electric vehicles. Customer owned PV adoption is modeled as a function of simple payback. The model explains historic adoption well and provides a framework that considers projected PV installation costs, electric prices and incentives. The adoption of electric vehicles is based on the EIA's forecast of vehicle stock. The EIA's has robust transportation model that includes a vehicle manufacturer component and a consumer choice component to estimate the mix of vehicles by powertrain type: gasoline, diesel, electric, plug-in hybrid electric, etc. The model accounts for projected fuel prices, electric prices, the decline in battery costs and federal incentives for electric vehicles.

Additionally, CEI South continually stays up to date with load forecasting topics in a variety of ways. First, CEI South is a member of Itron's Energy Forecasting Group. The Energy Forecasting Group contains a vast network of forecasters from around the country that share ideas and study results on various forecasting topics. Forecasters typically attend an annual meeting that includes relevant topic discussions along with keynote speakers from the EIA and other energy forecasting professionals. The meeting is an excellent source for end-use forecasting directions and initiatives, as well as a networking opportunity. CEI South forecasters periodically attend continuing education workshops and webinars on various forecasting topics to help improve skills and learn new techniques. Additionally, CEI South discusses forecasts with the State Utility Forecasting Group and other Indiana utilities to better understand their forecasts. CEI

South compares CEI South model assumptions and results to these groups to gain a better understanding of how they interpret and use model inputs.

8.1.2. Overview of Past Forecasts

The following tables outline the performance of CEI South's energy and demand forecasts over the last several IRPs by comparing Weather Normalized ("WN") sales and demand figures to IRP forecasts from 2015-2024.

Weather-normalization is performed each month in order to analyze the variance from the forecast without the impact of weather. This is done by combining customer count, meter read schedule, billing month sales and daily temperature with estimates of the impact of changes in usage to variations of temperature. Underlying the estimates are average use models. Separate models have been estimated for residential and general service customer classes. These models have been estimated from historical billed sales and customer data. Actual weather data from NOAA is used to generate daily use per customer estimates for the revenue classes. The results are used to predict daily use estimates and are used to allocate billed monthly sales to the calendar-month period. The models are also executed using normal daily temperatures.

The following tables show the WN[41] and forecasted values for:

- Total Peak Demand
- Total Energy
- Residential Energy
- GS Energy
- Large Energy

[41] Note that large sales are not weather normalized.

Figure 8-3- Total Peak Demand Requirements (MW), Including Losses and Street Lighting

Year	2014 IRP Forecast	2016 IRP Forecast	2019 IRP Forecast	2022 IRP Forecast	WN Results (MW)	2014 % Diff.	2016 % Diff.	2019 % Diff.	2022 % Diff.
2015	1,155				1,113	-3.8%			
2016	1,156				1,087	-6.3%			
2017	1,113	1,082			1,038	-7.2%	-4.3%		
2018	1,109	1,086			1,006	-10.2%	-7.9%		
2019	1,106	1,085			1,039	-6.4%	-4.5%		
2020	1,106	1,088	1,106		990	-11.8%	-9.9%	-11.7%	
2021	1,106	1,084	1,107		998	-10.8%	-8.5%	-10.8%	
2022	1,107	1,083	1,129		1,013	-9.2%	-6.9%	-11.4%	
2023	1,107	1,083	1,168	1,010	1,052	-5.2%	-2.9%	-11.0%	4.0%
2024	1,107	1,084	1,172	1,087	1,070	-3.5%	-1.3%	-9.5%	-1.6%
Mean Absolute Error						7.4%	5.8%	10.9%	1.2%

Figure 8-4- Total Energy Requirements (GWh), Including Losses and Street Lighting

Year	2014 IRP Forecast	2016 IRP Forecast	2019 IRP Forecast	2022 IRP Forecast	WN Results (GWh)	2014 % Diff.	2016 % Diff.	2019 % Diff.	2022 % Diff.
2015	5,914				5,773	-2.4%			
2016	5,936				5,725	-3.7%			
2017	5,514	5,257			5,073	-8.7%	-3.6%		
2018	5,503	5,290			5,139	-7.1%	-2.9%		
2019	5,494	5,294			4,965	-10.6%	-6.6%		
2020	5,497	5,319	5,400		4,788	-14.8%	-11.1%	-12.8%	
2021	5,492	5,302	5,405		4,923	-11.6%	-7.7%	-9.8%	
2022	5,494	5,303	5,527		4,834	-13.7%	-9.7%	-14.3%	
2023	5,494	5,308	5,755	4,725	4,793	-14.6%	-10.7%	-20.1%	1.4%
2024	5,496	5,320	5,784	5,164	5,096	-7.9%	-4.4%	-13.5%	-1.3%
Mean Absolute Error						9.5%	7.1%	14.1%	0.0%

Figure 8-5- Residential Energy (GWh)

Year	2014 IRP Forecast	2016 IRP Forecast	2019 IRP Forecast	2022 IRP Forecast	WN Results (GWh)	2014 % Diff.	2016 % Diff.	2019 % Diff.	2022 % Diff.
2015	1,404				1,444	2.8%			
2016	1,394				1,416	1.5%			
2017	1,383	1,407			1,398	1.1%	-0.6%		
2018	1,377	1,395			1,375	-0.2%	-1.5%		
2019	1,374	1,384			1,372	-0.1%	-0.9%		
2020	1,373	1,375	1,386		1,408	2.5%	2.3%	1.5%	
2021	1,370	1,366	1,376		1,417	3.3%	3.6%	2.9%	
2022	1,373	1,362	1,378		1,378	0.4%	1.2%	0.0%	
2023	1,377	1,359	1,382	1,433	1,402	1.8%	3.1%	1.4%	-2.2%
2024	1,383	1,359	1,390	1,453	1,446	4.3%	6.1%	3.9%	-0.5%
Mean Absolute Error						1.7%	1.7%	1.9%	1.4%

Figure 8-6- Commercial (GS) Energy (GWh)

Year	2014 IRP Forecast	2016 IRP Forecast	2019 IRP Forecast	2022 IRP Forecast	WN Results (GWh)	2014 % Diff.	2016 % Diff.	2019 % Diff.	2022 % Diff.
2015	1,304				1,321	1.3%			
2016	1,320				1,281	-3.0%			
2017	1,315	1,315			1,278	-2.9%	-2.9%		
2018	1,311	1,324			1,235	-6.1%	-7.2%		
2019	1,308	1,326			1,184	-10.5%	-12.0%		
2020	1,311	1,325	1,280		1,117	-17.4%	-18.7%	-14.7%	
2021	1,310	1,321	1,284		1,165	-12.4%	-13.4%	-10.1%	
2022	1,313	1,322	1,290		1,156	-13.5%	-14.3%	-11.6%	
2023	1,315	1,324	1,294	1,186	1,124	-17.0%	-17.8%	-15.1%	-5.5%
2024	1,320	1,330	1,300	1,186	1,179	-12.0%	-12.9%	-10.3%	-0.6%
Mean Absolute Error						9.4%	12.4%	12.3%	3.1%

Figure 8-7- Industrial (Large) Energy (GWh)

Year	2014 IRP Forecast	2016 IRP Forecast	2019 IRP Forecast	2022 IRP Forecast	WN Results (GWh)	2014 % Diff.	2016 % Diff.	2019 % Diff.	2022 % Diff.
2015	2,916				2,722	-7.1%			
2016	2,932				2,722	-7.7%			
2017	2,546	2,211			2,097	-21.4%	-5.5%		
2018	2,547	2,252			2,182	-16.7%	-3.2%		
2019	2,546	2,270			2,073	-22.8%	-9.5%		
2020	2,549	2,312	2,348		1,971	-29.3%	-17.3%	-19.1%	
2021	2,550	2,317	2,360		2,041	-25.0%	-13.5%	-15.6%	
2022	2,550	2,322	2,464		2,015	-26.5%	-15.2%	-22.2%	
2023	2,549	2,329	2,670	1,793	1,986	-28.4%	-17.3%	-34.5%	9.7%
2024	2,546	2,334	2,682	2,189	2,244	-13.5%	-4.0%	-19.5%	2.5%
Mean Absolute Error						19.8%	10.7%	22.2%	6.1%

8.1.3. Actual and Weather Normalized Energy and Demand Levels

Figure 8-8- Historic Peak Demand

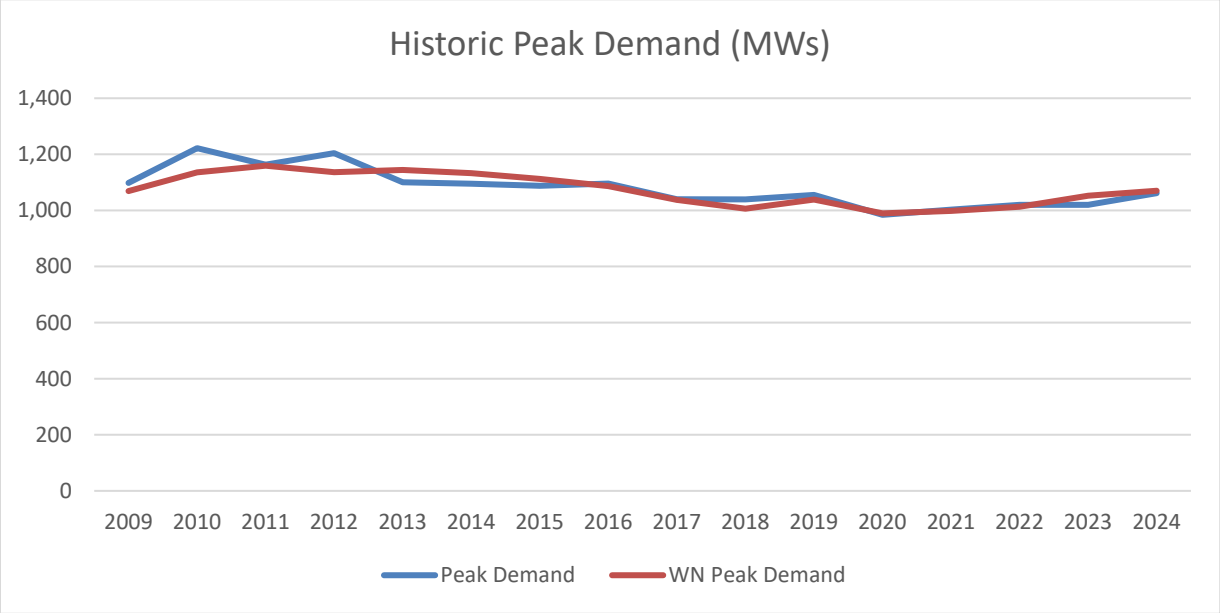
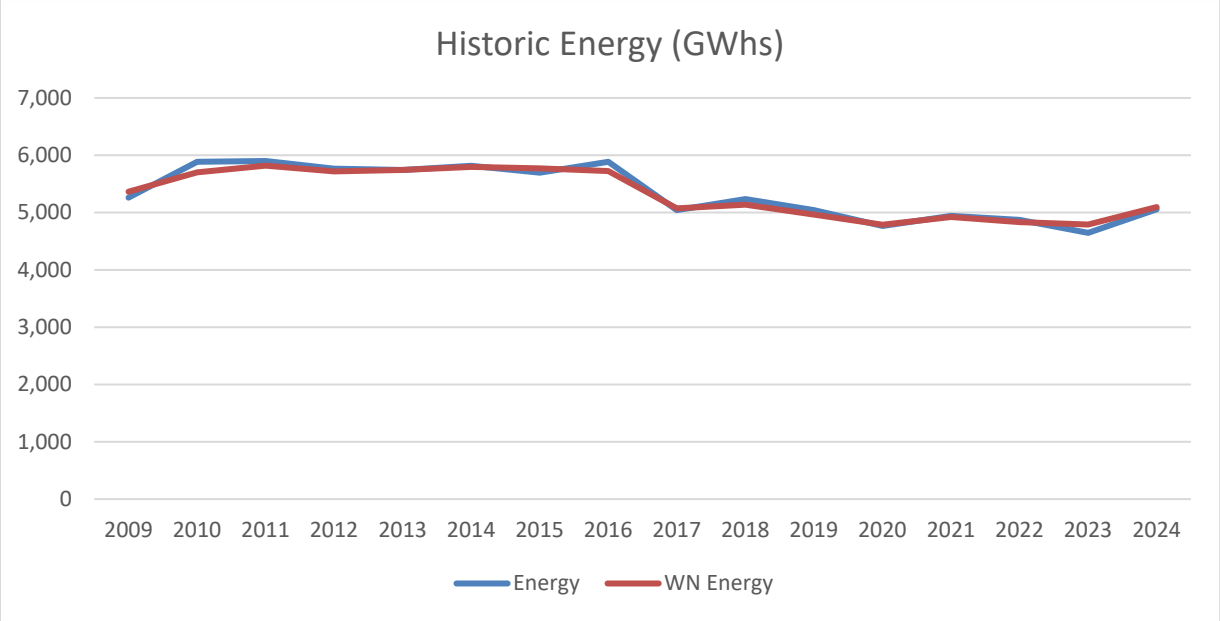


Figure 8-9- Historic Energy



8.1.4. Load Shapes

Figure 8-10- Historic Annual Load Shape

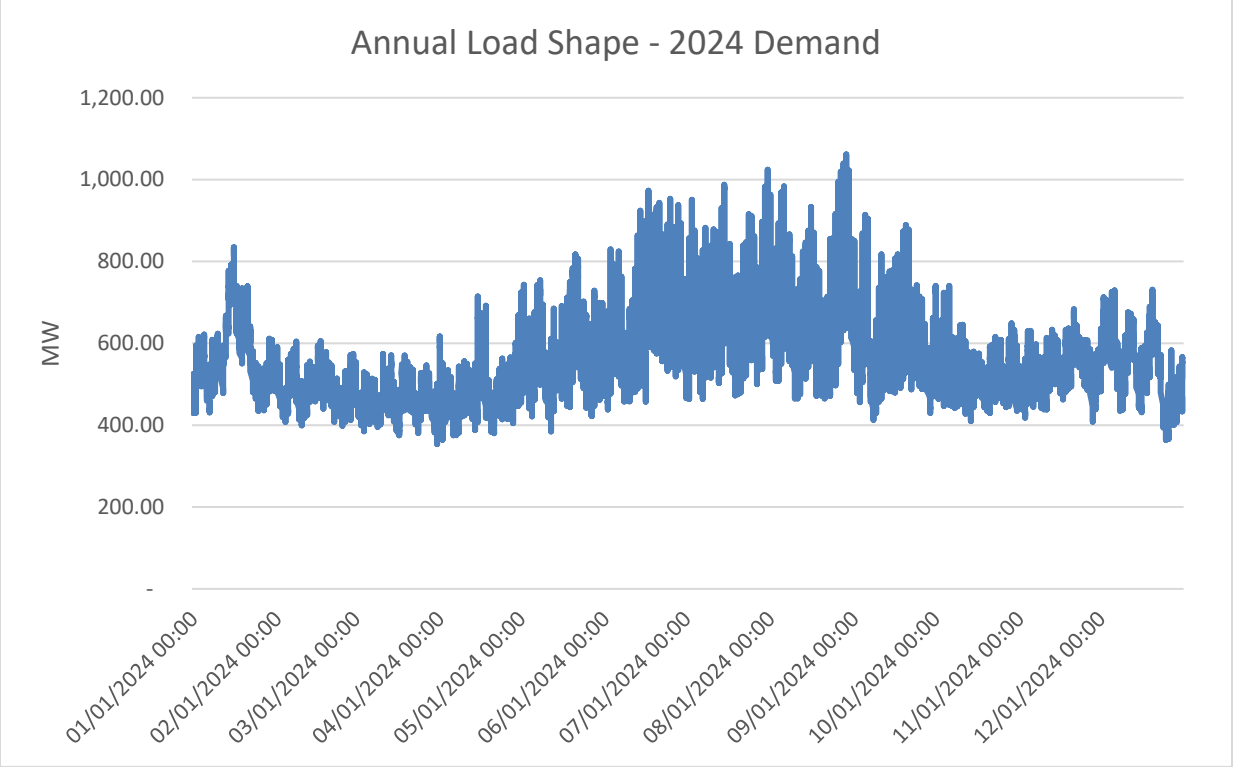


Figure 8-11- Summer Peak Day

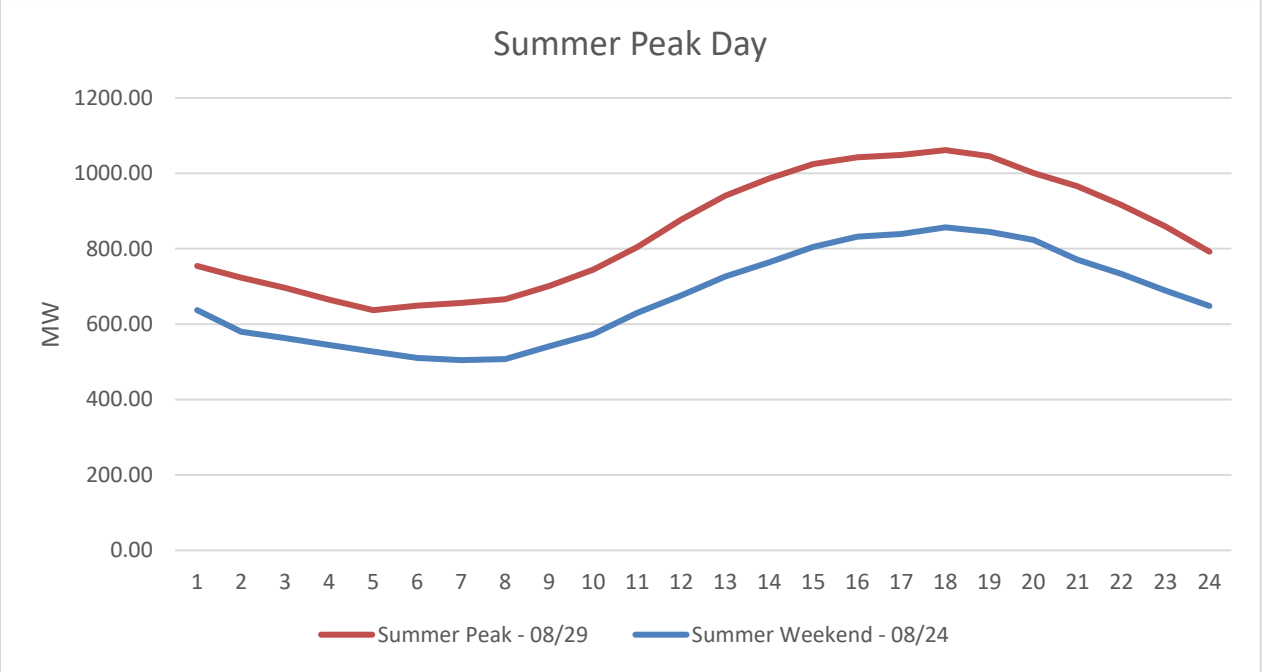


Figure 8-12- Typical Fall Day

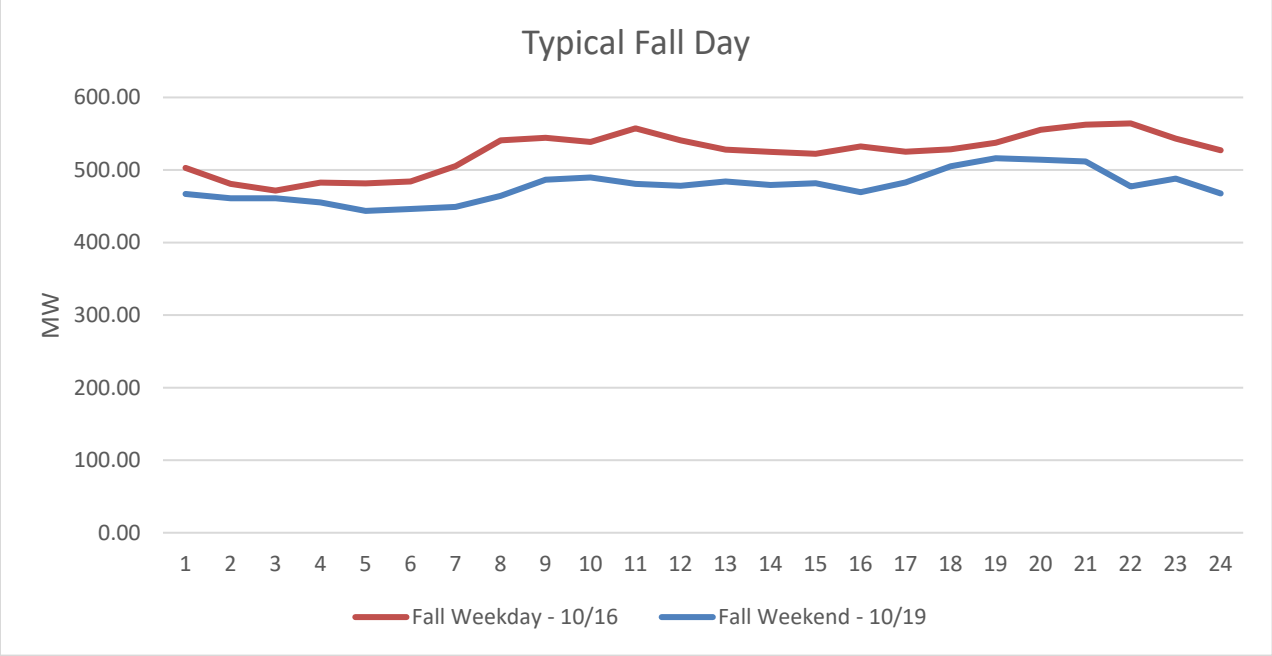


Figure 8-13- Winter Peak Day

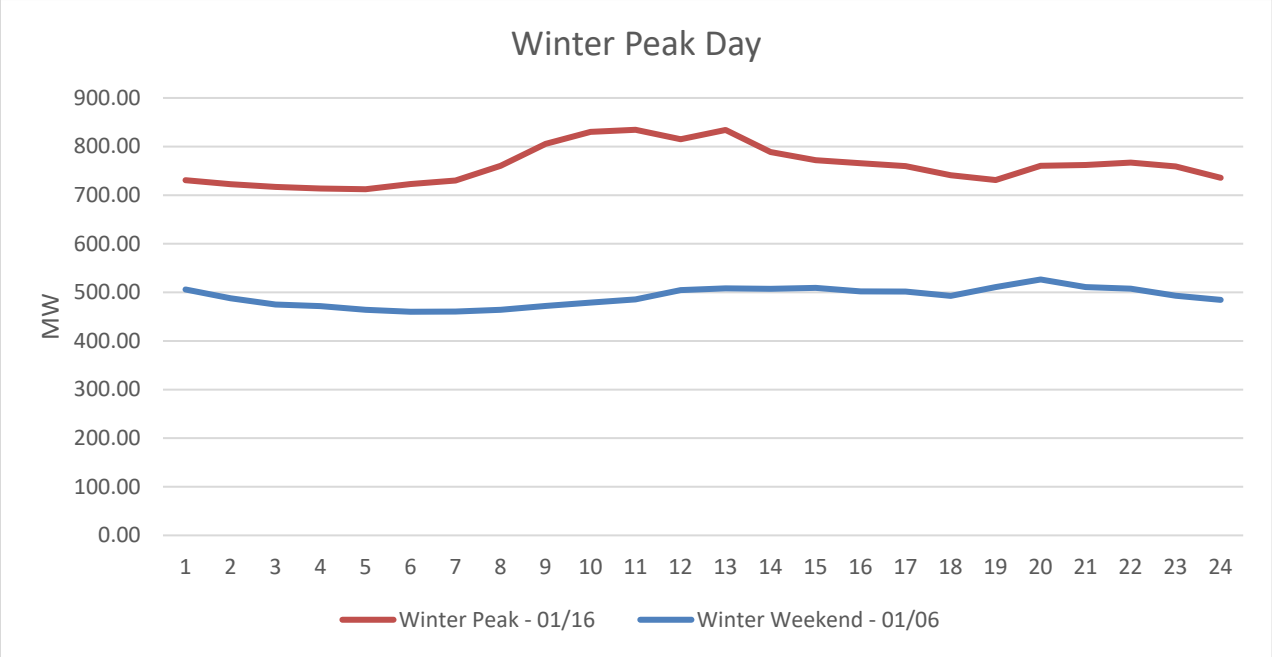


Figure 8-14- Typical Spring Day

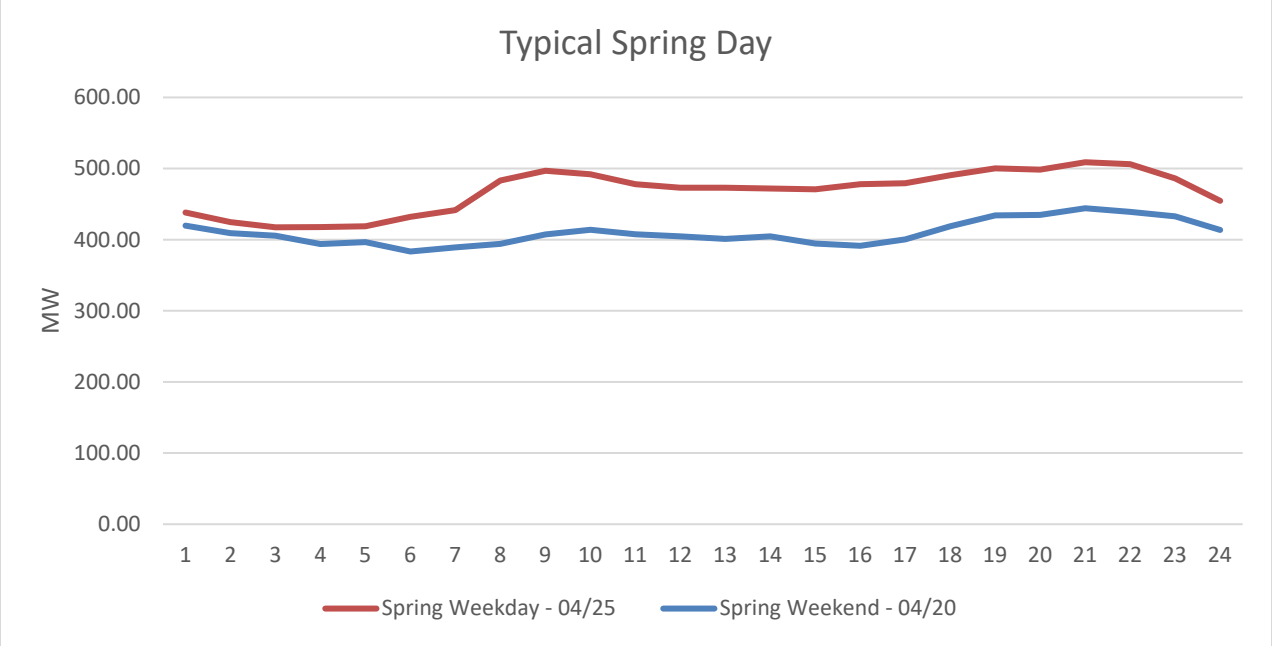


Figure 8-15- January Load

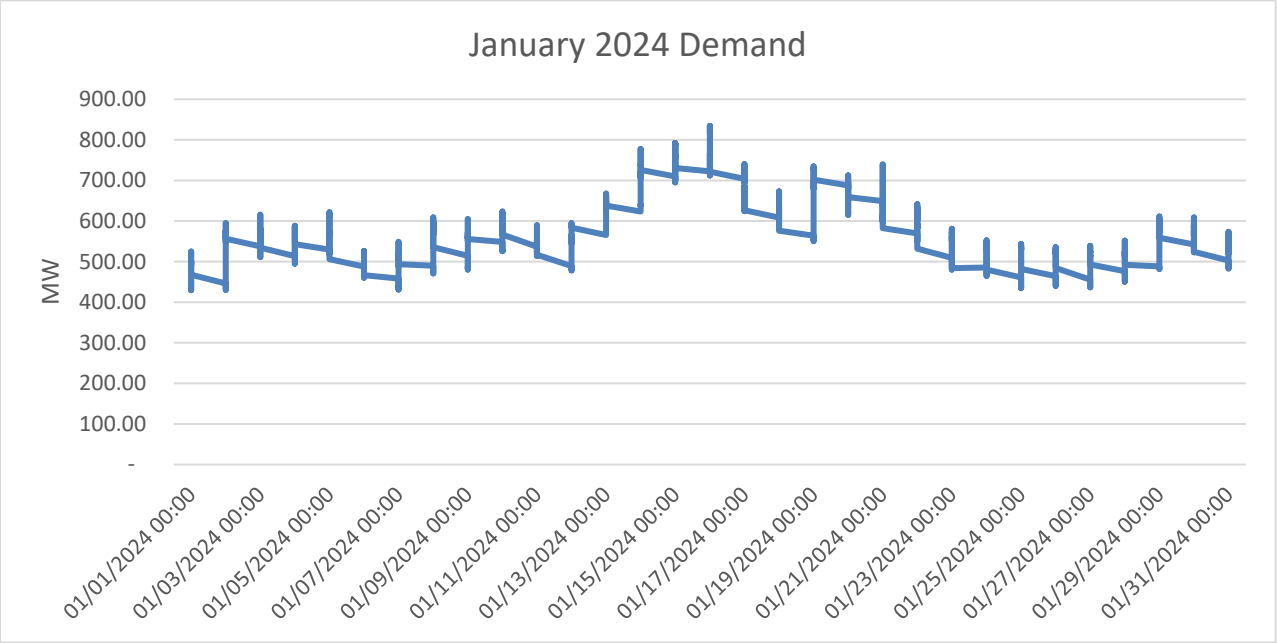


Figure 8-16- February Load

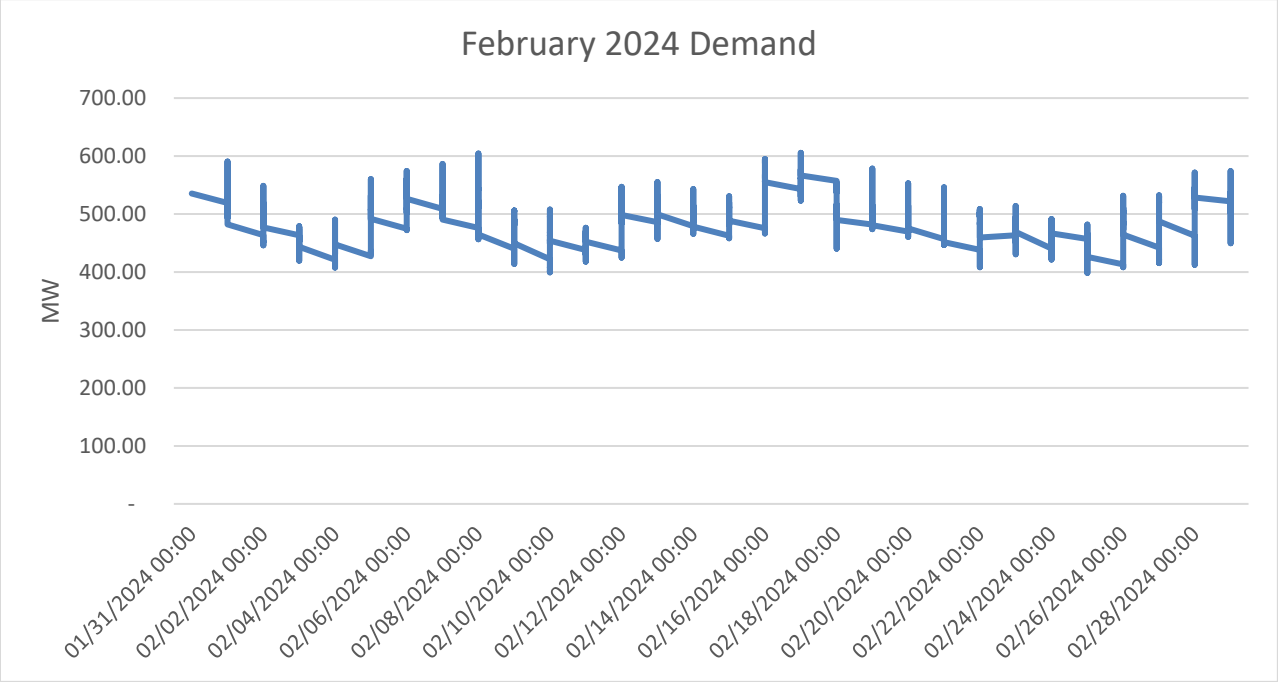


Figure 8-17- March Load

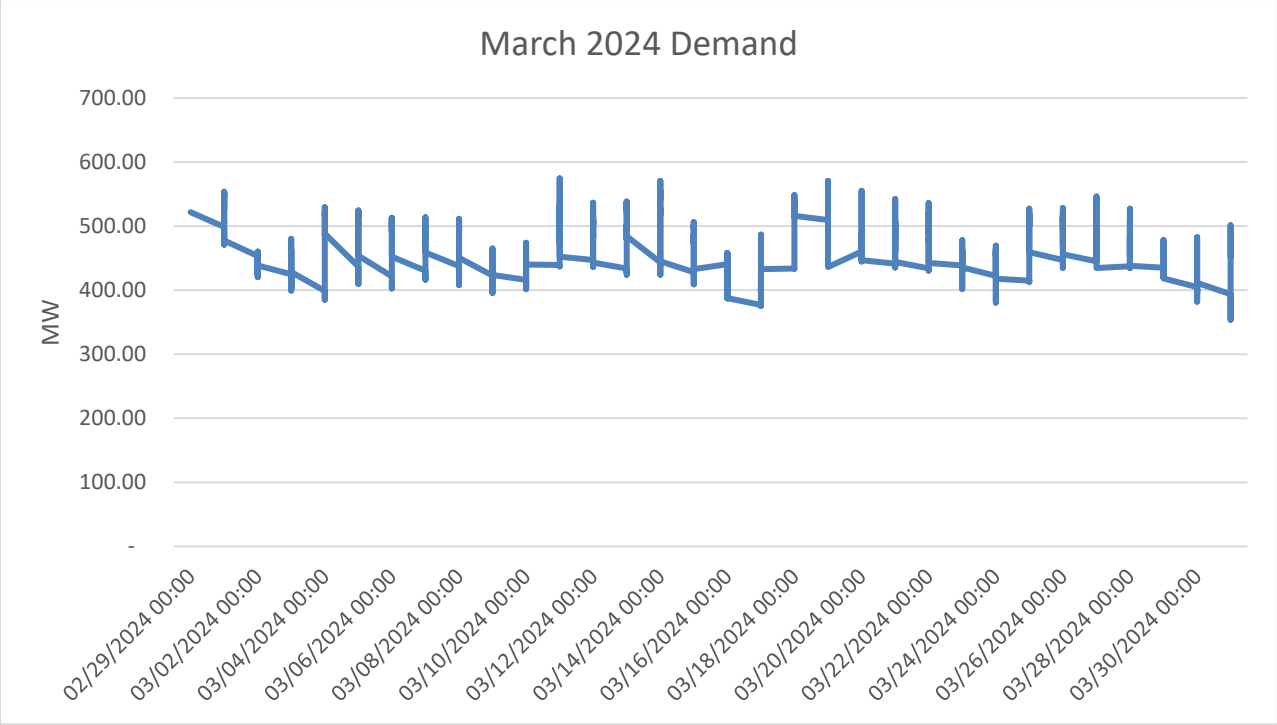


Figure 8-18- April Load

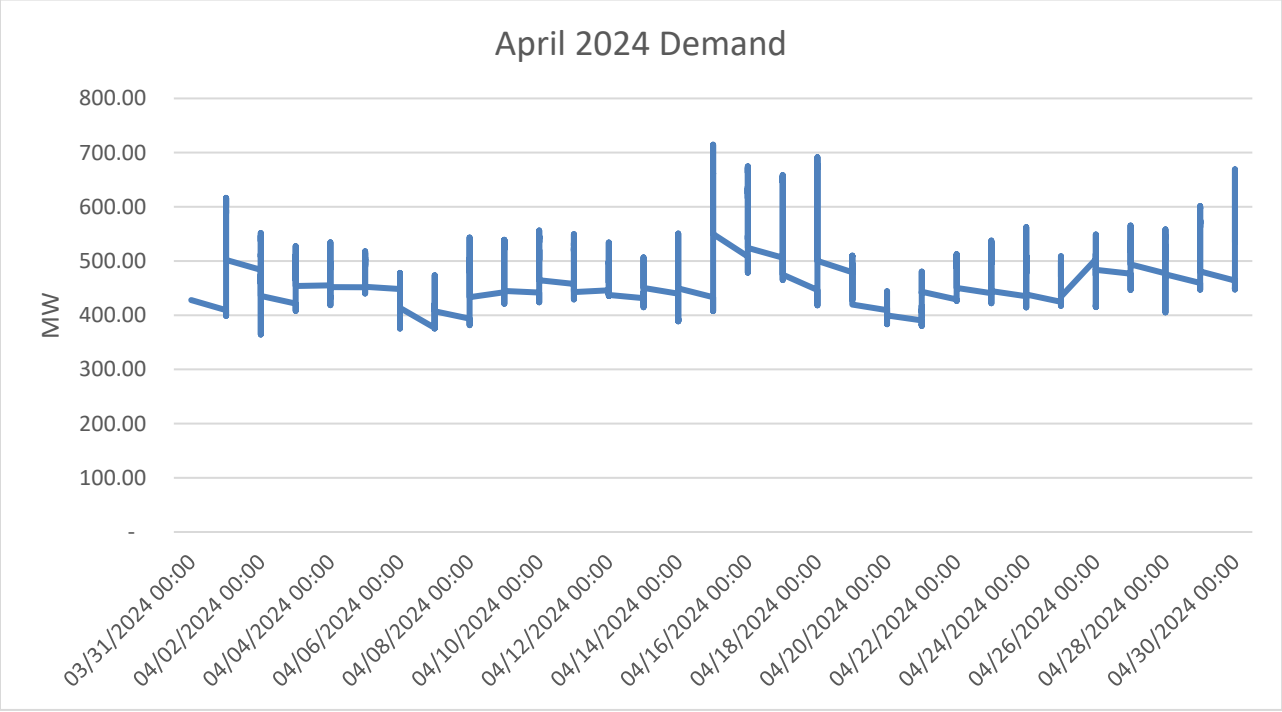


Figure 8-19- May Load

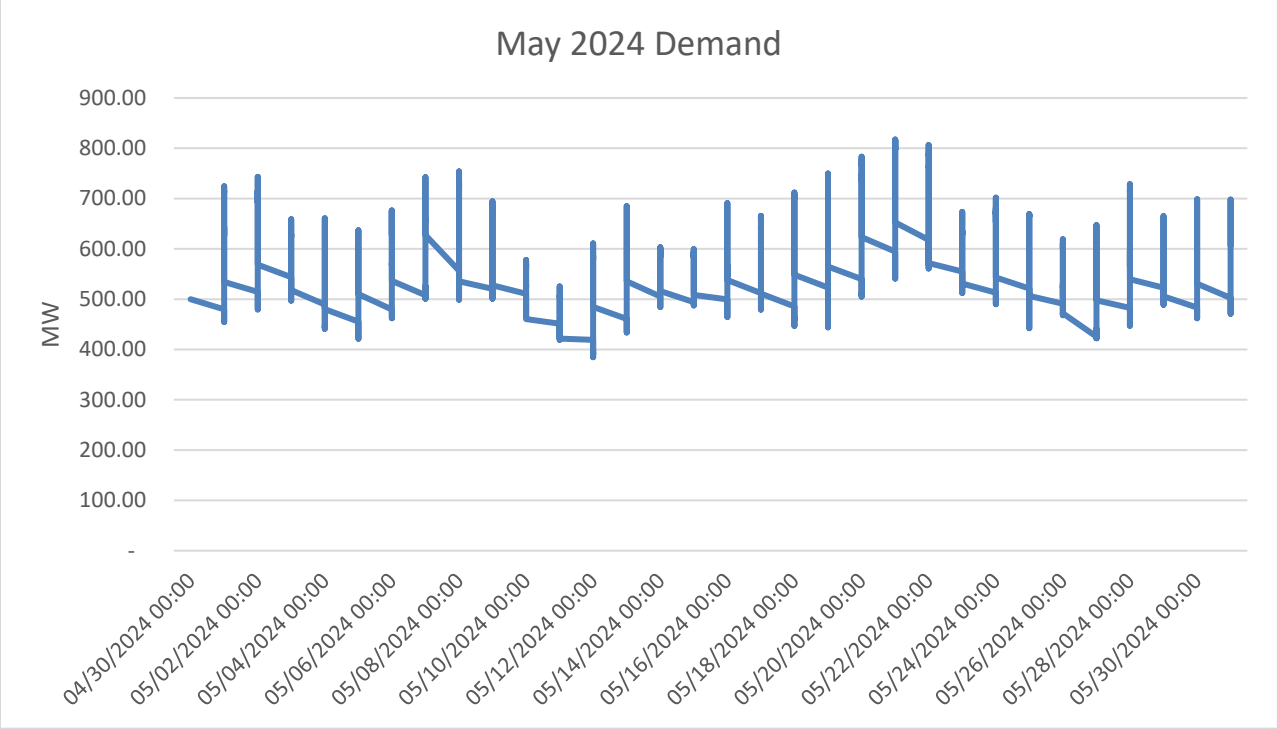


Figure 8-20- June Load

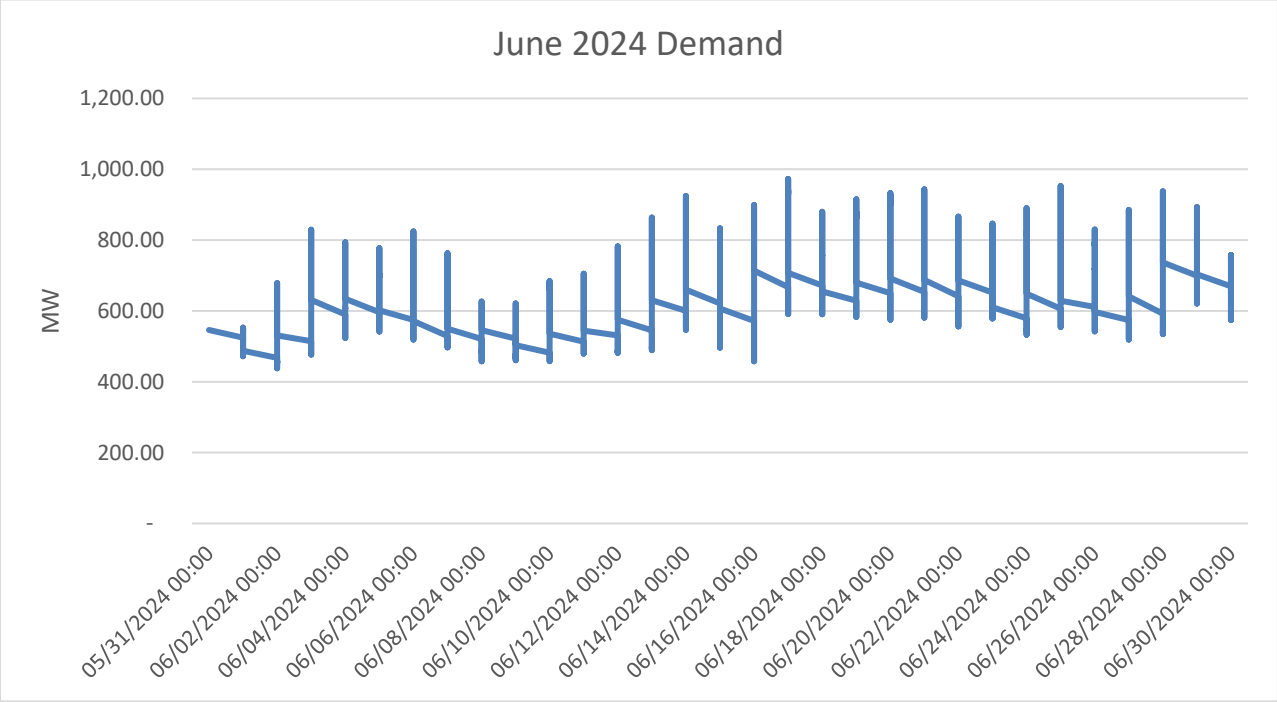


Figure 8-21- July Load

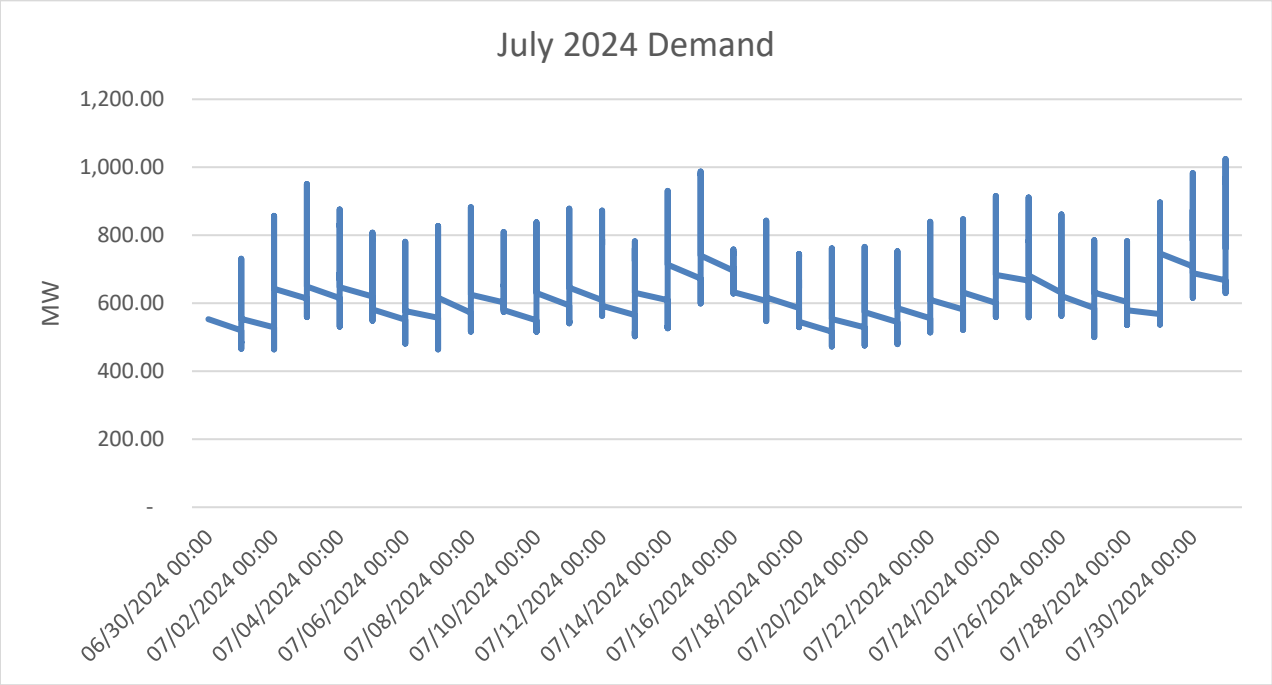


Figure 8-22- August Load

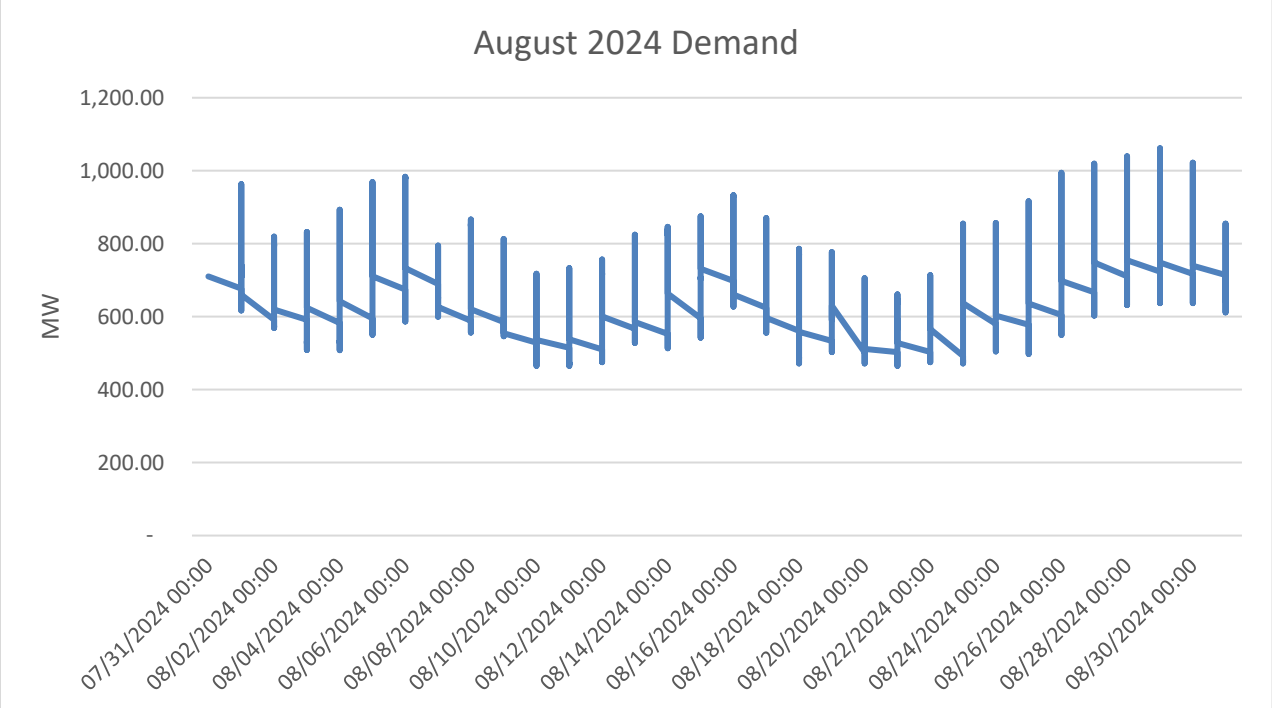


Figure 8-23- September Load

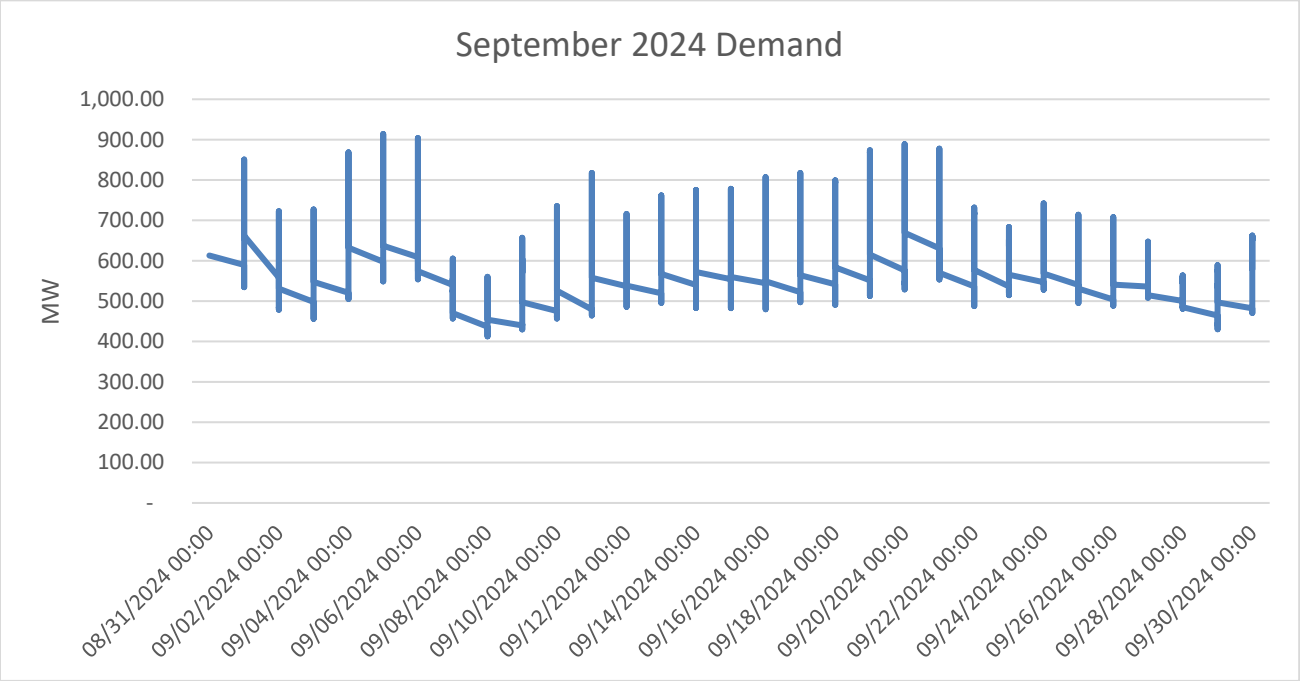


Figure 8-24- October Load

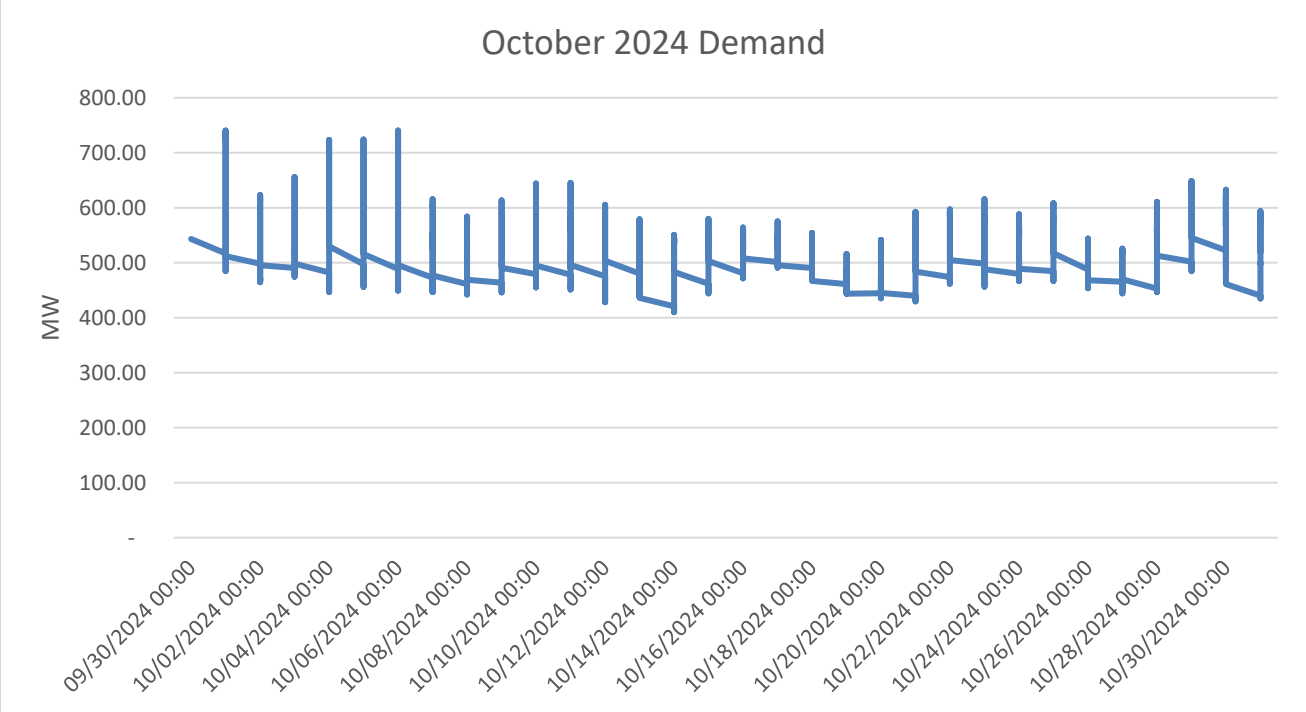


Figure 8-25- November Load

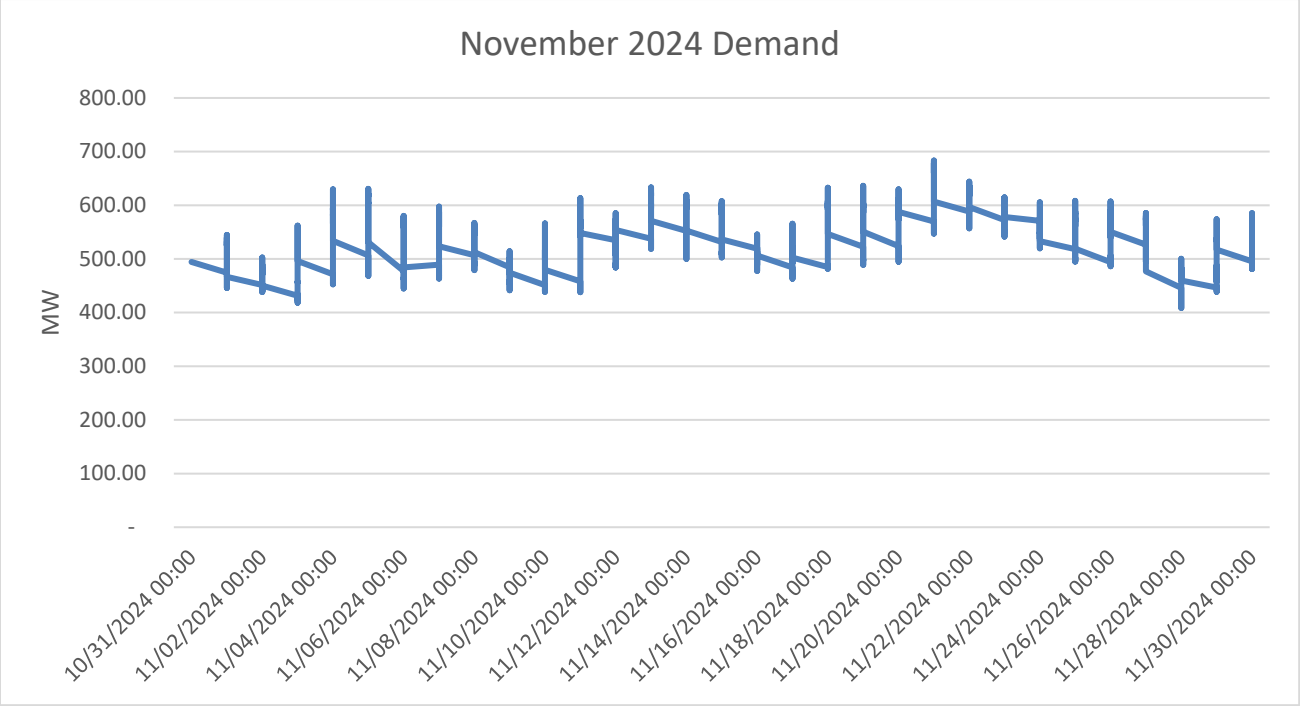
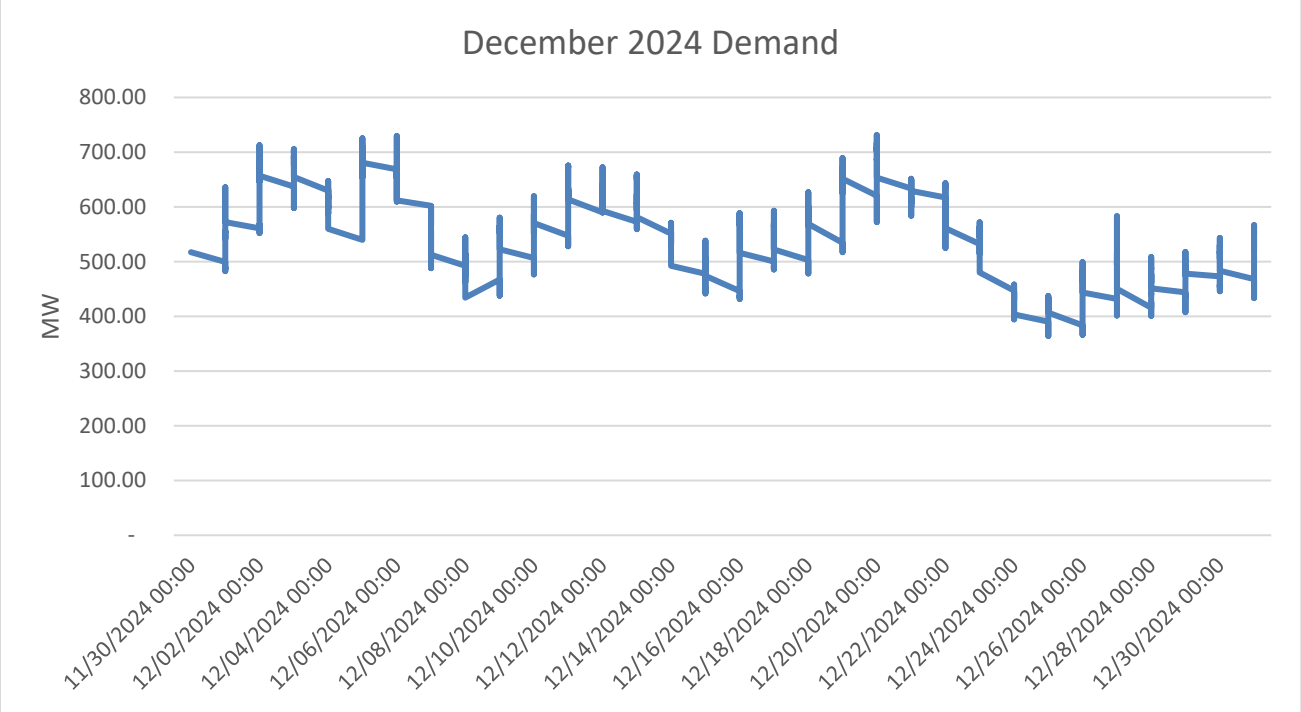


Figure 8-26- December Load



8.1.5. Advanced Metering Infrastructure and Continuous Improvement

CEI South has Advanced Metering Infrastructure (“AMI”). As described previously, the company continues to enhance the system with the use of edge computing applications that provide the company with valuable data to evaluate reliability and resiliency performance, and to find and correct items before they turn into issues that could affect customers. This information can be utilized to enhance forecasting and to perform more effective system planning and improved outage management resulting in better service and communications to customers. CEI South has been actively creating a system to help utilize AMI data for the CPP TOU rate. The pilot that is set to begin in Q2 2026, which has a time-based rate component and a demand response component, is enabled by the system that was put into place years ago. This program is intended to reduce system peak demand, mitigate capacity needs, and encourage cost efficient consumption behaviors. Incentivizing customers to lower consumption during the system’s most constrained hours reduces the need for peak generation resources and provides a mechanism to manage load during tight system conditions or during extreme weather events.

8.2. Environmental Appendix

8.2.1. Air Emissions

It was assumed that current or future generation resources would not exceed CEI South’s allocated annual SO_2 and NO_x emission allowances. CEI South’s fleet of existing power generation facilities meet all rules and regulations related to SO_2 and NO_x emissions, while the cost of emission control equipment and NO_x is factored into any new natural gas-fired facilities, or in the case of a natural gas conversion for Culley Unit 3, that would be selected as part of a portfolio. In 2023 EPA promulgated the Good Neighbor Plan which required 23 states, including Indiana, to further lower existing caps for seasonal NO_x allowances to be allocated to emissions units in the affected states and creating a CSAPR NO_x Ozone Season Group 3 Trading Program which would become effective in the 2024 ozone season. However, on June 27, 2024, the US Supreme Court granted emergency stay petitions, staying implementation of the rule. EPA issued guidance on August 5, 2024, reestablishing the existing CSAPR NO_x Ozone Season Group 2 allowance caps. Air emissions allowance costs are accounted for within IRP modeling.

8.2.2. Solid Waste Disposal

Fly ash from the F.B. Culley facility that meets beneficial reuse specifications is transported off site for beneficial reuse in a cement application, while fly ash that does not meet beneficial reuse specifications is transported for disposal in a permitted local landfill. The F.B. Culley facility completed the conversion of the Unit 3 bottom ash system to a dry

system in December 2020 and similarly sends bottom ash to beneficial reuse or transported for disposal in a permitted local landfill. The F.B. Culley facility utilizes a GeoTube Containment Area that collects the bottom ash and drains the filtrate to a lined pond. The collected bottom ash is sent for beneficial reuse or landfilled. Additionally, the F.B. Culley facility completed the construction of a Spray Dryer Evaporator to handle the FGD Wastewater from the scrubber. The East Ash Pond (approximately 10 acres) no longer receives any waste streams and is in final stages of closure. The West Pond (32 acres) completed closure in December 2020. The closure project included the construction of a new geosynthetic lined contact storm water pond that receives the coal pile run-off and other storm water that contacts industrial activity. Scrubber by-product generated by the F.B. Culley facility is sent off-site for beneficial reuse via shipment by river barge from F.B. Culley to a wallboard manufacturer.

8.2.3. Hazardous Waste

CEI South's A.B. Brown and F.B. Culley plants are episodic producers of hazardous waste that may include outage or maintenance related wastes, paints, parts washer fluids, or other excess or outdated chemicals. Both facilities are typically classified as Small Quantity Generators. All hazardous waste is disposed of in accordance with Federal and state regulations.

8.2.4. Water Consumption and Discharge

A.B. Brown and F.B. Culley currently discharge process and cooling water to the Ohio River under NPDES wastewater discharge permits issued by the IDEM. A.B. Brown natural gas fired combustion turbines have closed-loop cooling systems, while F.B. Culley has a once through cooling water system. In fall 2014, both plants installed chemical precipitation water treatment systems to meet Ohio River Valley Sanitation Commission ("ORSANCO") regional water quality standards mercury limit of 12 ppt monthly average.

8.3. DSM Appendix

8.3.1.1. DSM Planning Process

One of the key objectives of the IRP is to "provide all customers with a reliable supply of energy at the lowest reasonable cost." The level and costs of DSM to be offered in CEI South's service territory are important outcomes of the IRP process. The IRP will determine the appropriate level of DSM to include in the preferred resource plan. However, for CEI South, the IRP is not the appropriate tool to determine which specific programs to include in a DSM plan. Instead, every 3 years CEI South engages in a multi-step planning process designed to select programs that meet the level of savings established in the preferred resource portfolio. Once the level of DSM to be offered has been established by the IRP

and a portfolio of programs to meet the savings levels has been designed, the last step in the planning process is to re-affirm the cost effectiveness of the proposed programs.

8.3.1.2. Cost Benefit Analysis

Utilizing the DSMore cost/benefit model, the measures and programs were analyzed for cost effectiveness. The model includes a full range of economic perspectives typically used in EE and DSM analytics. Inputs into the model include the following: participation rates, incentives paid, energy and demand savings of the measure, life of the measure, avoided costs, implementation costs, administrative costs, incremental costs to the participant of the high efficiency measure and escalation rates and discount rates. CEI South considers the results of each test and ensures that the portfolio passes the Total Resource Cost test as it includes the total costs and benefits to both the energy company (program administrator) and the consumer. The outputs include all the California Standard Practice Manual results:

- Participant Cost Test
- Ratepayer Impact Measure Test
- Utility Cost Test (“UCT”)
- Total Resource Cost Test (“TRC”)

The cost effectiveness analysis produces two types of resulting metrics:

- Net Benefits (dollars) = NPV ∑ benefits – NPV ∑ costs
- Benefit Cost Ratio = NPV ∑ benefits ÷ NPV ∑ costs

The Participant Cost Test shows the value of the program from the perspective of the energy company’s customer participating in the program. The test compares the participant’s bill savings over the life of the DSM program to the participant’s cost of participation.

The Utility Cost Test shows the value of the program to the utility considering only avoided utility supply costs (based on the next unit of generation) in comparison to the utility program costs.

The Ratepayer Impact Measure (“RIM”) Test shows the impact of a program on all utility customers through impacts on average rates. This perspective also includes the estimates of revenue losses, which may be experienced by the utility as a result of the program.

The TRC Test shows the combined perspective of the energy company and the participating customers. This test compares (1) the level of benefits associated with the reduced energy supply costs to (2) the costs incurred by the energy company and by

program participants. In completing the tests listed above, CEI South used 6.77% as the weighted average cost of capital, which is the weighted cost of capital that was approved by the IURC on December 5, 2023 in Cause No. 45990.

Figure 8-27 - CEI South Cost Effectiveness Tests Benefits & Costs Summary

Test	Benefits	Costs
Participant Cost Test	• Incentive payments • Annual bill savings • Applicable tax credits	• Incremental technology/equipment costs • Incremental installation costs
Rate Impact Measure Test	• Avoided energy costs • Avoided capacity costs	• All program costs (startup, marketing, labor, evaluation, promotion, etc.) • Utility/Administrator incentive costs • Lost revenue due to reduced energy bills
Utility Cost Test (Program Administrator Cost Test)	• Avoided energy costs • Avoided capacity costs	• All program costs (startup, marketing, labor, evaluation, promotion, etc.) • Utility/Administrator incentive costs
Total Resource Cost Test	• Avoided energy costs • Avoided capacity costs • Applicable participant tax credits	• All program costs (not including incentive costs) • Incremental technology/equipment costs (whether paid by the participant or the utility)

8.3.2. Gross Savings 2025-2027 Plan

Figure 8-28 - 2025-2027 Approved Plan Gross kWh Energy Savings

	2025		2026		2027	
Sector	**Gross kWh Energy Savings**	**Gross KW Demand Savings**	**Gross kWh Energy Savings**	**Gross KW Demand Savings**	**Gross kWh Energy Savings**	**Gross KW Demand Savings**
Residential	14,377,963	8,184	15,932,490	9,214	15,862,630	8,236
C&I	22,600,000	3,005	25,024,327	3,492	25,400,000	3,279
Total	**36,977,963**	**11,189**	**40,956,817**	**12,706**	**41,262,630**	**11,515**

8.3.3. DSM Programs

CEI South has offered tariff-based DSM resource options to customers for many years. Consistent with a settlement approved in 2007 in Cause No. 43111, the Demand Side Management Adjustment (“DSMA”) was created to specifically recover all CEI South's Commission approved DSM costs, including (at that time) a DLC Component. The Commission, in its order in Cause No. 43427, authorized CEI South to include both Core and Core-Plus DSM Program Costs and related incentives in an Energy Efficiency Funding Component ("EEFC") of the DSMA. The EEFC supports the Company's efforts to help customers reduce their consumption of electricity and related impacts on peak demand. It is designed to recover the costs of Commission-approved DSM programs from all customers receiving the benefit of these programs. In Cause Nos. 43427, 43938 and 44318, the Commission approved recovery of the cost of Conservation Programs via the EEFC. This rider is applicable to customers receiving service pursuant to Rate Schedules RS, B, SGS, DGS, MLA, OSS, LP and HLF.

8.3.4. Impacts

The table below demonstrates estimated energy (kWh) and demand (kW) savings per participant for each program.

Figure 8-29 - 2025 Electric DSM Operating Plan Program Savings

Program	Sector	Participants	NTG	Gross kWh	Gross kWh/Participant	Net kWh	Gross KW	Gross KW/Participant	Net KW
Residential Prescriptive	Residential	1,978	74%	474,041	240	350,980	195	0.099	144
Residential Midstream	Residential	1,783	47%	1,841,874	1,033	874,256	581	0.326	276
Home Energy Assessment	Residential	478	100%	377,520	790	377,520	27	0.056	27
In Store Discount	Residential	4,575	100%	457,893	100	457,893	36	0.008	36
Multi Family Energy Solutions	Residential	26	100%	369,015	14,193	369,015	25	0.969	25
Community Connections	Residential	44,864	100%	778,895	17	778,895	24	0.001	24
Residential New Construction	Residential	154	64%	78,637	511	50,609	30	0.197	19

Program	Sector	Participants	NTG	Gross kWh	Gross kWh/Participant	Net kWh	Gross KW	Gross KW/Participant	Net KW
Income Qualified Weatherization	Residential	837	100%	779,346	931	779,346	83	0.099	83
Marketplace	Residential	7,209	100%	1,618,571	225	1,618,571	603	0.084	603
Residential Behavioral Savings	Residential	49,700	100%	6,125,117	123	6,125,117	1,850	0.037	1,850
Smart Cycle (DLC Change Out)	Residential	3,000	100%	1,477,053	492	1,477,053	3,300	1.100	3,300
BYOT (Bring Your Own Thermostat)	Residential	1,300	100%	0	0	0	1,430	1.100	1,430
Commercial Prescriptive	Commercial	13,047	84%	10,751,737	824	9,031,459	1,709	0.131	1,435
Commercial Midstream	Commercial	32	84%	448,263	14,008	376,541	53	1.658	45
Commercial Custom	Commercial	89	84%	5,600,000	62,921	4,704,000	754	8.468	633
Small Business Energy Solutions	Commercial	13,873	84%	4,300,000	310	3,612,000	470	0.034	395
Building Optimization	Commercial	10	100%	1,500,000	150,000	1,500,000	20	2.000	20
DSM Portfolio Total		**142,955**	**88%**	**36,977,963**	**259**	**32,483,256**	**11,189**	**0.078**	**10,345**

Figure 8-30 - 2026 Electric DSM Proposed Operating Plan Program Savings

Program	Sector	Participants	NTG	Gross kWh	Gross kWh/Participant	Net kWh	Gross KW	Gross KW/Participant	Net KW
Residential Prescriptive	Residential	2,638	74%	427,293	162	314,238	166	0.063	122
Residential Midstream	Residential	2,642	48%	1,861,980	705	884,859	587	0.222	279
Home Energy Assessment	Residential	385	100%	473,865	1,231	473,865	35	0.091	35
In Store Discount	Residential	3,300	100%	532,856	161	532,856	40	0.012	40
Multi Family Energy Solutions	Residential	350	100%	369,015	1,054	369,015	25	0.072	25
Community Connections	Residential	28,040	100%	778,895	28	778,895	24	0.001	24
Residential New Construction	Residential	167	64%	78,637	471	50,609	30	0.181	19
Income Qualified Weatherization	Residential	800	100%	784,991	981	784,991	86	0.108	86
Marketplace	Residential	6,100	100%	1,694,556	278	1,694,556	632	0.104	632
Residential Behavioral Savings	Residential	62,000	100%	6,125,117	99	6,125,117	1,850	0.030	1,850
Smart Cycle (DLC Change Out)	Residential	2,500	100%	1,477,053	591	1,477,053	3,300	1.320	3,300
BYOT (Bring Your Own Thermostat)	Residential	1,800	100%	0	0	0	1,430	0.794	1,430
Commercial Prescriptive	Commercial	13,003	84%	12,032,995	925	10,107,640	1,883	0.145	1,582
Commercial Midstream	Commercial	38	84%	567,005	14,921	476,284	82	2.150	69
Commercial Custom	Commercial	93	84%	6,100,000	65,591	5,124,000	754	8.106	633
Small Business Energy Solutions	Commercial	13,873	84%	4,300,000	310	3,612,000	470	0.034	395
Building Optimization	Commercial	5	100%	1,500,000	300,000	1,500,000	20	4.000	20
DSM Portfolio Total		**143,646**	**88%**	**40,956,817**	**285**	**36,158,538**	**12,706**	**0.088**	**11,836**

Figure 8-31 - 2027 Electric DSM Approved Plan Program Savings

Program	Sector	Participants	NTG	Gross kWh	Gross kWh/Participant	Net kWh	Gross KW	Gross KW/Participant	Net KW
Residential Prescriptive	Residential	1,724	73%	395,946	230	287,817	141	0.082	103
Residential Midstream	Residential	1,793	48%	1,896,389	1,058	902,894	597	0.333	284
Home Energy Assessment	Residential	748	100%	570,893	763	570,893	44	0.058	44
In Store Discount	Residential	7,275	100%	607,820	84	607,820	43	0.006	43
Multi Family Energy Solutions	Residential	26	100%	369,015	14,193	369,015	25	0.969	25
Community Connections	Residential	44,864	100%	778,895	17	778,895	24	0.001	24
Residential New Construction	Residential	154	64%	78,637	511	50,609	30	0.197	19
Income Qualified Weatherization	Residential	907	100%	790,637	872	790,637	90	0.099	90
Marketplace	Residential	7,893	100%	1,772,227	225	1,772,227	661	0.084	661
Residential Behavioral Savings	Residential	49,700	100%	7,125,117	143	7,125,117	1,850	0.037	1,850
Smart Cycle (DLC Change Out)	Residential	3,000	100%	1,477,053	492	1,477,053	3,300	1.100	3,300
BYOT (Bring Your Own Thermostat)	Residential	1,300	100%	0	0	0	1,430	1.100	1,430
Commercial Prescriptive	Commercial	12,958	84%	12,824,803	990	10,767,584	1,964	0.152	1,649
Commercial Midstream	Commercial	33	84%	675,197	20,461	567,166	72	2.170	60
Commercial Custom	Commercial	93	84%	6,100,000	65,591	5,124,000	754	8.106	633
Small Business Energy Solutions	Commercial	13,873	84%	4,300,000	310	3,612,000	470	0.034	395
Building Optimization	Commercial	10	100%	1,500,000	150,000	1,500,000	20	2.000	20
DSM Portfolio Total		**146,351**	**88%**	**41,262,630**	**282**	**36,303,727**	**11,515**	**0.079**	**10,631**

8.3.5. Avoided Costs

The avoided power capacity costs are reflective of the estimated replacement capital and fixed Operations and Maintenance ("O&M") cost. For this avoided cost analysis, a 235 MW 1x F-class simple cycle gas turbine was used as the comparison due to the low capital and fixed O&M costs. The operating and capital costs are assumed to escalate with inflation throughout the study period. Transmission and distribution capacity are accounted for within the transmission and distribution avoided cost.

The marginal operating energy costs were based off the modeled CEI South system marginal energy cost from the Preferred Portfolio under Reference Case assumptions. This included estimated capital, variable operation and maintenance and fuel costs. The marginal system cost reflects the modeled spinning reserve requirement and adjusted sales forecasts accounting for transmission and distribution losses.

The table below (Figure 8-32) shows avoided costs when energy efficiency is selected through the IRP modeling process. As energy efficiency competes against other supply side resources and is selected, then the cost of a 235 MW 1x F-class simple cycle gas turbine is avoided.

Figure 8-32 - Avoided Costs

Year	Avoided Capital/ O&M Cost ($/kW)	Transmission & Distribution Avoided Capital Cost ($/kW)	Total Capacity Avoided Cost ($/kW)	Natural Gas Forecast ($/MMBtu)	System Marginal Cost ($/MWh)
2026	$180.11	$13.74	**$193.85**	$3.48	$44.65
2027	$183.95	$13.58	**$197.53**	$3.76	$45.97
2028	$187.87	$13.72	**$201.59**	$4.08	$49.69
2029	$191.87	$14.16	**$206.03**	$4.39	$55.71
2030	$195.95	$14.62	**$210.57**	$4.62	$54.37
2031	$200.13	$14.30	**$214.42**	$4.82	$56.65
2032	20439%	$14.70	**$219.09**	$4.91	$57.73
2033	$208.74	$14.93	**$223.67**	$4.99	$59.41
2034	$213.19	$15.21	**$228.40**	$5.14	$48.46
2035	$217.73	$15.71	**$233.44**	$5.31	$58.75
2036	$222.37	$15.94	**$238.31**	$5.45	$60.34
2037	$227.11	$16.29	**$243.40**	$5.57	$60.95
2038	$231.94	$16.63	**$248.57**	$5.74	$62.16
2039	$236.88	$16.99	**$253.87**	$5.92	$63.85
2040	$241.93	$17.37	**$259.30**	$6.22	$66.94
2041	$247.08	$17.72	**$264.80**	$6.37	$66.63
2042	$252.34	$18.10	**$270.45**	$6.58	$66.70
2043	$257.72	$18.49	**$276.21**	$6.77	$69.91
2044	$263.21	$18.88	**$282.09**	$7.00	$70.70
2045	$268.82	$19.29	**$288.10**	$7.33	$69.87

8.3.6. Estimated Impact on Historical Forecasted Peak Demand and Energy

The load forecast developed by Itron incorporates CEI South's historical DSM in the residential and commercial models to account for historical program savings. The DSM variables help explain historical usage trends. For additional details on the impact of DSM on the forecast see *Technical Appendix Attachment 3.12025 CEIS Long-Term Electric Energy & Demand Forecast Report, Section 5.4 Historical DSM Savings*.

8.3.7. Appliance Saturation Survey

CEI South conducted a residential energy efficiency baseline survey which launched on February 17, 2025 and was closed on February 28, 2025. CEI South fielded forty-seven

(47) questions, which were developed with input from GDS (CEI South's Market Potential Study vendor), Itron, and the OSB. The survey contained a set of core questions with an option for customers to answer additional questions. CEI had 1,048 people who started the survey and 730 who completed the entire survey for a response rate of 5.4% out of the total number of people who received the survey. Survey responses informed the market potential study both qualitative, and quantitative in terms of saturation and efficiency levels of measures. The 2025 CNP Residential Energy Efficiency Baseline Survey presentation can be found in *Technical Appendix Attachment 3.7*. The results of the 2025 Survey will be incorporated into the sales and demand forecasts in future IRPs.

8.4. Risk Appendix

The probabilistic risk assessment allows for the development of portfolio results based on a range of randomly sampled input values. Specifically, it evaluates uncertainty around coal, natural gas, CO_2, and MISO energy prices, peak load, capital costs for new renewable, thermal, and storage resources, and market energy sales. With the uncertainty around the variables defined by probability distributions, the variables were modeled stochastically using Encompass's Monte Carlo sampling capability. Stochastically developed inputs allow for the testing of each portfolio's performance across a wide range of probable market conditions. The development of probability distributions around uncertainty variables, combined with running these distributions through a stochastic process to develop 200 sets of inputs, is key to the probability risk assessment approach. The probability distributions used in the assessment are described in more detail below.

8.4.1. Stochastics (Probabilistic Modeling)

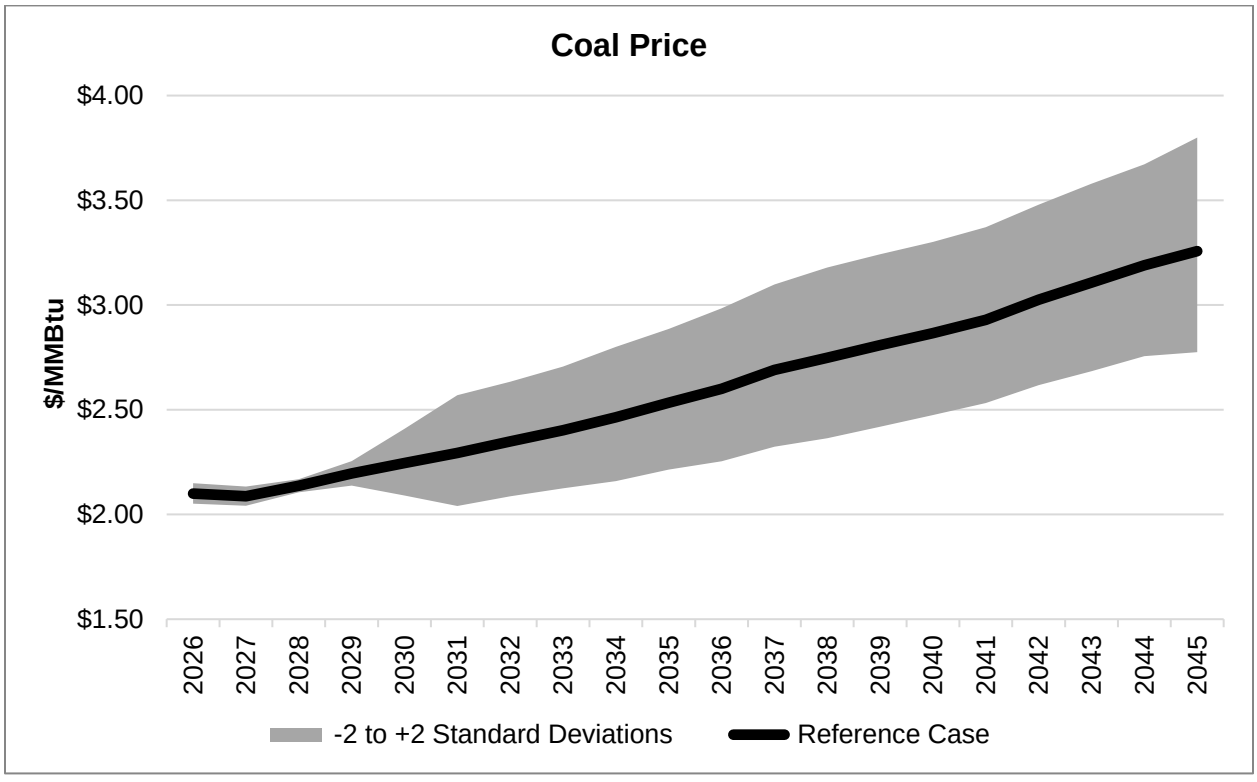
To perform the stochastics (probabilistic modeling), a set of probability distributions that characterize uncertainty was required for each of the key variables described above (coal prices, natural gas prices, MISO energy prices, peak demand, CO_2 prices, capital costs for new resources, and market sales). Monthly lognormal probability distributions were assumed for coal prices, natural gas prices, and peak demand. For the other variables, discrete distributions were developed at varying time intervals: hourly for MISO energy prices, monthly for sales limits, and annually for CO_2 prices and new resource capital costs. The lognormal probability distributions were stochastically simulated together in EnCompass with cross-variable correlation using Monte Carlo Sampling. This produced 200 sets of correlated inputs for coal prices, natural gas prices and peak demand. These stochastic runs in EnCompass assumed 100 percent mean reversion. The discrete distributions for MISO energy prices, CO_2 prices, new resource capital costs, and sales limits were then randomly assigned to each of the 200 stochastic iterations. These input sets were individually run through the dispatch model in EnCompass with each of 12

selected portfolios for a total of 2,400 simulations. The following sections describe the methodologies for developing the stochastic variables.

8.4.1.1. Coal Price Uncertainty

To define the uncertainty around coal prices to be used in the stochastic modeling, 1898 & Co. relied on a base, high and low coal price forecast from U.S. Energy Information Administration's ("EIA") 2025 Annual Energy Outlook ("AEO"). Specifically, 1898 & Co. developed annual standard deviations based on the EIA's Interior Minemouth price forecasts for the Reference Case, High Oil Price Case, and the Alternative Electricity Case. These annual standard deviations were converted to monthly standard deviations, which were then divided by EIA Interior Minemouth Reference Case pricing to arrive at percent standard deviations for coal pricing. The monthly percent standard deviations were then applied to the IRP consensus Reference Case pricing to impute a monthly lognormal probability distribution for coal pricing. These monthly distributions of coal prices were in turn sampled in the stochastic modeling that developed the 200 sets of stochastic inputs. Figure 8-33 displays the base coal forecast as well as two standard deviations from the mean.

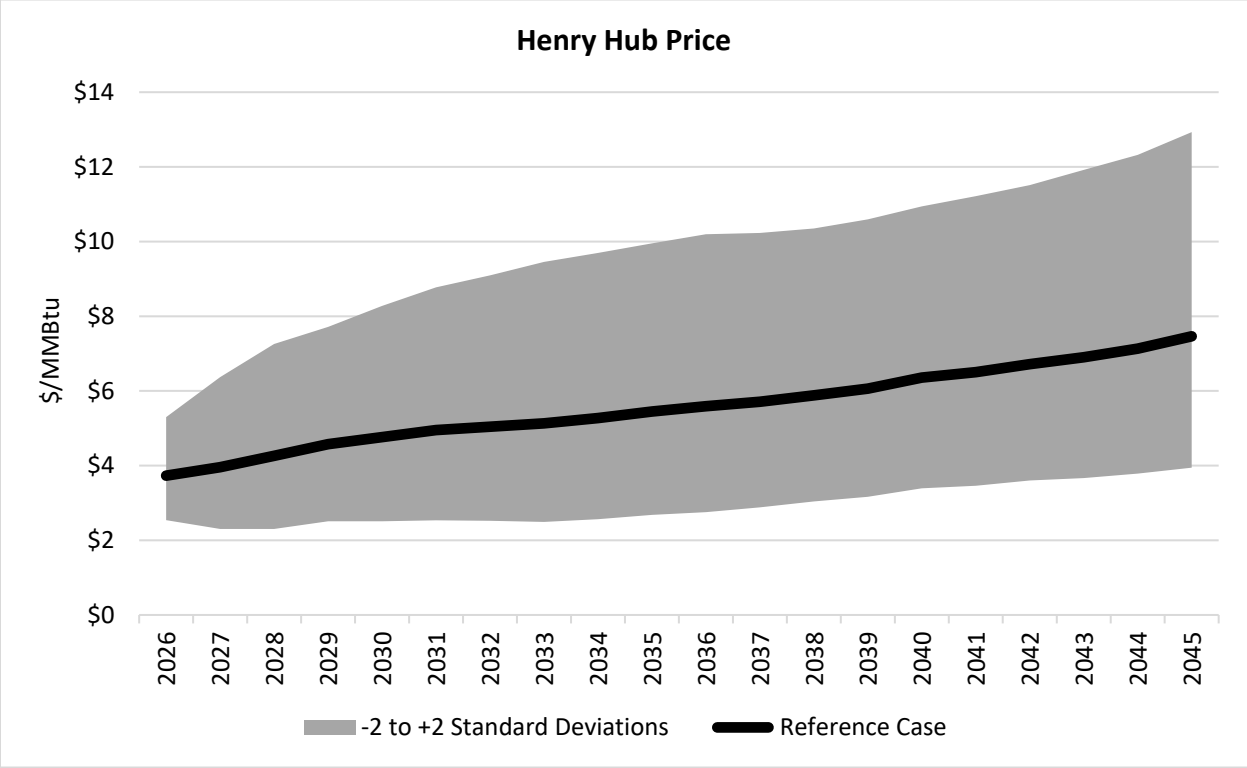
Figure 8-33 - Coal Price Distribution (Nominal$/MMBtu)



8.4.1.2. Natural Gas Price Uncertainty

To define the uncertainty around natural gas prices to be used in the stochastic modeling, 1898 & Co. relied on the base, high and low Henry Hub natural gas price forecast using data from Hitachi (ABB). Specifically, 1898 & Co. developed monthly standard deviations from the base, high and low forecasts, divided the result by the base price forecast to arrive at a percent standard deviation. The monthly percent standard deviations were then applied to the consensus Reference Case pricing to impute a monthly lognormal probability distribution for natural gas pricing. These monthly natural gas price distributions were in turn sampled in the stochastic modeling that developed the 200 sets of stochastic inputs. An illustration of the Reference Case natural gas forecast as well as its uncertainty is given in Figure 8-34.

Figure 8-34 - Natural Gas (Henry Hub) Price Distribution (Nominal$/MMBtu)

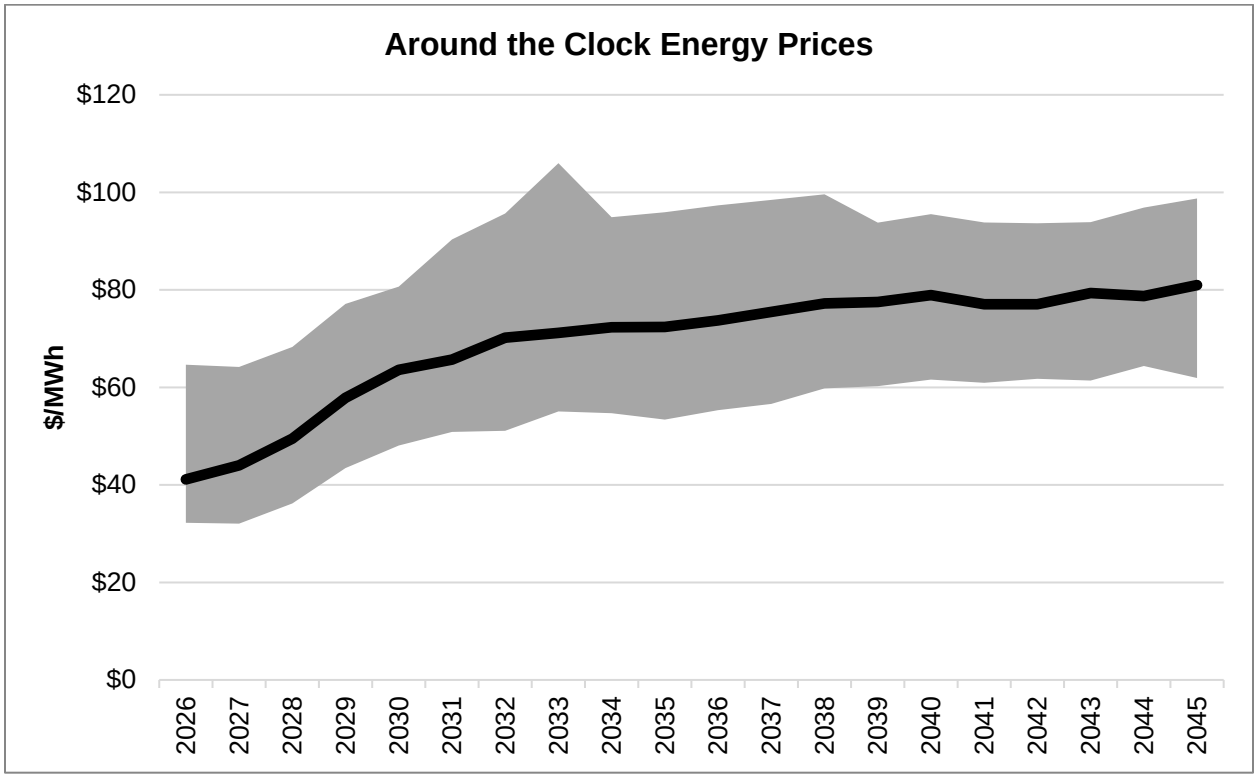


8.4.1.3. Energy Price Distribution

1898 & Co. updated energy prices that were input into EnCompass for each of the 200 draws. 1898 & Co. used the national database licensed from Horizon Energy, LLC as the starting point for creating the energy prices. Using the different IRP scenarios, unique energy price forecasts were developed. The energy prices and associated natural gas prices from the scenario model runs were used to develop monthly implied market heat

rate curves. These monthly implied market heat rates were applied to the monthly natural gas price for the 200 iterations to arrive at monthly energy prices for each iteration.

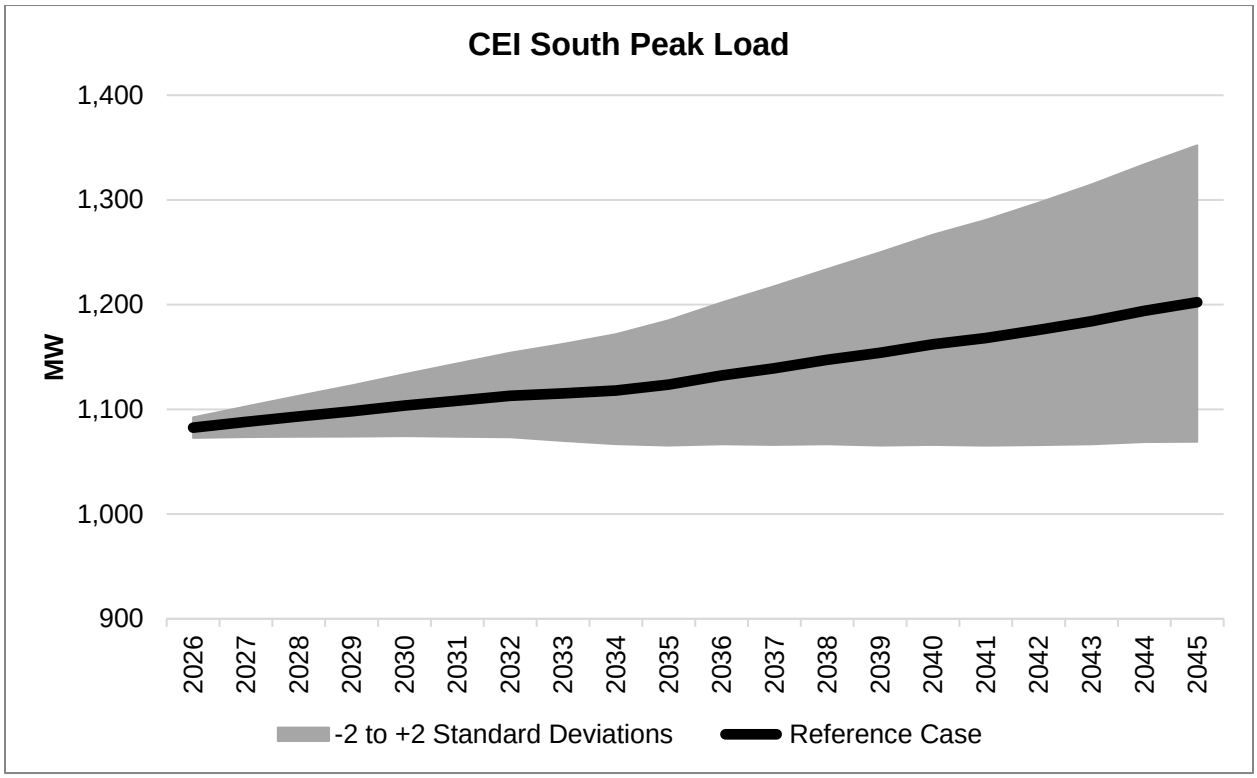
Figure 8-35 - Stochastic Inputs Energy Prices – Market Forecast



8.4.1.4. Load Uncertainty

To account for electricity demand variability that derives from economic growth, weather, energy efficiency and demand side management measures, 1898 & Co. relied on monthly peak load forecasts developed by CEI South's vendor, Itron. Itron developed base high and low peak demand forecasts. Using these forecasts, 1898 & Co. calculated monthly peak demand standard deviations which were applied to a lognormal distribution to represent the probability of monthly peak demand within the stochastic modeling framework. Figure 8-36 below shows uncertainty around peak loads.

Figure 8-36 - CEI South Load Distribution (Megawatts)



8.4.1.5. CO_2 Emissions Price Uncertainty

No CO_2 emissions prices are assumed for the Reference Case, rather CO_2 prices are assumed for the High Regulatory scenario. Because of these assumptions, CO_2 price uncertainty is assigned on a discrete basis. Specifically, 1898 & Co. randomly assigned a zero price for CO_2 for 150 iterations out of the 200 iterations of stochastic inputs and the CO_2 price from the High Regulatory scenario for 50 iterations.

8.4.1.6. Capital Cost Uncertainty

1898 & Co. developed base, high, and low capital cost assumptions for renewable, thermal, and storage resources used in the scenario analyses. For technologies that had a purchase option submitted to the 2024 All-Source RFP – namely storage, solar and solar plus storage – the base forecast was developed using the average purchase price for received bids. For wind resources, the technology assessment was combined with data collected for wind Power Purchase Agreements ("PPA") received during the 2024 All Source RFP to create an estimate that reflected current market conditions. The proposals reflect current near-term purchase options and were forecasted through the study period using capital cost estimates from the NREL. The low forecast follows a similar methodology; however, it uses

the lowest received purchase price as a starting point and then trends linearly to the NREL reference case cost in 2045. In contrast, the high forecast begins with the highest bid price and then escalates throughout the study period at the assumed inflation rate (2.13%).

For technologies that did not have a purchase option submitted in the recent RFP, the technology assessment provided a starting point for cost estimates. Specifically, for nuclear and thermal technologies, the technology assessment cost estimate was used for a starting price, which was then forecasted to follow the moderate NREL curve. The low forecast follows the same methodology, starting at the technology assessment data point and then following the low NREL cost curve. Finally, the high forecast begins at the same point and then escalates through the study period at the assumed escalation rate.

Since the base, high and low capital costs were developed based on fundamental assumptions and do not conform to a specific probability distribution type, the costs were treated as discrete distributions and assigned to the 200 iterations for inclusion in the stochastic inputs. Low capital costs were assigned to the first 50 stochastic iterations, base (Reference Case) capital costs to the next 100, and high capital costs to the final 50 iterations. Because it is unlikely capital costs would stay high or low for every year of the study period, the order of iterations was randomly shuffled every four years prior to the 50/100/50 iteration assignments. With this approach, any one iteration would have a combination of base, high and low capital costs in four year segments.

The following figures provide examples of capital cost curves from each resource category. Note that these diagrams are provided without the adder for Allowance for Funds Used During Construction (“AFUDC”), which was applied to the capital costs seen in the EnCompass Model.

Figure 8-37 - Lithium-Ion 100 MW/400 MWh Battery Storage Capital Costs Alternate Scenarios ($/kW)

Year	Reference Case	Low	High	NREL
2026	$2,273	$1,955	$2,591	$1,805
2027	$2,273	$1,955	$2,591	$1,786
2028	$2,273	$1,955	$2,591	$1,765
2029	$2,244	$1,948	$2,646	$1,742
2030	$2,212	$1,942	$2,703	$1,718
2031	$2,227	$1,936	$2,760	$1,729
2032	$2,241	$1,930	$2,819	$1,740
2033	$2,255	$1,924	$2,879	$1,751
2034	$2,269	$1,918	$2,940	$1,762
2035	$2,282	$1,912	$3,003	$1,772
2036	$2,294	$1,905	$3,067	$1,782
2037	$2,307	$1,899	$3,132	$1,791
2038	$2,318	$1,893	$3,199	$1,800
2039	$2,329	$1,887	$3,267	$1,809
2040	$2,340	$1,881	$3,336	$1,817
2041	$2,350	$1,875	$3,407	$1,825
2042	$2,359	$1,869	$3,480	$1,832
2043	$2,367	$1,862	$3,554	$1,838
2044	$2,375	$1,856	$3,630	$1,845
2045	$2,382	$1,850	$3,707	$1,850

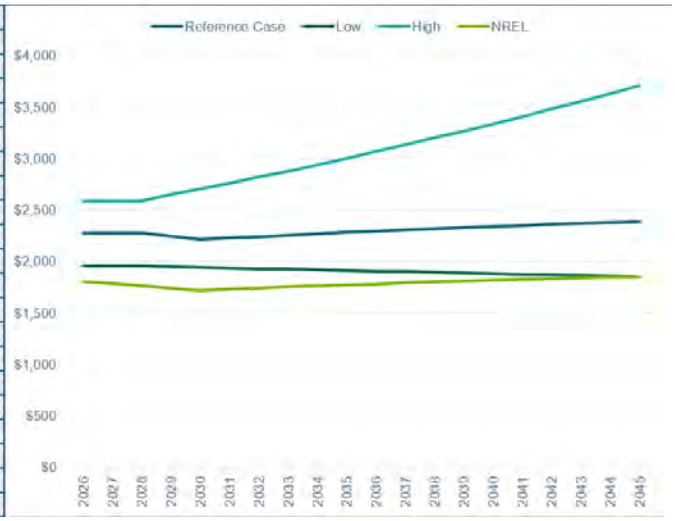


Figure 8-38 - Solar Capital Costs Alternate Scenarios (100 MW) ($/kW)

Year	Reference Case	Low	High	NREL
2026	$2,351	$1,895	$2,750	$1,558
2027	$2,351	$1,895	$2,750	$1,525
2028	$2,351	$1,895	$2,750	$1,490
2029	$2,351	$1,895	$2,750	$1,452
2030	$2,287	$1,853	$2,809	$1,413
2031	$2,219	$1,811	$2,868	$1,371
2032	$2,147	$1,769	$2,929	$1,326
2033	$2,071	$1,727	$2,992	$1,279
2034	$1,991	$1,685	$3,056	$1,230
2035	$1,906	$1,643	$3,121	$1,177
2036	$1,916	$1,601	$3,187	$1,183
2037	$1,925	$1,559	$3,255	$1,189
2038	$1,934	$1,517	$3,324	$1,195
2039	$1,943	$1,475	$3,395	$1,200
2040	$1,950	$1,433	$3,467	$1,205
2041	$1,958	$1,391	$3,541	$1,209
2042	$1,965	$1,350	$3,616	$1,213
2043	$1,971	$1,308	$3,693	$1,217
2044	$1,976	$1,266	$3,772	$1,221
2045	$1,981	$1,224	$3,852	$1,224

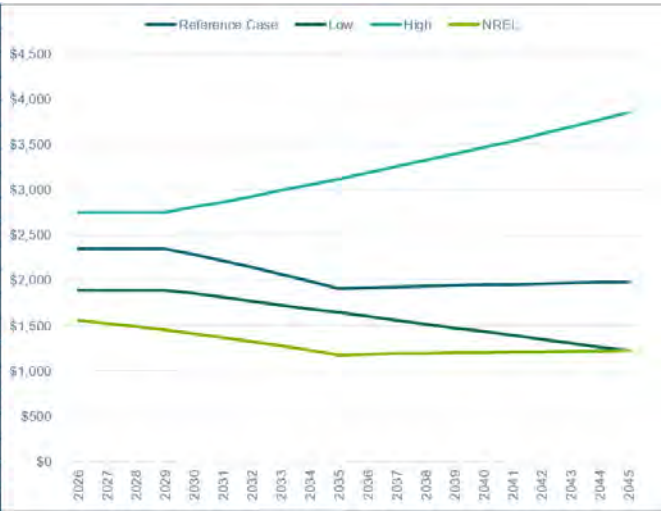


Figure 8-39 – Solar plus Storage Capital Costs Alternate Scenarios (100 + 50 MW) ($/kW)

Year	Reference Case	Low	High	NREL
2026	$3,492	$2,722	$4,500	$2,384
2027	$3,492	$2,722	$4,500	$2,342
2028	$3,492	$2,722	$4,500	$2,296
2029	$3,492	$2,722	$4,500	$2,248
2030	$3,412	$2,681	$4,596	$2,196
2031	$3,359	$2,641	$4,694	$2,163
2032	$3,303	$2,600	$4,794	$2,126
2033	$3,243	$2,559	$4,896	$2,088
2034	$3,178	$2,519	$5,000	$2,046
2035	$3,110	$2,478	$5,106	$2,002
2036	$3,125	$2,438	$5,215	$2,012
2037	$3,139	$2,397	$5,326	$2,021
2038	$3,152	$2,357	$5,440	$2,029
2039	$3,165	$2,316	$5,555	$2,037
2040	$3,176	$2,276	$5,674	$2,045
2041	$3,187	$2,235	$5,794	$2,052
2042	$3,197	$2,194	$5,918	$2,058
2043	$3,206	$2,154	$6,044	$2,064
2044	$3,213	$2,113	$6,173	$2,069
2045	$3,220	$2,073	$6,304	$2,073

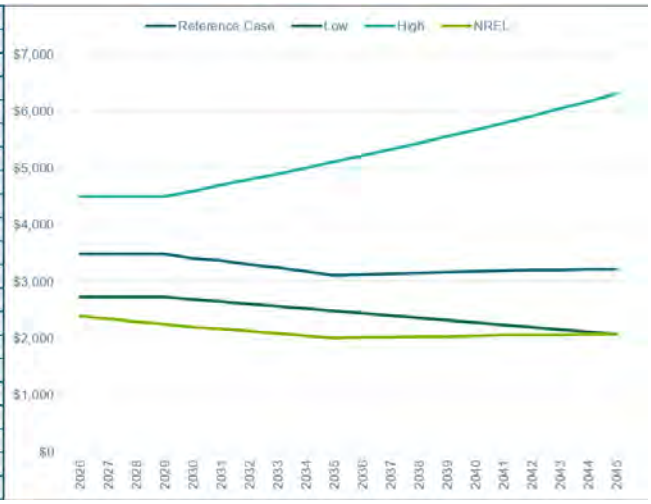


Figure 8-40 – Wind Capital Costs Alternate Scenarios (200 MW) ($/kW)

Year	Reference Case	Low	High	NREL
2026	$2,195	$1,625	$2,611	$1,672
2027	$2,195	$1,641	$2,667	$1,672
2028	$2,193	$1,657	$2,724	$1,671
2029	$2,191	$1,673	$2,782	$1,669
2030	$2,188	$1,689	$2,841	$1,666
2031	$2,211	$1,705	$2,902	$1,684
2032	$2,234	$1,721	$2,963	$1,702
2033	$2,258	$1,737	$3,026	$1,720
2034	$2,281	$1,753	$3,091	$1,737
2035	$2,304	$1,769	$3,157	$1,755
2036	$2,327	$1,785	$3,224	$1,773
2037	$2,351	$1,801	$3,292	$1,791
2038	$2,374	$1,817	$3,363	$1,808
2039	$2,397	$1,833	$3,434	$1,826
2040	$2,420	$1,849	$3,507	$1,843
2041	$2,442	$1,865	$3,582	$1,861
2042	$2,465	$1,881	$3,658	$1,878
2043	$2,488	$1,897	$3,736	$1,895
2044	$2,510	$1,913	$3,816	$1,912
2045	$2,532	$1,929	$3,897	$1,929

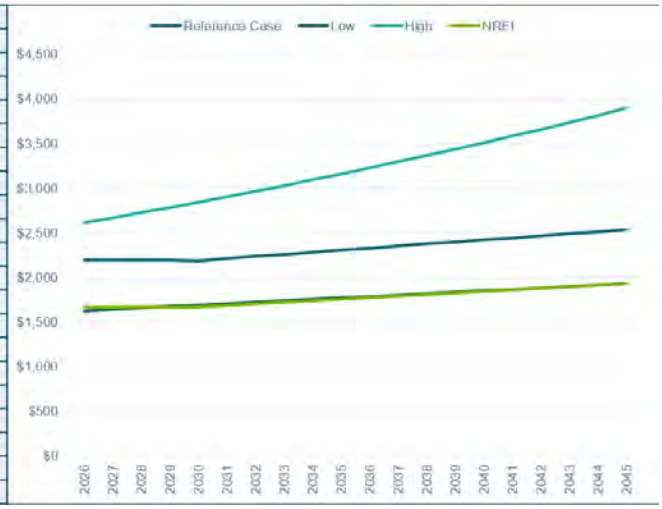


Figure 8-41 – 1x1 J Class Unfired CCGT Capital Costs Alternate Scenarios (620 MW) ($/kW)

Year	Reference Case	Low	High	NREL
2026	$2,065	$2,061	$2,082	$1,579
2027	$2,092	$2,083	$2,127	$1,599
2028	$2,119	$2,106	$2,172	$1,620
2029	$2,146	$2,128	$2,218	$1,640
2030	$2,173	$2,151	$2,266	$1,661
2031	$2,200	$2,173	$2,314	$1,682
2032	$2,228	$2,195	$2,363	$1,703
2033	$2,255	$2,217	$2,413	$1,724
2034	$2,283	$2,239	$2,465	$1,745
2035	$2,311	$2,262	$2,517	$1,767
2036	$2,342	$2,290	$2,571	$1,791
2037	$2,374	$2,319	$2,626	$1,815
2038	$2,406	$2,348	$2,681	$1,839
2039	$2,438	$2,377	$2,739	$1,864
2040	$2,471	$2,407	$2,797	$1,889
2041	$2,503	$2,436	$2,856	$1,914
2042	$2,536	$2,466	$2,917	$1,939
2043	$2,570	$2,496	$2,979	$1,964
2044	$2,603	$2,526	$3,043	$1,990
2045	$2,637	$2,556	$3,108	$2,016

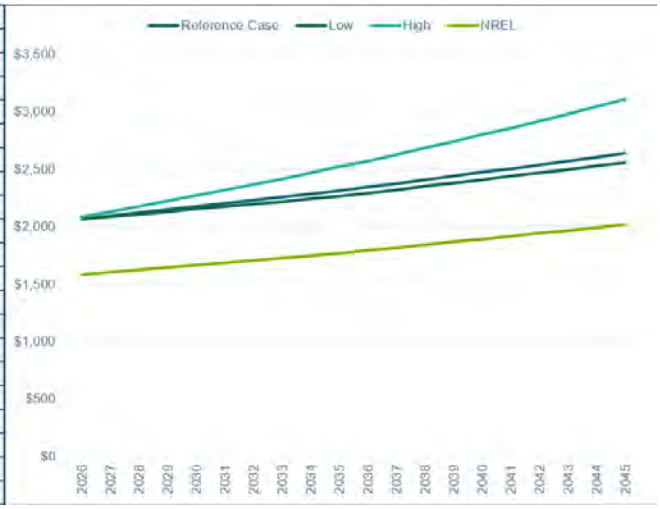


Figure 8-42 – J Class SCGT Capital Costs Alternate Scenarios (426 MW) ($/kW)[42]

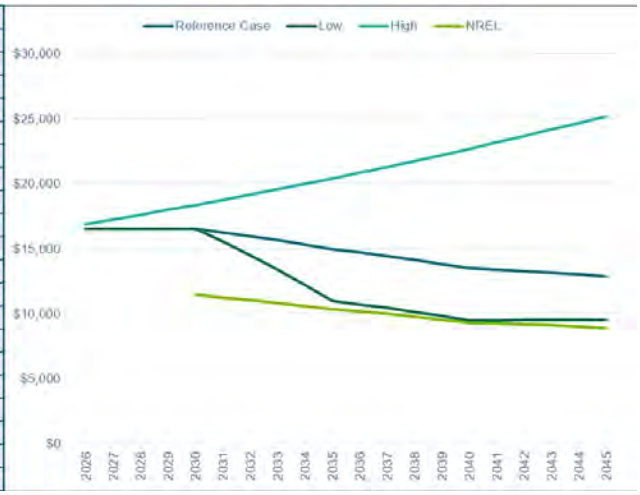
Year	Reference Case	Low	High	NREL
2026	$1,206	$1,206	$1,215	$1,425
2027	$1,223	$1,223	$1,241	$1,444
2028	$1,239	$1,239	$1,268	$1,464
2029	$1,256	$1,256	$1,295	$1,484
2030	$1,273	$1,273	$1,322	$1,504
2031	$1,290	$1,290	$1,350	$1,524
2032	$1,307	$1,307	$1,379	$1,544
2033	$1,325	$1,325	$1,408	$1,565
2034	$1,342	$1,342	$1,438	$1,585
2035	$1,360	$1,360	$1,469	$1,606
2036	$1,378	$1,378	$1,500	$1,627
2037	$1,396	$1,396	$1,532	$1,649
2038	$1,414	$1,414	$1,565	$1,670
2039	$1,432	$1,432	$1,598	$1,692
2040	$1,451	$1,451	$1,632	$1,713
2041	$1,469	$1,469	$1,667	$1,735
2042	$1,488	$1,488	$1,703	$1,757
2043	$1,506	$1,506	$1,739	$1,779
2044	$1,525	$1,525	$1,776	$1,802
2045	$1,544	$1,544	$1,814	$1,824



[42] For combustion turbines, the NREL base, low, and high curves are all identical. As such, the low and Reference Case curves are identical for this analysis. The high curve, as stated previously, is based on inflation and therefore remains unique.

Figure 8-43 – Advanced Nuclear (SMR) Capital Costs Alternate Scenarios (300 MW) ($/kW)

Year	Reference Case	Low	High	NREL
2026	$16,528	$16,528	$16,880	
2027	$16,528	$16,528	$17,239	
2028	$16,528	$16,528	$17,606	
2029	$16,528	$16,528	$17,981	
2030	$16,528	$16,528	$18,364	$11,422
2031	$16,255	$15,523	$18,755	$11,233
2032	$15,962	$14,469	$19,154	$11,031
2033	$15,650	$13,362	$19,562	$10,815
2034	$15,317	$12,201	$19,979	$10,585
2035	$14,963	$10,986	$20,404	$10,340
2036	$14,703	$10,717	$20,839	$10,161
2037	$14,425	$10,432	$21,282	$9,968
2038	$14,128	$10,130	$21,735	$9,763
2039	$13,812	$9,811	$22,198	$9,545
2040	$13,477	$9,473	$22,671	$9,313
2041	$13,378	$9,489	$23,153	$9,245
2042	$13,269	$9,501	$23,646	$9,169
2043	$13,149	$9,509	$24,150	$9,086
2044	$13,017	$9,513	$24,664	$8,996
2045	$12,875	$9,514	$25,189	$8,897



8.4.1.7. Market Sales Limits

In order to ensure the economic viability of portfolios independent of market sales, 1898 & Co. imposed a limit on energy market sales within the stochastic portfolios. This limit follows a discrete distribution with one third of draws randomly assigned 660 MW, one third assigned 330 MW, and one third assigned a 165 MW limit. 660 MW was chosen as the highest sales limit because that is approximately the capability of the physical transmission system today and thus a reasonable boundary for the IRP modeling. The lower limits, scaled to 50% and 25% of the maximum, account for the risk of lower market sales than projected under current model assumptions.

8.4.2. Rate Metric Ranking

Figure 8-44 provides the cost of each portfolio on a per kWh basis.

Figure 8-44 – Portfolio Cost Rate (¢/kWh)

Portfolio Number	Portfolio Description	(¢/kWh)
2	FBC3 NG 2035	6.50¢
1	Reference Case	6.52¢
8	Low Reg	6.58¢
12	Delayed Reference	6.71¢
11	FBC3 Co-Fire	6.74¢
3	FBC3 on Coal	7.05¢
10	Alt High Reg	7.37¢
9	High Reg	7.52¢
5	FBC3 to SCGT	7.53¢
6	Renewable Heavy	7.54¢
7	FBC3 NG with Renewables	7.65¢
4	FBC3 to SMR	7.79¢

8.5. Transmission Appendix

8.5.1. MISO Regional Transmission Planning

MISO performs the NERC functional role of Planning Coordinator on behalf of CEI South. In its NERC functional role of Transmission Planner, CEI South supports MISO's regional transmission planning processes.

MISO develops regional transmission models that are used for a variety of near-term and long-term planning studies. On an annual basis, MISO builds models to represent a 10-year planning horizon. The modeling process begins in September and concludes the following August. CEI South is responsible for submitting the required modeling data to MISO pursuant to NERC MOD-032.

CEI South participates in MISO coordinated Seasonal Transmission Assessments ("CSA") for spring, summer, fall and winter peak loads as applicable. MISO's Seasonal Assessments review projected demand and resources for the MISO footprint and assess adequacies and risks for upcoming seasons. The CSAs consider planned and unplanned generation and transmission outages. CEI South also participates in MISO Generator

Interconnection (“DPP”) and Transmission Service Requests (“TSR”) planning processes as required.

CEI South participates in MISO’s regional Transmission Expansion Plan (“MTEP”). The system expansion plans produced through the MTEP process ensure the reliable operation of the transmission system, support achievement of state and federal energy policy requirements and enable a competitive electricity market to benefit all customers. The planning process, in conjunction with an inclusive, transparent stakeholder process, identifies and supports the development of transmission infrastructure that is sufficiently robust to meet local and regional reliability standards, enables competition among wholesale capacity and energy suppliers in the MISO markets and allows for competition among transmission developers in the assignment of transmission projects.

MISO approved the LRTP Tranche 2.1 portfolio during the MTEP 2024 planning cycle. 24 transmission projects (MISO LRTP ID #19-42) were approved across the MISO Midwest, including ID #35 which includes major transmission investments in the SIGE region. The project has a targeted completion date of 2032 per MISO. The various upgrades included in LRTP project #35 consist of a new 345/138kV, 400MVA transformer at A.B. Brown substation, a new 345kV line from Duff substation to the new 765/345kV Pike County substation (AEP/DEI), a new 345kV line from Duff substation to the F.B. Culley area, and a new 345kV line from the Culley area to the Ohio River Crossing. From the river crossing, the 345kV line will continue to BREC Reid substation. Pursuant to FERC Order 1000, MISO solicited competitive bids to construct the 345kV line from the Ohio River crossing to BREC Reid substation. This project in Kentucky was awarded to Republic Transmission, LLC. CEI South, as the incumbent transmission owner, is responsible for all other modifications required for the project, apart from the terminal at BREC Reid substation. The overall project cost will be shared according to MISO’s Tariff. The Tranche 2.1 projects will provide regional economic benefits and enhanced grid reliability for the CEI South region looking into the future as generation and load profiles change across the Midwest.

8.5.2. Annual Transmission Assessment

CEI South’s most recent transmission assessment was completed in 2025. The study used MISO MTEP24 models for the year 2029 representing transmission system conditions in the winter season, summer season, and off-peak, light load conditions. The study used CEIS transmission system performance criteria as documented in VEC-008 Electric Transmission Planning Criteria as a measure to determine the strength of the SIGE transmission system. Siemens PTI PSS/E (version 35.6) software was used to conduct the assessment. The study also uses SIGE transmission ratings methodology as

documented in VEC-014 which was applied to all existing and proposed facilities. All simulations were performed using Steady State Power Flow models using AC analysis. Models were solved using the Fixed Slope Decoupled Newton-Raphson (“FDNS”) solution method with stepping transformer tap adjustments, switched shunts enabled, area interchange control enabled for tie lines and loads, DC taps disabled, and VAR limits applied automatically. Dynamic simulations were not completed in 2025, as previous dynamic studies were still deemed valid. Dynamic simulations were completed with the MTEP24 annual assessment with MISO.

The scope of this 2025 study involved several key assessments as shown below.

- Overall Reliability Assessment using NERC TPL-001 “Transmission System Planning Performance Requirements” criteria
- Reactive Power Deficiency Assessment
- Assessment of MISO Tranche 2.1 approved projects
- SIGE Import and Export Capability Assessment
- Review of the 2025 Long-Range Distribution Plan

Overall, the CEI South Bulk Electrical System (100kV and above) is expected to be stable and perform well through 2034. Normal system conditions do not result in any voltage problems or thermally overloaded facilities. Some facility outage contingencies create thermal overloads and voltage violations. When these violations cannot be effectively mitigated by operational guides, CEI South plans projects to mitigate the violations.

8.5.3. DSM Impacts on Transmission and Distribution Systems

Potential future DSM interconnection requests are currently being studied, per the planning criteria outlined in VEC-008 Electric Transmission Planning Criteria (*Technical Appendix Attachment* 3.9). If VEC-008 does not address applicable planning criteria, CEI South defaults to MISO’s criteria.

At this time, no controllable loads or demand side management resources exist on CEI South’s transmission system.

8.6. Public Advisory Process Appendix

As defined by 170 IAC, the public advisory process refers to a set of procedures that provide customers and interested parties with the opportunity to receive information from the utilities, provide input for the utility to consider in the development of the IRP, and comment on a utility's IRP.

Highlights:

- CEI South views the public as an essential partner in developing our integrated resource plan and therefore strives to conduct an inclusive stakeholder process that encourages feedback.

- CEI executive leadership and subject matter experts attended public meetings to hear feedback and respond to questions.

- CEI South held four public (in person and virtual) meetings. An average of 70 individuals, representing local residents and over 30 organizations, registered for the public meetings.

- Three virtual technical meetings were held with interested stakeholders who signed an NDA. Leadership and subject matter experts attended the technical meetings to hear feedback and respond to questions.

- Stakeholder feedback made an impact on various aspects of the IRP, including assumptions, scenarios, sensitivities, and scorecard metrics.

8.6.1. Foundational Elements

Framework

Ensuring meaningful and sustained stakeholder engagement is crucial to the public advisory process. CEI South's Stakeholder Engagement Framework serves as a guide for fostering substantive and impactful discourse. The Framework is built on four objectives: Inform, Consult, Involve, and Collaborate. Figure 8-45 highlights the alignment among a sample of CEI's engagement activities and the Framework objectives.

Figure 8-45 - Stakeholder Engagement Framework



Stakeholders

CEI South's IRP development is a robust process involving input from many stakeholders, including, but are not limited to, CEI South residential, commercial and industrial customers, regulators, customer advocacy groups, environmental advocacy groups, fuel suppliers and advocacy groups, shareholders, economic development groups, generation developers, and elected officials.

8.6.2. Engagement Resources and Strategies

Given the significant impact IRP decisions can have, conducting the IRP with transparency and full participation from interested stakeholders is essential. CEI South implemented engagement resources and strategies to encourage wide participation.

Engagement Resources

Website

Throughout the 2025 IRP process, CEI South's IRP website[43] served as an information hub for stakeholders. Meeting materials (presentations and post-meeting summaries) as well as the registration links for public meetings were published on the site. Prior IRP materials are also available on the website.

Meeting Notifications

CEI South maintains a confidential IRP stakeholder contact list. With over 300 individual contacts, the list includes CEI South customers, advocates, technical/industry experts, regulators, elected officials, etc. The list is updated throughout the IRP process to ensure new registrants or interested individuals are added. Those on the list received several meeting-related notifications: 1) invitations and reminders to register for meetings via the posted registration link, 2) meeting reminders for registrants, 3) posting of meeting presentation prior to the meeting, and 4) posting of meeting summary after the meeting.

Email Communications

CEI South continued to use a dedicated IRP email address for IRP-related communications. The simple and singular email address provided an easy method for stakeholders to stay involved and engaged outside the public meetings. Stakeholders' written requests for information and CEI South's subsequent responses were also administered through irp@centerpointenergy.com.

File Share

Technical stakeholders, with signed NDAs, were provided access to a secure file share site. The site served as a repository for modeling files and other detailed data and inputs used in the development of the 2025 IRP. The data release schedule and data type were included in the public and Tech-to-Tech meeting presentations.

Engagement Strategies

Stakeholder Meetings

CEI South again engaged 1898 & Co., a third-party consultant and facilitator, to assist in facilitation and support CEI SOUTH's focus on conducting the IRP with full participation from stakeholders. In collaboration with 1898, CEI South hosted four public stakeholder meetings and three technical meetings during the 2025 IRP process. Highlighting the

[43] CEI South, Integrated Resource Plan website available at https://www.centerpointenergy.com/irp

importance of the meetings, CEI South executive leadership actively participated as presenters and subject matter experts.

Presentations and discussions covered various issues regarding inputs, assumptions, risks, modeling methodology, planned sensitivities and analytical results. To ensure ample opportunity for participants to ask questions, provide feedback, and share information, designated Q&A and feedback periods were included in the agendas. If feedback was received following the meetings, questions were answered via e-mail (irp@centerpointenergy.com) and/or during subsequent public or tech-to-tech meetings, as appropriate.

Public Meetings
In a continued effort to remove barriers to participation, CEI South provided both in-person and virtual attendance options. The CenterPoint Plaza in Evansville, Indiana served as the meeting location for the in-person option. Meeting presentations and meeting summaries, in question-and-answer format, were posted to CEI South's IRP website seven calendar days prior to the meeting and 15 calendar days following the meeting, respectively.

Figure 8-46 is a summary of the stakeholder meetings, see *Technical Appendix Attachment 4.2 Stakeholder Materials* for a comprehensive account of stakeholder meetings, presentations, and meeting summaries.

Figure 8-46 - 2025 Stakeholder Meeting Schedule



Meeting one laid the foundation of CEI South's IRP by providing an overview of the IRP process, metrics, inputs, and assumptions. In the spirit of continuous improvement, past stakeholder feedback and 2025 IRP enhancements were also covered.

2025 IRP Enhancements

1. *5 pillar-focused score card*
2. *Refreshed IRP layout*
3. *Expanded sensitivity analysis*
4. *Collaboration with Transmission & Distribution*
5. *Additional analysis of underserved energy*
6. *Data release schedule*

Meeting two, as with meetings three and four, opened with a review of stakeholder feedback and requests. Presenters also provided updates for ongoing work and furthered the discussion of inputs, modeling assumptions, portfolio methodology. A preview of the draft Reference Case modeling was also provided.

Meeting three began with an update on CEI South's generation transition timeline, followed by a review of stakeholder feedback and requests. Topics included the DSM Market Potential Study results, updates on scenario revisions and probabilistic modeling, as well as initial scenario optimization and deterministic portfolio results.

Meeting four also started with stakeholder feedback and requests. The last of the stakeholder meetings, meeting four covered the Preferred Portfolio, Alternative Preferred Portfolio and near-term action plan, as well as examined each portfolio's capacity, energy mix, and associated benefits and challenges. Presenters also shared the detailed risk metrics via a scorecard, reviewed an alternate reference case and optimization outcomes, presented sensitivity analyses, and concluded with a summary of key takeaways.

Tech-to-Tech

Tech-to-Tech meetings were held virtually and facilitated by 1898 & Co. While the meeting dates were made public, attendance was limited to self-identified technical stakeholders with executed NDAs. NDAs were provided to technical stakeholders upon request. Members of Indiana Office of Utility Consumer Counselor, Citizens Action Coalition, Reliable Energy, Sierra Club, State Utility Forecasting Group, and Indiana Utility Regulatory Commission staff were invited to attend these meetings.

The meetings allowed CEI South to share and consult with technical stakeholders on detailed, and often confidential, modeling assumptions and inputs. They also had the added benefit of increasing transparency in the planning process. Tech-to-Tech meeting dates and agendas are listed below (Figure 8-47):

Figure 8-47 - 2025 Tech-to-Tech Meetings



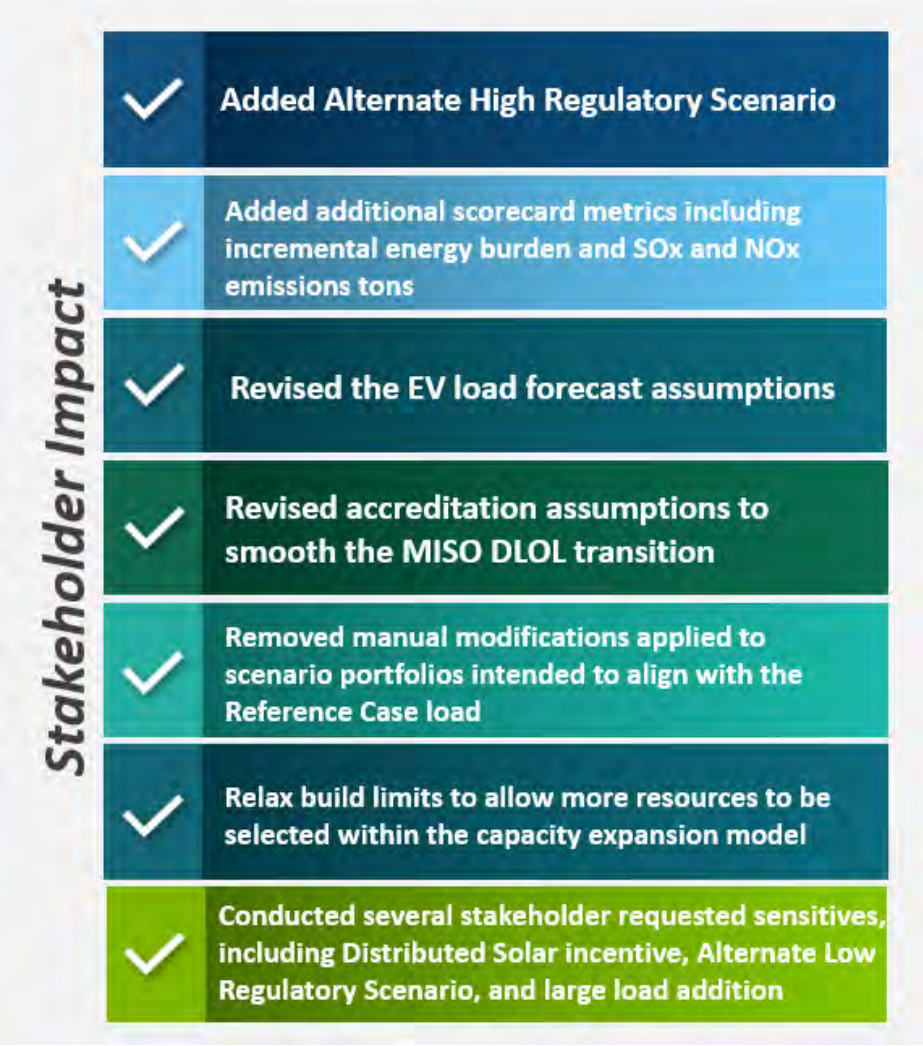
In addition to Tech-to-Tech meetings and public stakeholder meetings, CEI South met with individual stakeholders on various topics. For example, CEI South met several times with the CAC on Energy Efficiency modeling inputs.

8.6.3. Stakeholder Input

As discussed in Section 8.6.2, CEI South provided multiple avenues for engagement throughout the 2025 IRP process – dedicated Q&A and feedback time during public meetings; use of the IRP email address for written feedback/requests; Tech-to-Tech meetings between public meetings; and individual meetings upon request.
Critical to the IRP, feedback was reviewed, responded to, and incorporated as applicable.

In recognition of the importance of the received feedback, Figure 8-48 is a summary of key feedback that was ultimately included in the 2025 IRP analysis. For a full list, including suggestions not taken, see the *Technical Appendix Attachment 4.2 Stakeholder Materials*.

Figure 8-48 - Summary of Key Stakeholder Input



8.6.4. Data Requests Summary

During the public stakeholder process CEI South received seven data requests from the Citizens Action Coalition, Clean Grid Alliance, Reliable Energy, Sierra Club, Solar United, and State Utility Forecasting Group. These data requests and CEI South's response can be found in the *Technical Appendix Attachment 4.2 Stakeholder Materials*.

8.7.5 DSM OSB Presentations and Data Requests

CEI South collaborates with the CenterPoint Energy Oversight Board (which consists of CEI South, the OUCC, and CAC) on a monthly basis to discuss energy efficiency programs, results, and solicits feedback on program design and funding. This same collaborative group was utilized to discuss DSM in the 2025 Market Potential Study and

the development of energy efficiency and demand response inputs into the IRP. CEI South held seven meetings with the kickoff meeting occurring in-person at our Indianapolis office. The meeting dates and topics are listed in Figure 8-49 below, OSB stakeholder presentations can be found in *Technical Appendix Attachment 8.1 2025 MPS Slide Decks for Stakeholders*. This process allowed for robust discussion on topics to drive consensus, where possible, with several data requests and responses which can be found in *Technical Appendix Attachment 8.2 2025 DSM Data Requests and Responses*.

Figure 8-49 - DSM Oversight Board Meetings

Date	Discussion Topic
December 11, 2024	Integrated Gas & Electric Market Potential Study Kickoff
February 5, 2025	Data Request Response Updates/Observations; Measure Lists
March 6, 2025	Initial Demand Response Program Assumptions and Historical Performance Benchmarking
March 13, 2025	Additional Interruptible & Aggregation Discussion
April 17, 2025	Draft Demand Response Potential and EE Measure Assumptions
May 22, 2025	Draft EE Potential Results and Refined Demand Response Potential Results
June 30, 2025	Final EE Results and Initial IRP Inputs



Technical Appendix Attachments

Chapter 9

Attachment 1.1 Non-Technical Summary

Attachment 2.1 2024 All-Source Request for Proposal & Report

Attachment 2.2 2025 Technology Assessment Summary (Confidential)

Attachment 2.3 Transmission Study (Confidential)

Attachment 3.1 2025 CEIS Long-Term Electric Energy & Demand Forecast Report

Attachment 3.2 Energy and Demand Forecast Model Inputs-Outputs (Confidential)

Attachment 3.3 CEIS 2024 System Hourly Load

Attachment 3.4 CEIS Electric 2025-2027 DSM Plan

Attachment 3.5 Gas Pipeline Cost Estimates (Confidential)

Attachment 3.6 2025 DSM Market Potential Study

Attachment 3.7 CEIS 2025 Residential Energy Efficiency Baseline Survey

Attachment 3.8 CEIS Distribution System Long Range Planning Report

Attachment 3.9 VEC-008 Electric Transmission Planning Criteria

Attachment 4.1 CEIS 2025 IRP Model with Scenarios & Stochastics Model (Confidential)

Attachment 4.2 Stakeholder Materials

Attachment 6.1 CEIS 2025 IRP Alternate Reference Stochastics Model (Confidential)

Attachment 6.2 Large Load Study Results (Confidential)

Attachment 8.1 2025 MPS Slide Decks for Stakeholders

Attachment 8.2 2025 DSM Data Requests and Responses



IRP Rule Requirements Cross Reference Table

Chapter 10

IRP Rule Requirements Cross Reference Table

Rule	Section(s)
170 IAC 4-7-2 Integrated Resource Plan Submission Section 2	
(c) On or before the applicable date, a utility subject to subsection (a) or (b) must submit electronically to the director or through an electronic filing system if requested by the director, the following documents:	
(1) The IRP.	2025 IRP submitted on December 5, 2025
(2) A technical appendix containing supporting documentation sufficient to allow an interested party to evaluate the data and assumptions in the IRP. The technical appendix shall include at least the following: (A) The utility's energy and demand forecasts and input data used to develop the forecasts. (B) The characteristics and costs per unit of resources examined in the IRP; (C) Input and output files from capacity planning models, in electronic format. (D) For each portfolio, the electronic files for the calculation of the revenue requirement if not provided as an output file. If a utility does not provide the above information, it shall include a statement in the technical appendix specifying the nature of the information it is omitting and the reason necessitating its omission. The utility may request confidential treatment of the technical appendix under section 2.1 of this rule.	8 Technical Appendix; 9 Technical Appendix Attachments
(3) An IRP summary that communicates core IRP concepts and results to nontechnical audiences in a simplified format using visual elements where appropriate. The IRP summary shall include, but is not limited to, the following: (A) A brief description of the utility's: (i) existing resources; (ii) preferred resource portfolio; (iii) key factors influencing the preferred resource portfolio; (iv) short term action plan; (v) public advisory process; and (vi) additional details requested by the director. (B) A simplified discussion of the utility's resource types and load characteristics.	Executive Summary (Non-Technical Summary Document)
The utility shall make the IRP summary readily accessible on its website.	www.centerpointenergy.com/irp

Rule	Section(s)
170 IAC 4-7-2.6 Public advisory process Sec. 2.6	
(b) The utility shall provide information requested by an interested party relating to the development of the utility's IRP within 15 business days of a written request or as otherwise agreed to by the utility and the interested party. If a utility is unable to provide the requested information within 15 business days or the agreed timeframe, it shall provide a statement to the director and the requestor as to the reason it is unable to provide the requested information.	2.4 Stakeholder Engagement; 8.6 Public Advisory Process Appendix; 9 Technical Appendix Attachment 4.2 Stakeholder Materials
(c) The utility shall solicit, consider and timely respond to relevant input relating to the development of the utility's IRP provided by: (1) interested parties; (2) the OUCC; and (3) commission staff.	2.4 Stakeholder Engagement; 8.6 Public Advisory Process Appendix; 9 Technical Appendix Attachment 4.2 Stakeholder Materials
(d) The utility retains full responsibility for the content of its IRP.	n/a
(e) The utility shall conduct a public advisory process as follows: (1) Prior to submitting its IRP to the commission, the utility shall hold at least three (3) meetings, a majority of which shall be held in the utility's service territory. The topics discussed in the meetings shall include, but not be limited to, the following:	2.4 Stakeholder Engagement; 8.6 Public Advisory Process Appendix; 9 Technical Appendix Attachment 4.2 Stakeholder Materials
(A) An introduction to the IRP and public advisory process. (B) The utility's load forecast. (C) Evaluation of existing resources. (D) Evaluation of supply-side and demand-side resource alternatives, including: (i) associated costs; (ii) quantifiable benefits; and (iii) performance attributes. (E) Modeling methods. (F) Modeling inputs. (G) Treatment of risk and uncertainty. (H) Discussion seeking input on its candidate resource portfolios. (I) The utility's scenarios and sensitivities. (J) Discussion of the utility's preferred resource portfolio and the utility's rationale for its selection.	2.4 Stakeholder Engagement; 8.6 Public Advisory Process Appendix; 9 Technical Appendix Attachment 4.2 Stakeholder Materials
(2) The utility may hold additional meetings.	2.4 Stakeholder Engagement; 8.6 Public Advisory Process Appendix; 9 Technical Appendix Attachment 4.2 Stakeholder Materials
(3) The schedule for meetings shall:	2.4 Stakeholder Engagement;

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(A) be determined by the utility; (B) be consistent with its internal IRP development schedule; and (C) provide an opportunity for public participation in a timely manner so that it may affect the outcome of the IRP.	8.6 Public Advisory Process Appendix; 9 Technical Appendix Attachment 4.2 Stakeholder Materials
170 IAC 4-7-4 Integrated resource plan contents Sec. 4	
An IRP must include the following: (1) At least a twenty (20) year future period for predicted or forecasted analyses.	3.1.4 Reference Case
(2) An analysis of historical and forecasted levels of peak demand and energy usage in compliance with section 5(a) of this rule.	8.1.2 Overview of Past Forecasts
(3) At least three (3) alternative forecasts of peak demand and energy usage in compliance with section 5(b) of this rule.	3.1.5 Alternative Scenarios
(4) A description of the utility's existing resources in compliance with section 6(a) of this rule.	3.7.1 Current Resource Mix
(5) A description of the utility's process for selecting possible alternative future resources for meeting future demand for electric service, including a cost-benefit analysis, if performed.	3.7 Resource Options; 4 Portfolio Development and Evaluation
(6) A description of the possible alternative future resources for meeting future demand for electric service in compliance with section 6(b) of this rule.	3.7 Resource Options
(7) The resource screening analysis and resource summary table required by section 7 of this rule.	3.7 Resource Options; Figure 3-40; Figure 3-41
(8) A description of the candidate resource portfolios and the process for developing candidate resource portfolios in compliance with section 8(a) and 8(b) of this rule.	4 Portfolio Development and Evaluation
(9) A description of the utility's preferred resource portfolio and the information required by section 8(c) of this rule.	4 Portfolio Development and Evaluation; 5 The Preferred Portfolio; 6 The Alternate Preferred Portfolio
(10) A short term action plan for the next three (3) year period to implement the utility's preferred resource portfolio and its workable strategy, pursuant to section 9 of this rule.	7 Short Term Action Plan
(11) A discussion of the: (A) inputs; (B) methods; and (C) definitions; used by the utility in the IRP.	11 List of Acronyms/Abbreviations with Definitions; 2 Resource Planning Process; 4 Portfolio Development and Evaluation
(12) Appendices of the data sets and data sources used to establish alternative forecasts in section 5(b) of this rule. If	9 Technical Appendix Attachments

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the IRP references a third-party data source, the IRP must include for the relevant data: (A) source title; (B) author; (C) publishing address; (D) date; (E) page number; and (F) an explanation of adjustments made to the data. The data must be submitted within two (2) weeks of submitting the IRP in an editable format, such as a comma separated value or excel spreadsheet file.	
(13) A description of the utility's effort to develop and maintain a database of electricity consumption patterns, disaggregated by: (A) customer class; (B) rate class; (C) NAICS code; (D) DSM program; and (E) end-use. 14) The database in subdivision (13) may be developed using, but not limited to, the following methods: (A) Load research developed by the individual utility. (B) Load research developed in conjunction with another utility. (C) Load research developed by another utility and modified to meet the characteristics of that utility. (D) Engineering estimates. (E) Load data developed by a non-utility source.	3.7 Resource Options; 9 Technical Appendix Attachment 3.1 2025 CEIS Long-Term Electric Energy & Demand Forecast Report; 8.1.1.1 Energy Data; 8.1.1.4 Equipment Efficiencies and Market Share Data
(15) A proposed schedule for industrial, commercial and residential customer surveys to obtain data on: (A) end-use penetration; (B) end-use saturation rates; and (C) end-use electricity consumption patterns.	8.1.1.4 Equipment Efficiencies and Market Share Data
(16) A discussion detailing how information from advanced metering infrastructure and smart grid, where available, will be used to enhance usage data and improve load forecasts, DSM programs and other aspects of planning.	8.1.5 Advanced Metering Infrastructure and Continuous Improvement
(17) A discussion of the designated contemporary issues designated, if required by section 2.7(e).	Executive Summary Section V. Stakeholder Process
(18) A discussion of distributed generation within the service territory and its potential effects on: (A) generation planning; (B) transmission planning; (C) distribution planning; and	3.8 Transmission Planning and Distribution Planning; 4.1.1.1.3 Distributed Generation Resource Portfolios;

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(D) load forecasting.	9 Technical Appendix Attachment 3.1 2025 CEIS Long-Term Electric Energy & Demand Forecast Report
(19) For models used in the IRP, including optimization and dispatch models, a description of the model's structure and applicability.	2.11.2 Modeling Tools
(20) A discussion of how the utility's fuel inventory and procurement planning practices have been taken into account and influenced the IRP development.	5.1.8 Fuel Inventory and Procurement Planning
(21) A discussion of how the utility's emission allowance inventory and procurement practices for an air emission have been considered and influenced the IRP development.	8.2.1 Air Emissions
(22) A description of the generation expansion planning criteria. The description must fully explain the basis for the criteria selected.	3 Forecasts and Key Modeling Assumptions; 4 Portfolio Development and Evaluation
(23) A discussion of how compliance costs for existing or reasonably anticipated air, land, or water environmental regulations impacting generation assets have been taken into account and influenced the IRP development.	2.1 Planning Scenarios; 2.6 Reference Case; 2.7 Alternative Scenarios; 3.5 Environmental Regulations
(24) A discussion of how the utilities' resource planning objectives, such as: (A) cost effectiveness; (B) rate impacts; (C) risks; and (D) uncertainty; were balanced in selecting its preferred resource portfolio.	4 Portfolio Development and Evaluation; 5 The Preferred Portfolio; 6 The Alternate Preferred Portfolio
(25) A description and analysis of the utility's Reference Case scenario, sometimes referred to a business as usual case or reference case. The Reference Case scenario is the most likely future scenario and must meet the following criteria: (A) Be an extension of the status quo, using the best estimate of forecasted electrical requirements, fuel price projections and an objective analysis of the resources required over the planning horizon to reliably and economically satisfy electrical needs. (B) Include: (i) existing federal environmental laws; (ii) existing state laws, such as renewable energy requirements and energy efficiency laws; and (iii) existing policies, such as tax incentives for renewable resources.	2.6 Reference Case

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(C) Existing laws or policies continuing throughout at least some portion of the planning horizon with a high probability of expiration or repeal must be eliminated or altered when applicable. (D) Not include future resources, laws, or policies unless: (i) a utility subject to section 2.6 of this rule solicits stakeholder input regarding the inclusion and describes the input received; (ii) future resources have obtained the necessary regulatory approvals; and (iii) future laws and policies have a high probability of being enacted. A Reference Case scenario need not align with the utility's preferred resource portfolio.	
(26) A description and analysis of alternative scenarios to the Reference Case scenario, including comparison of the alternative scenarios to the Reference Case scenario.	2.7 Alternative Scenarios
(27) A brief description of the models(s), focusing on the utility's Indiana jurisdictional facilities, of the following components of FERC Form 715: (A) The most current power flow data models, studies and sensitivity analysis. (B) Dynamic simulation on its transmission system, including interconnections, focused on the determination of the performance and stability of its transmission system on various fault conditions. The description must state whether the simulation meets the standards of the North American Electric Reliability Corporation (NERC). (C) Reliability criteria for transmission planning as well as the assessment practice used. This description must include the following: (i) The limits of the utility's transmission use. (ii) The utility's assessment practices developed through experience and study. (iii) Operating restrictions and limitations particular to the utility.	3.8 Transmission and Distribution Planning 8.5.1 MISO Regional Transmission Planning 9 Technical Appendix Attachment 3.9 VEC-008 Electric Transmission Planning Criteria
(28) A list and description of the methods used by the utility in developing the IRP, including the following: (A) For models used in the IRP, the model's structure and reasoning for its use. (B) The utility's effort to develop and improve the methodology and inputs, including for its: (i) load forecast;	2 Resource Planning Process; 3 Forecasts and Key Assumptions; 4 Portfolio Development and Evaluation; 8.1.1.5 Load Forecast Continuous Improvement; 8.6 Public Advisory Process Appendix;

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(ii) forecasted impact from demand-side programs; (iii) cost estimates; and (iv) analysis of risk and uncertainty.	9 Technical Appendix Attachment 3.1 2025 CEIS Long-Term Electric Energy & Demand Forecast Report; 9 Technical Appendix Attachment 3.2 Energy and Demand Forecast Model Inputs-Outputs (Confidential); 9 Technical Appendix Attachment 3.6 2025 DSM Market Potential Study
(29) An explanation, with supporting documentation, of the avoided cost calculation for each year in the forecast period, if the avoided cost calculation is used to screen demand-side resources. The avoided cost calculation must reflect timing factors specific to the resource under consideration such as project life and seasonal operation. The avoided cost calculation must include the following: (A) The avoided generating capacity cost adjusted for transmission and distribution losses and the reserve margin requirement. (B) The avoided transmission capacity cost. (C) The avoided distribution capacity cost. (D) The avoided operating cost, including: (i) fuel cost; (ii) plant operation and maintenance costs; (iii) spinning reserve; (iv) emission allowances; (v) environmental compliance costs; and (vi) transmission and distribution operation and maintenance costs.	8.3.5 Avoided Costs
(30) A summary of the utility's most recent public advisory process, including the following: (A) Key issues discussed. (B) How the utility responded to the issues. (C) A description of how stakeholder input was used in developing the IRP.	Executive Summary; 2.4 Stakeholder Engagement; 8.6 Public Advisory Process Appendix; 9 Technical Appendix Attachment 4.2 Stakeholder Materials
(31) A detailed explanation of the assessment of demand-side and supply-side resources considered to meet future customer electricity service needs.	3.7 Resource Options; 3.9.1 Resource Availability 3.8.4 Transmission Facilities as a Resource;
170 IAC 4-7-5 Energy and demand forecasts Sec. 5.	
(a) The analysis of historical and forecasted levels of peak demand and energy usage must include the following: (1) Historical load shapes, including the following:	8.1.4 Load Shapes; 9 Technical Appendix Attachment 3.1 2025 CEIS Long-

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(A) Annual load shapes. (B) Seasonal load shapes. (C) Monthly load shapes. (D) Selected weekly load shapes. (E) Selected daily load shapes, which shall include summer and winter peak days and a typical weekday and weekend day.	Term Electric Energy & Demand Forecast Report; 9 Technical Appendix Attachment 3.3 CEIS 2024 System Hourly Load
(2) Disaggregation of historical data and forecasts by: (A) customer class; (B) interruptible load; and (C) end-use; where information permits.	8.1.2 Overview of Past Forecasts; 9 Technical Appendix Attachments Attachment 3.1 2025 CEIS Long-Term Electric Energy & Demand Forecast Report
(3) Actual and weather normalized energy and demand levels.	8.1.2 Overview of Past Forecasts
(4) A discussion of methods and processes used to weather normalize.	8.1.2 Overview of Past Forecasts
(5) A minimum twenty (20) year period for peak demand and energy usage forecasts.	3.1.4 Reference Case
(6) An evaluation of the performance of peak demand and energy usage for the previous ten (10) years, including the following: (A) Total system. (B) Customer classes or, rate classes, or both. (C) Firm wholesale power sales.	8.1.2 Overview of Past Forecasts
(7) A discussion of how the impact of historical DSM programs is reflected in or otherwise treated in the load forecast.	9 Technical Appendix Attachments 3.1 2025 CEIS Long-Term Electric Energy & Demand Forecast Report
(8) Justification for the selected forecasting methodology.	9 Technical Appendix Attachments 3.1 2025 CEIS Long-Term Electric Energy & Demand Forecast Report
(9) A discussion of the potential changes under consideration to improve the credibility of the forecasted demand by improving the data quality, tools and analysis.	8.1.1.5 Load Forecast Continuous Improvement
(10) For purposes of subdivisions (1) and (2), a utility may use utility specific data or data such as described in section 4(14) of this rule.	n/a
(b) To establish plausible risk boundaries, the utility shall provide at least three (3) alternative forecasts of peak demand and energy usage including: (1) high; (2) low; and (3) most probable; peak demand and energy use forecasts.	3.1.5 Alternate Scenarios

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(c) In determining the peak demand and energy usage forecast that is deemed by the utility, with stakeholder input, to be most probable, the utility shall consider alternative assumptions such as: (1) Rate of change in population. (2) Economic activity. (3) Fuel prices. (4) Price elasticity. (5) Penetration of new technology. (6) Demographic changes in population. (7) Customer usage. (8) Changes in technology. (9) Behavioral factors affecting customer consumption. (10) State and federal energy policies. (11) State and federal environmental policies.	3.1 Load Forecast; 9 Technical Appendix Attachment 3.1 2025 CEIS Long-Term Electric Energy & Demand Forecast Report
170 IAC 4-7-6 Description of available resources	
Sec. 6. (a) In describing its existing electric power resources, the utility must include in its IRP the following information relevant to the twenty (20) year planning period being evaluated: The net and gross dependable generating capacity of the system and each generating unit. The information listed in subdivision (a)(1) through (a)(4) shall be provided for each year of the future planning period.	3.7.1 Current Resource Mix
(2) The expected changes to existing generating capacity, including the following: (A) Retirements. (B) Deratings. (C) Plant life extensions. (D) Repowering. (E) Refurbishment. The information listed in subdivision (a)(1) through (a)(4) shall be provided for each year of the future planning period.	3.7.1 Current Resource Mix; 9 Technical Appendix Attachment 4.1 CEIS 2025 IRP Model with Scenarios & Stochastics Model (Confidential); 9 Technical Appendix Attachment 6.1 CEIS 2025 IRP Alternate Reference Stochastics Model (Confidential)
(3) A fuel price forecast by generating unit. The information listed in subdivision (a)(1) through (a)(4) shall be provided for each year of the future planning period.	9 Technical Appendix Attachment 4.1 CEIS 2025 IRP Model with Scenarios & Stochastics Model (Confidential); 9 Technical Appendix Attachment 6.1 CEIS 2025 IRP

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	Alternate Reference Stochastics Model (Confidential)
(4) The significant environmental effects, including: (A) air emissions; (B) solid waste disposal; (C) hazardous waste; and(D) subsequent disposal; and (E) water consumption and discharge; at existing fossil fueled generating units. The information listed in subdivision (a)(1) through (a)(4) shall be provided for each year of the future planning period.	8.2 Environmental Appendix
(5) An analysis of the existing utility transmission system that includes the following: (A) An evaluation of the adequacy to support load growth and expected power transfers. (B) An evaluation of the supply-side resource potential of actions to reduce: (i) transmission losses; (ii) congestion; and (iii) energy costs. (C) An evaluation of the potential impact of demand-side resources on the transmission network.	8.5 Transmission Appendix
(6) A discussion of demand-side resources and their estimated impact on the utility's historical and forecasted peak demand and energy. (a)(6) shall be provided for each year of the future planning period.	3.7 Resource Options; 8.3 DSM Appendix
The information listed in subdivision (a)(1) through (a)(4) and in subdivision (a)(6) shall be provided for each year of the future planning period.	Included in Sec. 6 (a)(1) through (a)(4) and in subdivision (a)(6)
(b) In describing possible alternative methods of meeting future demand for electric service, a utility must analyze the following resources as alternatives in meeting future electric service requirements: (1) Rate design as a resource in meeting future electric service requirements.	3.7.2.14 Innovative Rate Design
(2) Demand-side resources. For potential demand-side resources, the utility shall include the following: (A) A description of the potential demand-side resource, including its costs, characteristics and parameters. (B) The method by which the costs, characteristics and other parameters of the demand-side resource are determined.	3.7.2.10 Energy Efficiency; 3.7.2.10.1 DSM Market Potential Study; 3.7.2.11 Demand Response; 3.7.2.13 DSM Improvements Based on Stakeholder Feedback;

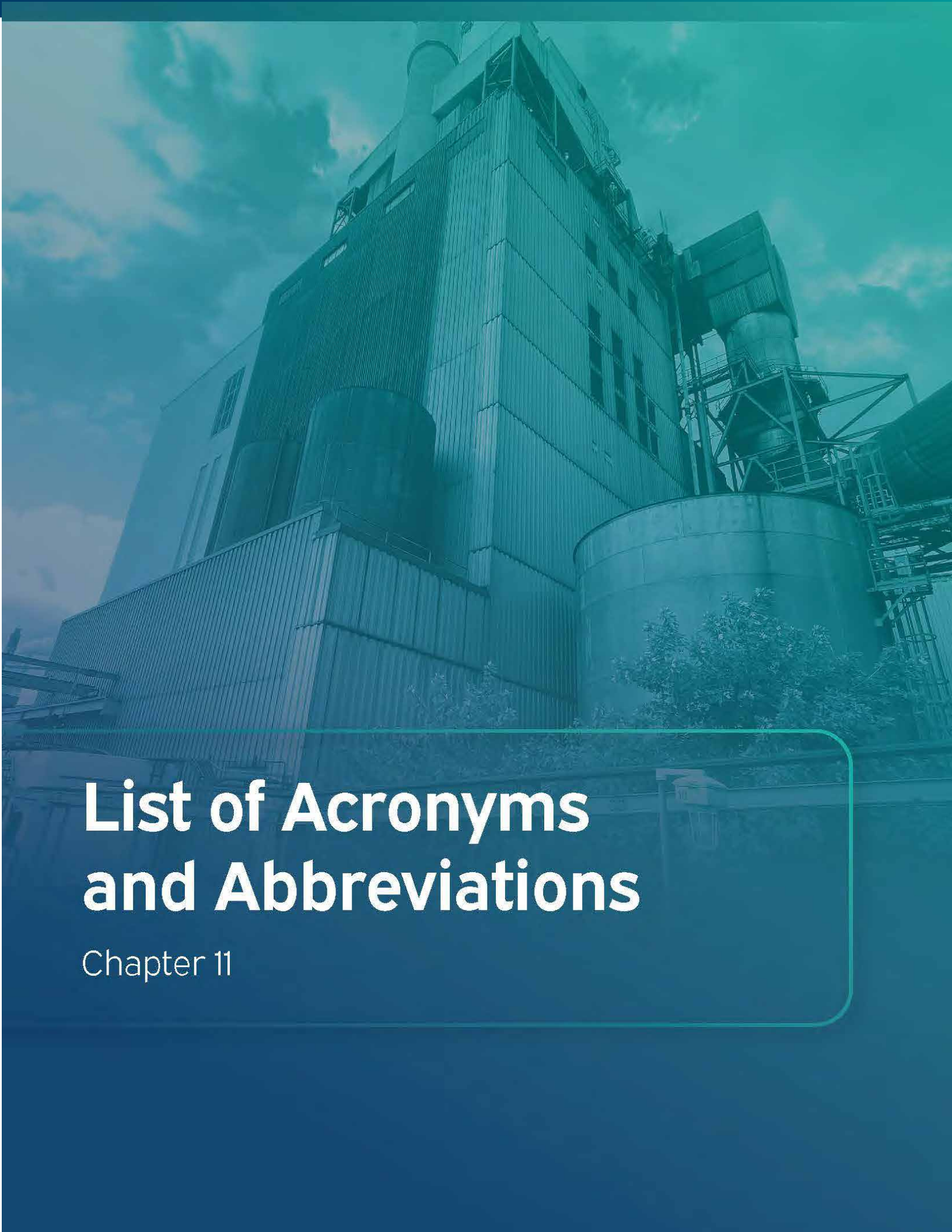
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(C) The customer class or end-use, or both, affected by the demand-side resource. (D) Estimated annual and lifetime energy (kWh) and demand (kW) savings. (E) The estimated impact of a demand-side resource on the utility's load, generating capacity and transmission and distribution requirements. (F) Whether the program provides an opportunity for all ratepayers to participate, including low-income residential ratepayers.	9 Technical Appendix Attachment 3.6 2025 DSM Market Potential Study
(3) Supply-side resources. For potential supply-side resources, the utility shall include the following:	
(A) Identification and description of the supply-side resource considered, including the following: (i) Size in megawatts. (ii) Utilized technology and fuel type. (iii) Energy profile of non-dispatchable resources. (iv) Additional transmission facilities necessitated by the resource.	3.7 Resource Options; 3.9.1 Resource Availability; 9 Technical Appendix Attachment 2.2 2025 Technology Assessment Summary (Confidential); 9 Technical Appendix Attachment 4.1 CEIS 2025 IRP Model with Scenarios & Stochastics Model (Confidential);
(B) A discussion of the utility's effort to coordinate planning, construction and operation of the supply-side resource with other utilities to reduce cost.	
(C) A description of significant environmental effects, including the following: (i) Air emissions. (ii) Solid waste disposal. (iii) Hazardous waste and subsequent disposal. (iv) Water consumption and discharge.	9 Technical Appendix Attachment 6.1 CEIS 2025 IRP Alternate Reference Stochastics Model (Confidential)
(4) Transmission facilities as resources. In analyzing transmission resources, the utility shall include the following:	
(A) The type of the transmission resource, including whether the resource consists of one (1) of the following: (i) New projects. (ii) Upgrades to transmission facilities. (iii) Efficiency improvements. (iv) Smart grid technology.	3.8.4 Transmission Facilities as a Resource; 8.5 Transmission Appendix
(B) A description of the timing, types of expansion and alternative options considered.	
(C) The approximate cost of expected expansion and alteration of the transmission network.	
(D) A description of how the IRP accounts for the value of new or upgraded transmission facilities increasing power transfer capability, thereby	

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increasing the utilization of geographically constrained cost-effective resources. (E) A description of how: (i) IRP data and information affect the planning and implementation processes of the RTO of which the utility is a member; and (ii) RTO planning and implementation processes affect the IRP.	
170 IAC 4-7-7 Selection of resources	
Sec. 7. (a) To eliminate nonviable alternatives, a utility shall perform an initial screening of the future resource alternatives listed in section 6(b) of this rule. The utility's screening process and the decision to reject or accept a resource alternative for further analysis must be fully explained and supported in the IRP. The screening analysis must be additionally summarized in a resource summary table.	N/A
170 IAC 4-7-8 Resource portfolios Sec. 8	
(a) The utility shall develop candidate resource portfolios from existing and future resources identified in sections 6 and 7 of this rule. The utility shall provide a description of its process for developing its candidate resource portfolios, including a description of its optimization modeling, if used. In selecting the candidate resource portfolios, the utility shall at a minimum consider: (1) risk; (2) uncertainty; (3) regional resources; (4) environmental regulations; (5) projections for fuel costs; (6) load growth uncertainty; (7) economic factors; and (8) technological change.	4 Portfolio Development and Evaluation; 5 The Preferred Portfolio; 6 The Alternate Preferred Portfolio
(b) With regard to candidate resource portfolios, the IRP must include the following: (1) An analysis of how candidate resource portfolios performed across a wide range of potential future scenarios, including the alternative scenarios required under section 4(25) of this rule. (2) The results of testing and rank ordering of the candidate resource portfolios by key resource planning objectives, including cost effectiveness and risk metrics. (3) The present value of revenue requirement for each candidate resource portfolio in dollars per	4 Portfolio Development and Evaluation; 8.4.2 Rate Metric Ranking

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kilowatt-hour delivered, with the interest rate specified.	
(c) Considering the analyses of the candidate resource portfolios, a utility shall select a preferred resource portfolio and include in the IRP the following: (1) A description of the utility's preferred resource portfolio. (2) Identification of the standards of reliability. (3) A description of the assumptions expected to have the greatest effect on the preferred resource portfolio. (4) An analysis showing that supply-side resources and demand-side resources have been evaluated on a consistent and comparable basis, including consideration of: (A) safety; (B) reliability; (C) risk and uncertainty; (D) cost effectiveness; and (E) customer rate impacts.	4 Portfolio Development and Evaluation; 5 The Preferred Portfolio; 6 The Alternate Preferred Portfolio
(5) An analysis showing the preferred resource portfolio utilizes supply-side resources and demand-side resources that safely, reliably, efficiently and cost-effectively meets the electric system demand taking cost, risk and uncertainty into consideration.	5 The Preferred Portfolio; 6 The Alternate Preferred Portfolio
(6) An evaluation of the utility's DSM programs designed to defer or eliminate investment in a transmission or distribution facility, including their impacts on the utility's transmission and distribution system.	8.5.3 DSM Impacts on Transmission and Distribution Systems
(7) A discussion of the financial impact on the utility of acquiring future resources identified in the utility's preferred resource portfolio including, where appropriate, the following: (A) Operating and capital costs of the preferred resource portfolio. (B) The average cost per kilowatt-hour of the future resources, which must be consistent with the electricity price assumption used to forecast the utility's expected load by customer class in section 5 of this rule. (C) An estimate of the utility's avoided cost for each year of the preferred resource portfolio. (D) The utility's ability to finance the preferred resource portfolio.	5 The Preferred Portfolio; 6 The Alternate Preferred Portfolio: 7.2.6 Ability to Finance the Preferred Portfolio; 8.3.5 Avoided Costs; 8.4.2 Rate Metric Ranking; 9 Technical Appendix Attachment 4.1 CEIS 2025 IRP Model with Scenarios & Stochastics Model (Confidential)
(8) A description of how the preferred resource portfolio balances cost effectiveness, reliability and portfolio risk and uncertainty, including the following:	Executive Summary; 1 Integrated Resource Planning; 2 Resource Planning Process;

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(A) Quantification, where possible, of assumed risks and uncertainties, including, but not limited to: (i) environmental and other regulatory compliance; (ii) reasonably anticipated future regulations; (iii) public policy; (iv) fuel prices; (v) operating costs; (vi) construction costs; (vii) resource performance; (viii) load requirements; (ix) wholesale electricity and transmission prices; (x) RTO requirements; and (xi) technological progress. (B) An assessment of how robustness of risk considerations factored into the selection of the preferred resource portfolio.	4 Portfolio Development and Evaluation; 5 The Preferred Portfolio; 6 The Alternate Preferred Portfolio; 9 Technical Appendix Attachment 4.1 CEIS 2025 IRP Model with Scenarios & Stochastics Model (Confidential)
(9) Utilities shall include a discussion of potential methods under consideration to improve the data quality, tools and analysis as part of the ongoing efforts to improve the credibility and efficiencies of their resource planning process.	2.11.3 Process Enhancements; 3.7.2.13 DSM Improvements Based on Stakeholder Feedback; 3.7.2.14 Innovative Rate Design; 7.2.7 Continuous Improvement; 8.1.1.5 Load Forecast Continuous Improvement; 8.1.5 Advanced Metering Infrastructure Continuous Improvement; 8.3.7 Appliance Saturation Survey
(10) A workable strategy to quickly and appropriately adapt its preferred resource portfolio to unexpected circumstances, including changes in the following: (A) Demand for electric service. (B) Cost of new supply-side resources or demand-side resources. (C) Regulatory compliance requirements and costs. (D) Wholesale market conditions. (E) Fuel costs. (F) Environmental compliance costs. (G) Technology and associated costs and penetration. (H) Other factors which would cause the forecasted relationship between supply and demand for electric service to be in error.	4 Portfolio Development and Evaluation; 5 The Preferred Portfolio; 6 The Alternate Preferred Portfolio; 7 Short Term Action Plan

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170 IAC 4-7-9 Short term action plan Sec. 9	
(a) A utility shall prepare a short term action plan as part of its IRP and shall cover a three (3) year period beginning with the first year of the IRP submitted pursuant to this rule.	7 Short Term Action Plan
(b) The short-term action plan shall summarize the utility's preferred resource portfolio and its workable strategy, as described in section 8(c)(9) of this rule, where the utility must act or incur expenses during the three (3) year period.	7 Short Term Action Plan
(c) The short term action plan must include, but is not limited to, the following: (1) A description of resources in the preferred resource portfolio included in the short term action plan. The description may include references to other sections of the IRP to avoid duplicate descriptions. The description must include, but is not limited to, the following: (A) The objective of the preferred resource portfolio. (B) The criteria for measuring progress toward the objective.	7 Short Term Action Plan
(2) Identification of goals for implementation of DSM programs that can be developed in accordance with IC 8-1-8.5-10, 170 IAC 4-8-1 *et seq*. and consistent with the utility's longer resource planning objectives.	3.7.2.10 Energy Efficiency; 3.7.2.10.1 DSM Market Potential Study; 7.2 Discussion Of Plans For The Next 3 Years
(3) The implementation schedule for the preferred resource portfolio.	7.3 Schedule
(4) A budget with an estimated range for the cost to be incurred for each resource or program and expected system impacts.	7 Short Term Action Plan; 9 Technical Appendix Attachment 4.1 CEIS 2025 IRP Model with Scenarios & Stochastics Model (Confidential)
(5) A description and explanation of differences between what was stated in the utility's last filed short-term action plan and what actually occurred.	7.1 Differences Between the Last Short Term Action Plan from What Transpired



List of Acronyms and Abbreviations

Chapter 11

List of Acronyms/Abbreviation

1898 & Co.	1898 & Co., a part of Burns & McDonnell
AAR	Ambient Adjusted Rating
ABB	Power Consulting Company (Hitachi Predecessor)
ABB	A.B. Brown Generating Station
ACE	Affordable Clean Energy
ADR	Aggregation Demand Response
AEO	Annual Energy Outlook
AI	Artificial Intelligence
AMI	Advanced Metering Infrastructure
ATB	Annual Technology Baseline
ATC	Around the Clock
AUPC	Average Use Per Customer
BAU	Business as Usual
BES	Bulk Electric System
BESS	Battery Energy Storage System
Btu	British Thermal Unit
BYOT	Bring Your Own Thermostat
CAA	Clean Air Act
C&I	Commercial and Industrial
CAC	Citizens Action Coalition
CAES	Compressed Air Energy Storage
CAGR	Compound Annual Growth Rate
CCGT	Combined Cycle Gas Turbine
CCR	Coal Combustion Residuals
CDD	Cooling Degree Day
CNP	CenterPoint Energy
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide equivalent
CONE	Cost of New Entry
CPCN	Certificate of Public Convenience and Necessity
CPP	Critical Peak Pricing
CRL	Combustion Residual Leachate
CSA	Coordinated Seasonal Transmission Assessment
CSAPR	Cross State Air Pollution Rule
CT	Combustion Turbine
CVR	Conservation Voltage Reduction
CWIS	Cooling Water Intake Structures
DC	Direct Current
DCP	Distributed Capacity Procurement
DG	Distributed Generation
DGS	Demand General Service
DLC	Direct Load Control

DLOL	Direct Loss of Load
DPP	Definitive Planning Phase
DR	Demand Response DSM Demand Side Management
DSMA	Demand Side Management Adjustment
eCFR	Electronic Code of Federal Regulations
EE	Energy Efficiency
EEFC	Energy Efficiency Funding Component
$EFOR_d$	Equivalent Forced Outage
EGU	Electric Generation Units
EIA	Energy Information Administration
ELCC	Effective Load Carrying Capability
ELG	Effluent Limitation Guidelines
EM&V	Evaluation, Measurement and Verification
EPA	U.S. Environmental Protection Agency
ERAS	Expedited Resource Addition Study
EV	Electric Vehicle
EVA	Energy Ventures Analysis, Inc.
FBC	F.B. Culley Generating Station
FBC3	F.B. Culley Unit 3
FDNS	Fixed Slope Decoupled Newton-Raphson
FERC	Federal Energy Regulatory Commission
FGD	Flue Gas Desulfurization
GAO	General Administrative Order
GE	General Electric
GHG	Greenhouse Gas
GI	Generator Interconnection
GIA	Generator Interconnection Agreement
GET	Grid Enhancing Technology
GS	General Service
GW	Gigawatt
GWh	Gigawatt Hour
GWP	Global Warming Potential
H_2SO_4	Sulfuric Acid
HDD	Heating Degree Days
HHV	Higher Heating Value
HLF	High Load Factor
HRSG	Heat Recovery Steam Generator
HVAC	Heating, Ventilation and Air Conditioning
IC	Internal Combustion
ICAP	Installed Capacity
IDEM	Indiana Department of Environmental Management
IRA	Inflation Reduction Act
IRP	Integrated Resource Plan
ISO	Independent System Operator

ITC	Investment Tax Credit
IURC	Indiana Utility Regulatory Commission
kV	Kilovolt
kW	Kilowatt
kWh	Kilowatt Hour
LCR	Local Clearing Requirement
LDES	Long Duration Energy Storage
LGE/KU	Louisville Gas and Electric/Kentucky Utilities
Li-ion	Lithium-ion
LMR	Load Modifying Resources
LOLE	Loss of Load Expectation
LP	Large Power
LRZ	Local Resource Zone
LRTP	Long-Range Transmission Plan
LSE	Load Serving Entity
MISO	Midcontinent Independent System Operator
MLA	Municipal Levee Authority
MMBtu	One Million British Thermal Unit
MPS	Market Potential Study
MTEP	MISO Transmission Expansion Plan
MVAR	Dynamic VAR Support
MW	Megawatt
MWh	Megawatt Hour
NDA	Non-Disclose Agreement
NERC	North American Electric Reliability Council
NERC MOD	NERC Modeling, Data and Analysis
NOAA	National Oceanic and Atmospheric Administration
NO_x	Nitrogen Oxide
NPDES	National Pollutant Discharge Elimination System
NPV	Net Present Value
NPVRR	Net Present Value Revenue Requirement
NREL	National Renewable Energy Lab
NT	Near-term
NTG	Net to Gross
NYMEX	New York Mercantile Exchange
OBBBA	One Big Beautiful Bill Act
O&M	Operation and Maintenance
ORSANCO	Ohio River Valley Sanitation Commission
OUCC	Office of Utility Consumer Counselor
OVEC	Ohio Valley Electric Corporation
PPA	Purchase Power Agreement
PPT	Parts Per Trillion
PRA	Planning Resource Auction
PRM	Planning Reserve Margin

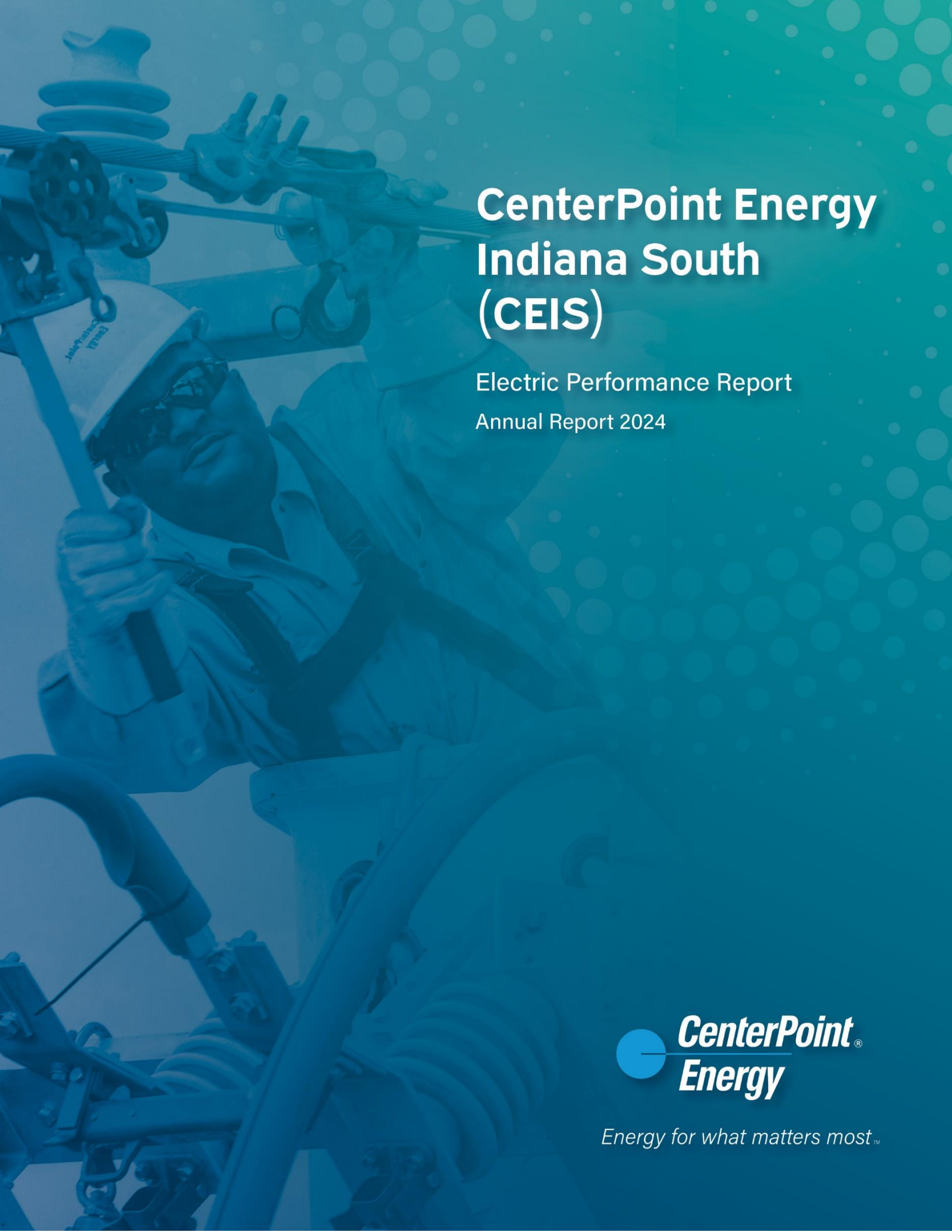
PRMR	Planning Reserve Margin Requirement
PTC	Production Tax Credit
PV	Photovoltaic
PY	Planning Year
RBDC	Reliability Based Demand Curve
RAN	Resource Availability and Need
RERRA	Relevant Electric Retail Rate Authority
RF	ReliabilityFirst
RFP	Request for Proposals
RIM	Ratepayer Impact Measure
RRA	Regional Resource Assessment
RS	Residential
RTO	Regional Transmission Operator
SAC	Seasonal Accredited Capacity
SAE	Statistically Adjusted End-use
SCGT	Simple Cycle Gas Turbine
SCR	Short Circuit Ratio
SGS	Small General Service
SIGE	Southern Indiana Gas and Electric
SIGECO	Southern Indiana Gas and Electric Company
SMR	Small Modular Reactor
Sox	Sulfur Oxide
SO_2	Sulfur Dioxide
SO_3	Sulfur Trioxide
TDSIC	Transmission, Distribution and Storage System Improvement Charge
T&D	Transmission and Distribution
TOU	Time of Use
TRC	Total Resource Cost
TSR	Transmission Service Request
UC	Utility Cost
UCAP	Unforced Capacity
UCT	Utility Cost Test
V	Volt
VAR	Volt-Amp Reactance
VPP	Virtual Power Plant
VER	Variable Energy Resources
WN	Weather Normalized
ZLD	Zero Liquid Discharge

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-25-12
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	))))	Order No. 202-25-13

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 22
CenterPoint 2024 Performance Report



CenterPoint Energy Indiana South (CEIS)

Electric Performance Report

Annual Report 2024

CenterPoint Energy®

Energy for what matters most™

Executive summary

On June 28, 2022, the Indiana Utility Regulatory Commission (Commission) issued an order in Cause No. 45564 directing CenterPoint Energy Indiana South (CEIS) to establish a stakeholder collaborative process to develop an open and transparent dialogue among interested stakeholders on utility operational efficiency. The Commission stated that the collaborative process would enable an analysis of CEIS's performance over time and a comparison with similarly situated utilities. A collaborative process is currently in place for all Indiana investor-owned electric utilities. The order requires CEIS to file an annual report until otherwise indicated by the Presiding Officers. CEIS continues to solicit stakeholder input on its annual report prior to submitting the report to the Commission. The stakeholder process for this report is summarized below.

May 14, 2025, Stakeholder review

On May 14, 2025, CEIS provided the final draft to stakeholders for consideration and comments. A meeting was set for May 22, 2025, to review the final draft with stakeholders and CEIS subject matter experts.

May 22, 2025, Stakeholder meeting

During the May 22, 2025, meeting, CEIS reviewed the final draft of the Electric Performance Report. The Stakeholders provided feedback on various portions of the report, both related to the current draft and to improving future reports. CEIS also accepted written comments after the meeting until June 6, 2024.

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Safety and training

Safety is CenterPoint Energy Inc.'s primary core value, underscoring the company's commitment to sustaining a culture of safety excellence. CenterPoint's Safety Forward initiative is designed to engage employees across the company in making safety their top priority, regardless of their business unit or work location. One concrete example of this focus is the inclusion of a safety message at the beginning of each internal and external company meeting.

CenterPoint has embraced the READY Model to eliminate Serious Injuries and Fatalities (SIFs):

R – Have you RECOGNIZED the hazards?
E – Have you EVALUATED the work?
A – Have you ANTICIPATED changing conditions?
D – Have you DEFINED direct controls?
Y – YES, you're READY to start work.

Since implementing this model, we have seen improved results across our operations. Additionally, we have incorporated company-wide "Safety: Close Calls" messaging to encourage continued use of the READY model across all departments at CenterPoint.

The following safety metrics show that 2024 had a rate increase in three of the four categories. The increase of these lagging indicators shows that our "Safety Differently" approach has created a culture of promoting psychological safety, a belief that that employees will report more near misses, accidents, and incidents when they feel comfortable in reporting without fear of blame. The increased reporting promotes an environment for continuous improvement as each near miss, accident, and incident provides an opportunity to learn from and evaluate controls that can help keep our employees safe. In addition, this information can be shared company-wide to further develop safety awareness based on "real-world" reports.

The drive to increase reporting rates is part of a broader national movement toward transparency, prevention, and employee well-being. In the utilities industry, this aligns with both regulatory expectations and best practices for managing complex, high-risk environments. By fostering psychological safety and encouraging open reporting, organizations can better identify risks, prevent incidents, and protect both their workforce and the public.

"We've seen more employees speaking up and sharing what's happening in the field," said Al Payton, Vice President of Safety and Technical Training. "That's a sign that our safety culture is growing stronger. When our employees feel safe reporting incidents, it gives us more opportunities to learn and reinforce safer practices across every part of our business."

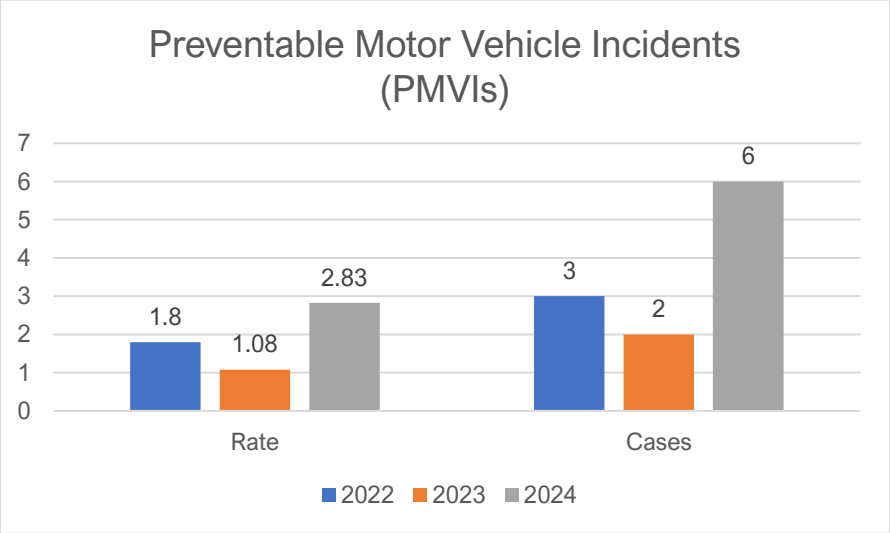
**We've updated our 2023 data for OSHA Recordable Incidents, DART and Lost Time Rate after standardizing how we collect the data internally.*

Safety and training (Continued)

Preventable Motor Vehicle Incidents

Preventable Motor Vehicle Incidents (PMVIs) are calculated using the following formula:

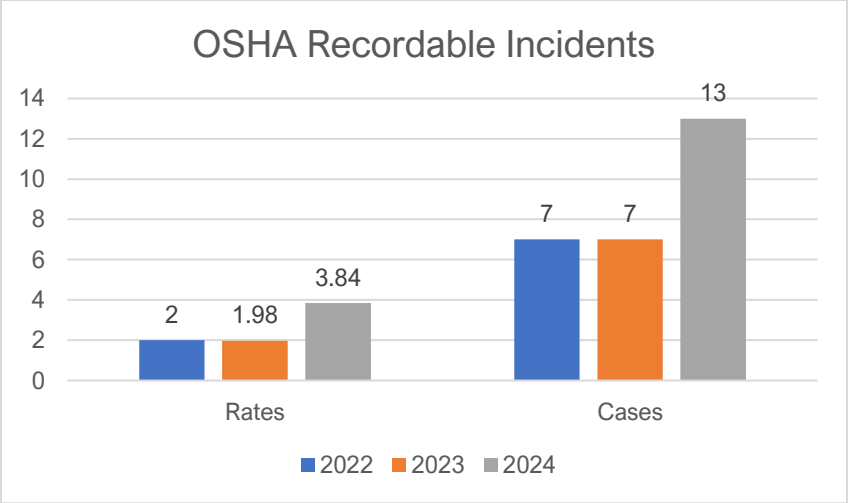
$$\text{PMVI rate} = \frac{\text{\# of PMVIs x 1,000,000}}{\text{Actual miles driven}}$$



OSHA Recordable Incidents

OSHA Recordable Incidents are found using the formula:

$$\text{OSHA Recordable Incident rate} = \frac{\text{\# of OSHA recordable injuries X 200,000}}{\text{Actual hours worked}}$$

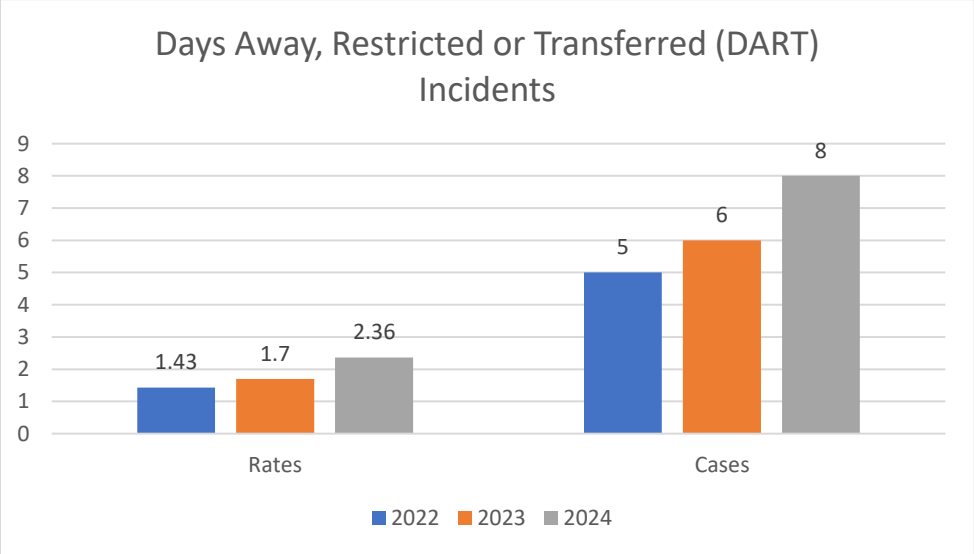


Safety and training (Continued)

Days Away, Restricted or Transferred (DART) incidents

DART incidents are calculated with:

$$\text{DART incident rate} = \frac{\text{\# of DART injuries X 200,000}}{\text{Actual hours worked}}$$

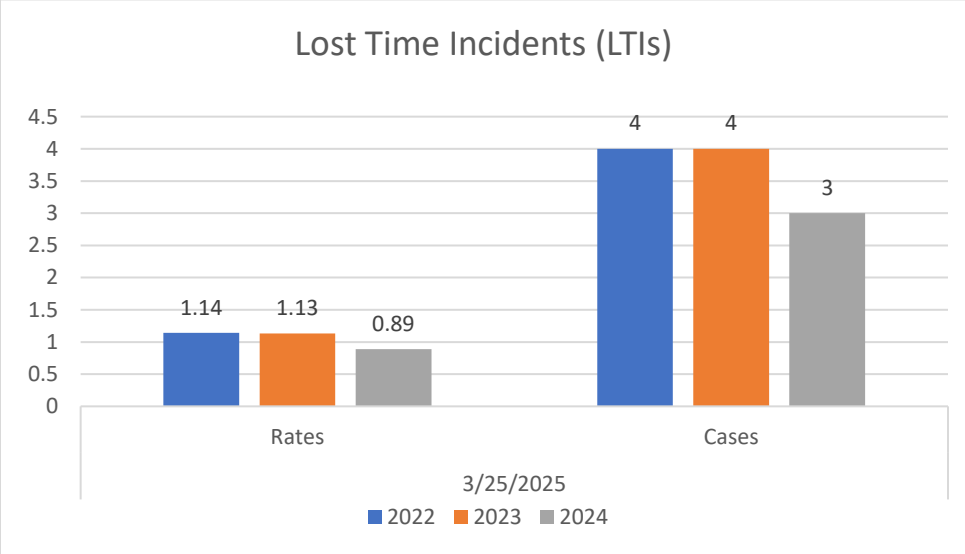


Safety and training (Continued)

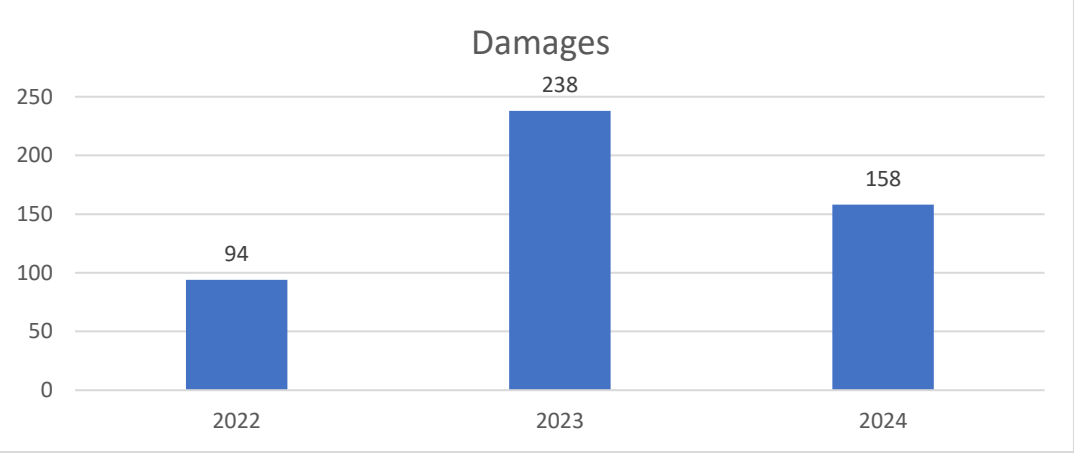
Lost Time Incident rate

The Lost Time Incident (LTI) rate is found with the following formula:

$$\text{LTI rate} = \frac{\text{\# of LTIs X 200,000}}{\text{Actual hours worked}}$$



Electric Facility Damage Above and Below Ground



Safety and training (Continued)

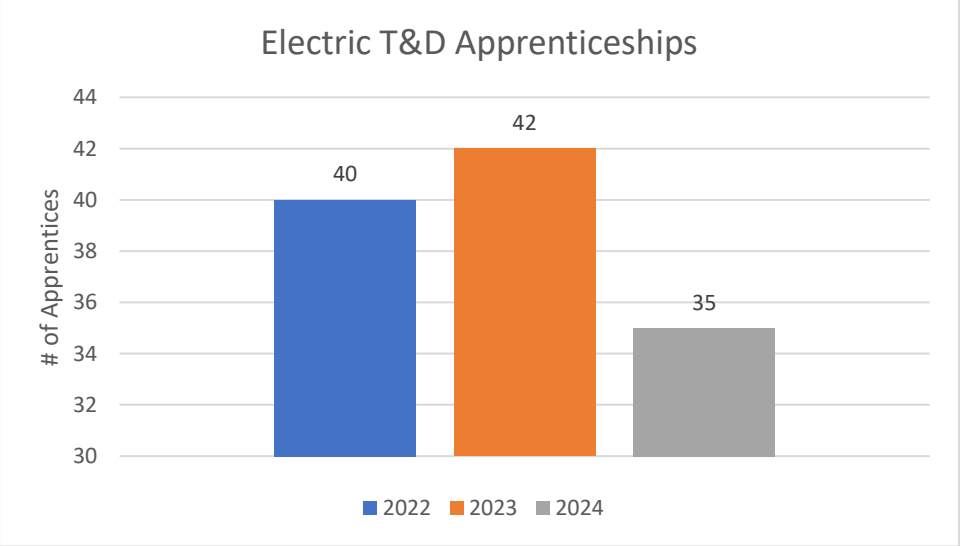
In the past we have provided data for combined gas and electric utilities. In an effort to report data specific to the electric utility, the data referenced on previous pages includes our above and below ground damage cases for our electric utility. These numbers include pole damages and excavation from third parties.

Our Public Awareness programs educate the public on utility safety, including contact with electric facilities. We also increased safety messaging in the community while collaborating with the 811/Utility Safety Booth at several community events throughout the year.

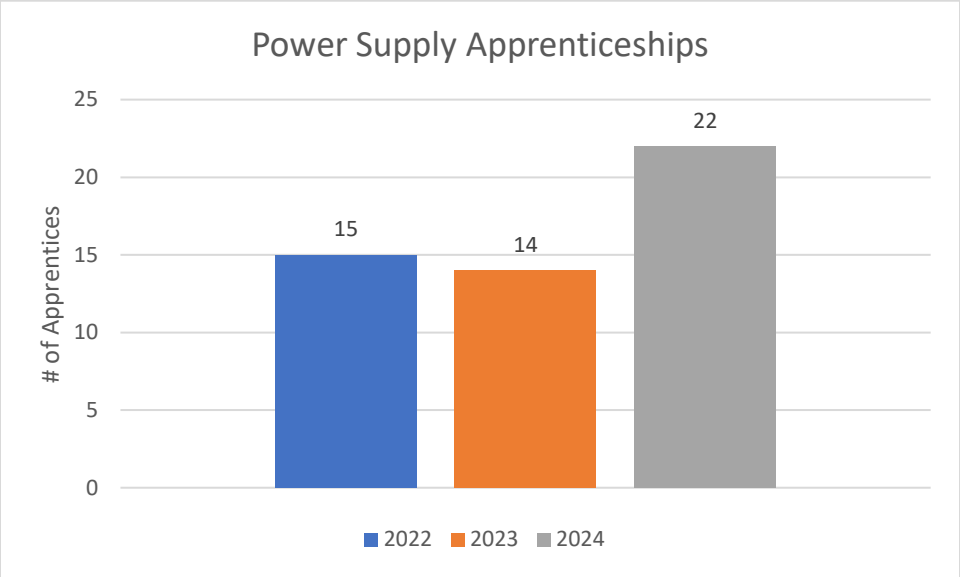
Electric T&D and Power Supply Apprenticeships

In 2024, we saw a decrease in our Electric T&D Apprenticeships but an increase in our Power Supply Apprenticeships. The graph below demonstrates a decrease of 16% for our Electric T&D apprenticeship program and an increase of 57% in our Power Supply apprenticeship programs for Indiana Electric only.

This follows our hiring needs based on attrition results and forward-year hiring plans. This data is neither good nor bad but indicates our initiative to maintain a steady and reliable workforce. The closing section of the report will highlight our retirement and retention efforts.



Safety and training (Continued)



Reliability

Note: For 2024, all reliability metrics shifted to the unmodified Institute of Electrical and Electronics Engineers Major Event Days (IEEE MED) definition. Previous years used a modified version of IEEE MED definition, resulting in difference of metrics for prior years.

Major Event Days (MEDs) are caused by significant events such as tornadoes, ice storms or strong thunderstorms. They are typically system-wide events.

CEIS has invested in modernizing and enhancing the safety and reliability of its electric distribution and transmission system. The traditional metrics of System Average Interruption Duration Index (SAIDI), Customer Average Interruption Duration Index (CAIDI) and System Average Interruption Frequency Index (SAIFI) are monitored daily and throughout the year.

System Average Interruption Duration Index (SAIDI) indicates the total duration of interruption for the average customer during a predefined period of time. It is commonly measured in minutes or hours of interruption.

$$SAIDI = \frac{\text{Total customer minutes of interruption}}{\text{Total number of customers served}}$$

Customer Average Interruption Duration Index (CAIDI) represents the average time required to restore service.

$$CAIDI = \frac{\text{Total customer minutes of interruption}}{\text{Total number of customers interrupted}}$$

System Average Interruption Frequency Index (SAIFI) indicates how often the average customer experiences a sustained interruption over a predefined period of time.

$$SAIFI = \frac{\text{Total number of customers interrupted}}{\text{Total number of customers served}}$$

These indices are related to each other through the formula:

$$CAIDI = \frac{SAIDI}{SAIFI}$$

Reliability (Continued)

In recent years, CEIS has also started to track the more customer-centric metric, CEMI or Customers Experiencing Multiple Interruptions rather than average system-wide performance.

Customers Experiencing Multiple Interruptions ($CEMI_X$) is the percent of total system customers that have experiencing *X* number of multiple operations over a predefined period of time.

$$CEMI_X = \frac{\text{Total number of customers who have experienced } x \text{ outages}}{\text{Total number of customers served}}$$

The metric CEMI better encapsulates the customer's experience which may be masked by system-wide measures. CEMI performance is monitored, and action plans are developed to prevent customers from experiencing additional outages. For instance, customers who have had three outages over the past 12 months (i.e., $CEMI_3$) are at risk to move to $CEMI_4$ and plans should be evaluated and developed for targeted reliability improvement.

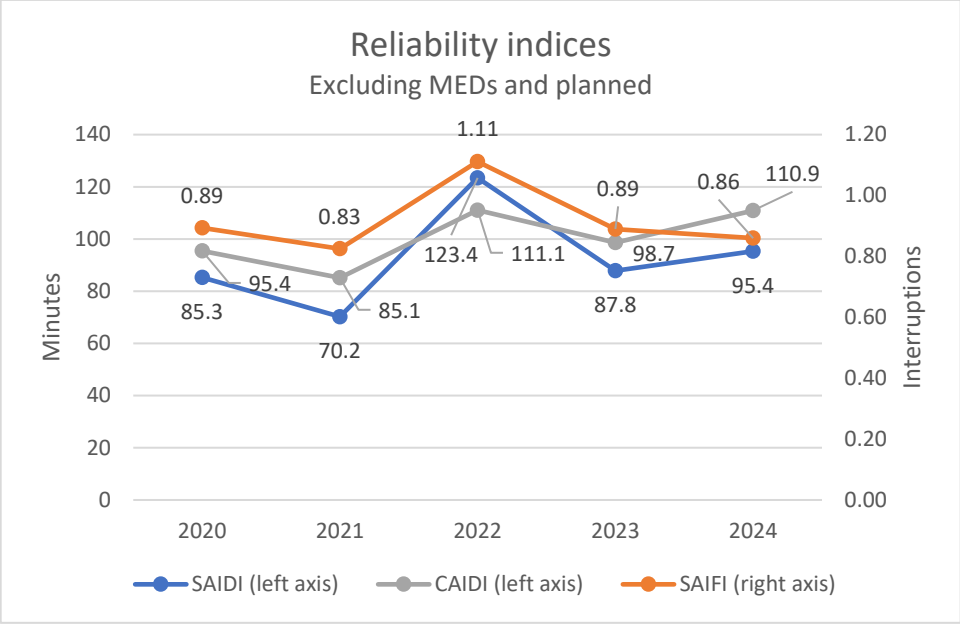
Reliability performance is impacted by MEDs, which are not representative of normal performance. The IEEE defines MEDs as, "…all days that have a SAIDI greater than T_{MED}." (IEEE Std 1366-2022) Thus, T_{MED} is a calculated daily SAIDI value derived from the past five-year performance and is used as a threshold for identifying abnormal days. Days that exceed the T_{MED} value are labeled as MEDs and analyzed separately. During such days, the electric system and the processes used to maintain it are under unusual stress due to catastrophic events – usually thunderstorms with high winds or tornadoes. The electric system requires additional resources and special processes to support restoration efforts during these periods that are not comparable to normal operation.

Unless stated otherwise, all reliability metrics presented follow the IEEE 1366 2.5 Beta method.

Reliability (Continued)

Normalized, non-MED, five-year reliability performance with respect to SAIDI, SAIFI and CAIDI are shown in Figure 1. After an uptick in SAIDI in 2022, SAIDI has seen a downward trend while SAIFI has maintained a year over year reduction.

Figure 1: Reliability Indices without MEDs



Reliability (Continued)

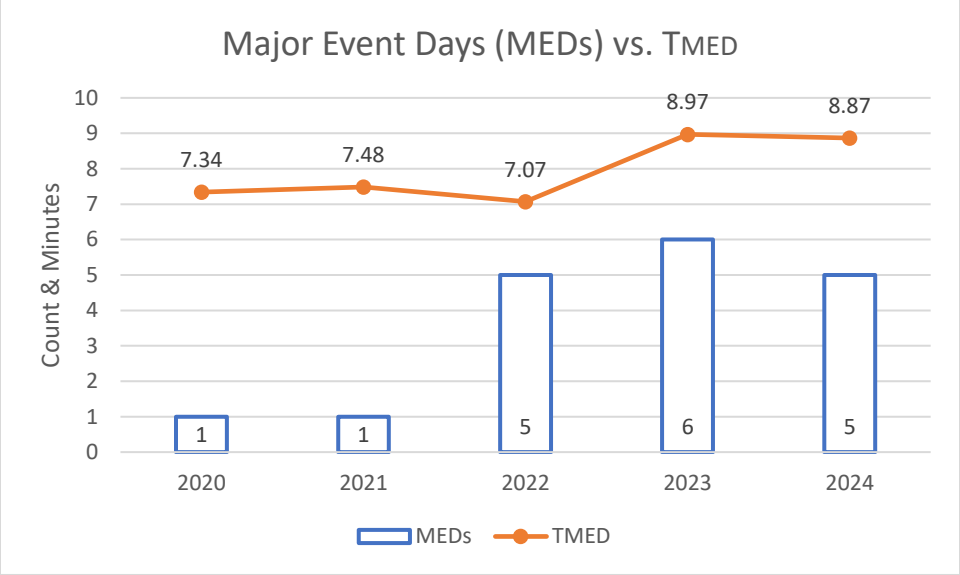
CEIS experienced three events in 2024 totaling five Major Event Days (April 2-3, May 26, and July 30-31) – see Figure 2.

The first major event occurred in the morning of April 2, where a derecho swept through the service territory with strong storms and multiple tornadoes resulting in over 222 SAIDI minutes across the 5-day restoration period.

The next major event occurred on May 26, with two waves of storms – one in the morning and another round in the evening – which totaled over 31 SAIDI minutes across the 3-day restoration.

The last major event on July 30 was the result of strong storms, including an EF1 tornado in Newburgh, that added 123 SAIDI minutes over the 4-day restoration.

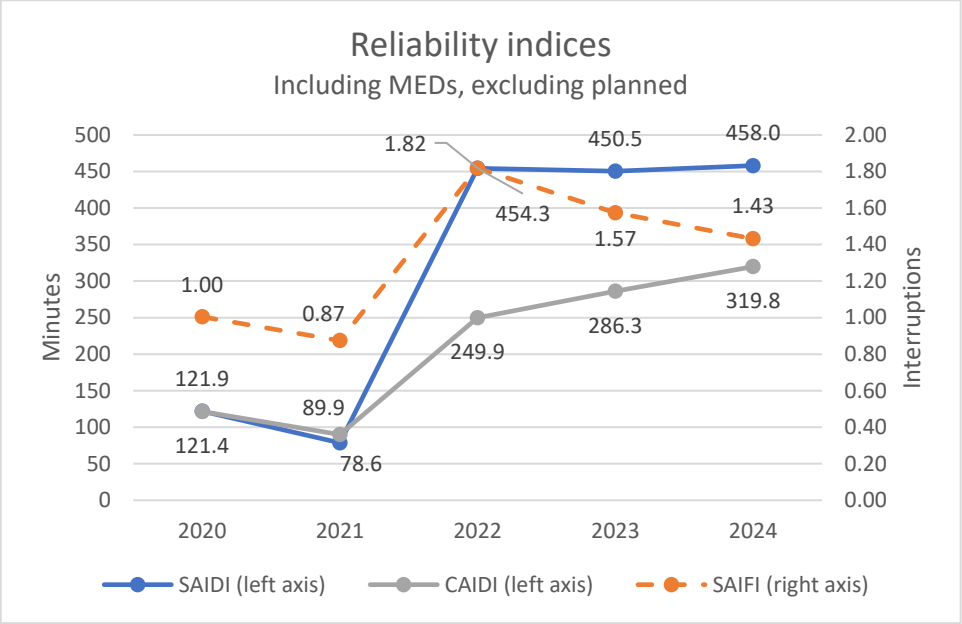
Figure 2: Major Event Days (MEDs)



Reliability (Continued)

Figure 3 shows non-normalized reliability metrics with MEDs included. Note how SAIDI has remained relatively flat since 2022 while SAIFI decreases and CAIDI increases. This is a result of major events impacting fewer customers (SAIFI).

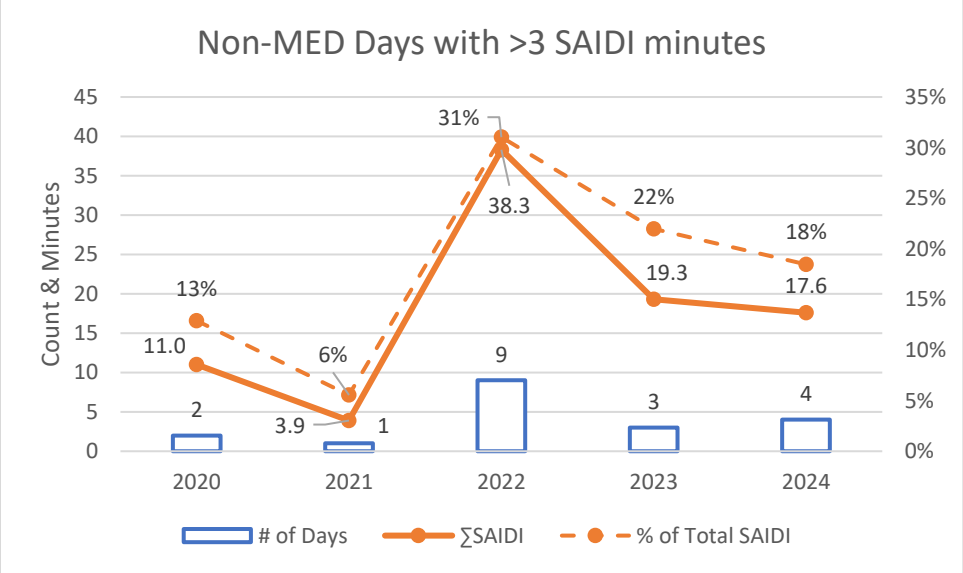
Figure 3: Reliability indices with MEDs



Reliability (Continued)

After favorable weather for much of 2020 and 2021, impactful weather patterns negatively impacted performance from 2022 through 2024. Figure 4 shows the number of days per year that had a daily SAIDI greater than 3.0 and below T_{MED} as well as its percentage of total SAIDI. These could be considered gray-sky days that are impactful to performance. After a five-year peak of 9 such days in 2022, there were fewer days in 2023 and 2024 with significantly less SAIDI impacts than 2022. This downward trend in gray-sky days (i.e., impactful, non-MEDs) is also reflected in reliability metrics across the board.

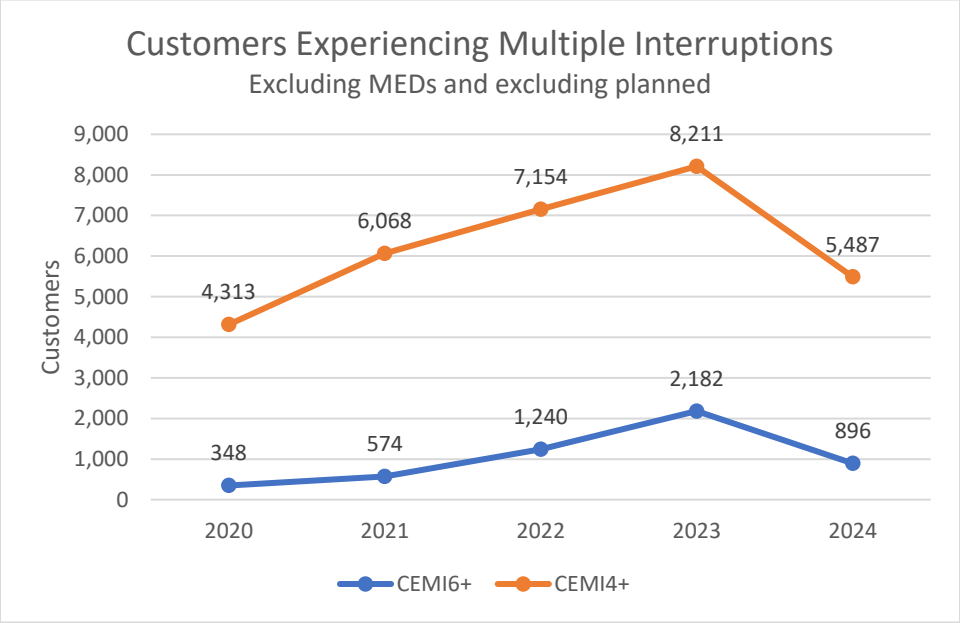
Figure 4: Non-MED days with >3 SAIDI minutes



Reliability (Continued)

Beginning in 2024, CEIS implemented a program to formally track CEMI performance and work to improve in this metric – see Figure 5 for the past five years of performance. This metric, in connection with the SAIDI/SAIFI/CAIDI metrics, provides CEIS with a fuller picture of the impact of non-major event severe weather and unplanned outages on customers, allowing the company to target efforts at reducing multiple interruptions.

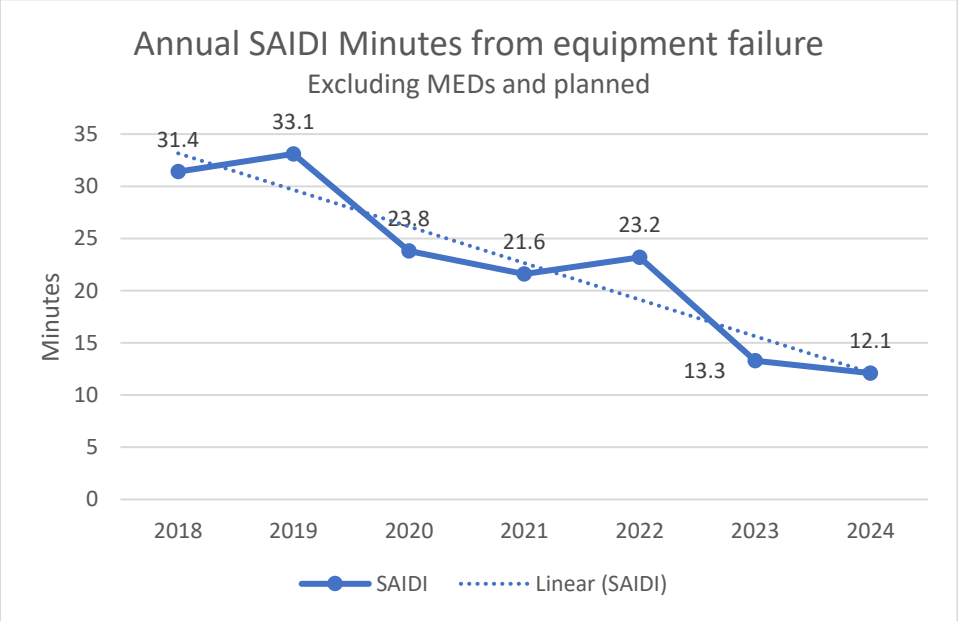
Figure 5: Customer experiencing multiple interruptions



Reliability (Continued)

As CEIS continues to improve its infrastructure through TDSIC and other projects, there has been a sustained, downward trend of annual SAIDI minutes attributed to equipment failure – see Figure 6. Over the past five years, there has been a 50% reduction from 2020 to 2024 and a 61% reduction from 2018 levels (31.4 to 12.1 SAIDI minutes).

Figure 6: Annual SAIDI minutes from equipment failure

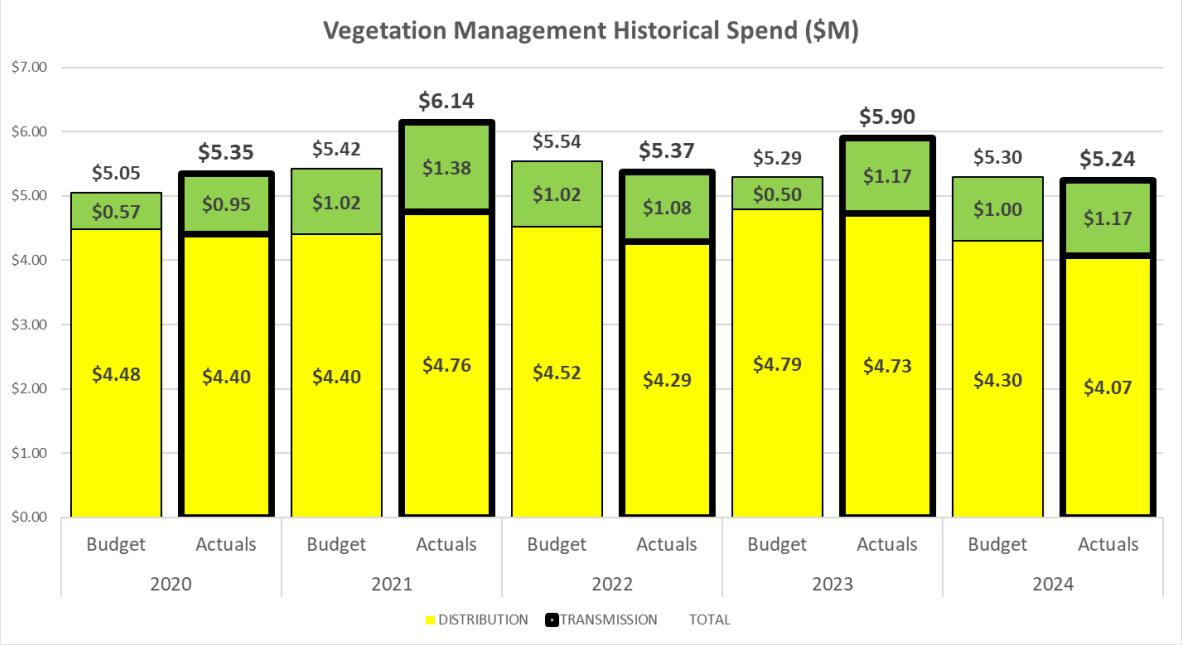


Other causes of SAIDI are outages related to vegetation and public interference, vehicle accidents with utility poles. This chart demonstrates the impact of our TDSIC work to replace and upgrade equipment, which has led to a decrease in equipment-caused outages.

Vegetation management

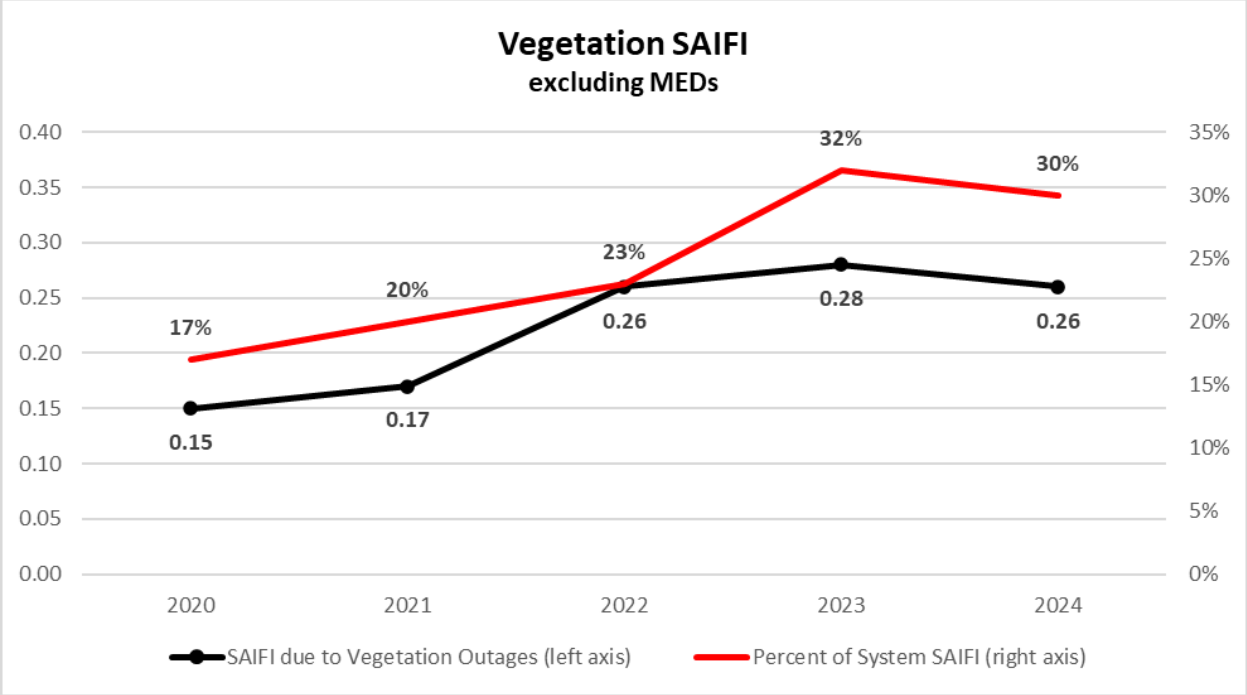
Consistent vegetation management is important to improve and maintain our reliability performance. This targeted spend keeps our rights of way and easements clear of trees and obstructions by addressing trees in our easements or rights of ways that have the potential to interfere with our powerlines resulting in reduced reliability (outages). Vegetation management also supports gaining access to our facilities or infrastructure, when needed, to be able to perform necessary maintenance.

Figure 7: Vegetation management spend – Total



Vegetation management (Continued)

Figure 8: Vegetation SAIFI (excluding MEDs)



Percentage (%) of system SAIFI / SAIFI due to vegetation outages

The trend in "% of System SAIFI - related to vegetation outages" and "SAIFI due to vegetation outages" can be attributed to the severity of weather we experienced each respective year and the significant reduction in equipment SAIFI. Unless stated otherwise, all reliability metrics presented follow IEEE 1366 2.5 Beta method.

For 2020 and 2021, these were very mild years related to weather. Each year, 2020 and 2021, had 1 MED day. Outside of the MED days, the remainder of the year for 2020 and 2021 was generally calm related to weather and vegetation outages. For 2020, we had 4 days for the entire year in which the daily SAIDI was between 2 and our MED threshold of 7.34. For 2021, we had 4 days for the entire year in which daily SAIDI was between 2 and our MED threshold of 7.48. The mild weather in 2020 and 2021 resulted in reduced vegetation outages as a % of total system SAIFI.

For 2022, we had multiple storm events which drove vegetation outages for the year. In 2022, we experienced 5 MED days and another 13 days that had a daily SAIDI between 2 and our threshold of 7.07 due to bad weather events. The weather activity in 2022 drove up the vegetation outages as a % of total system SAIFI.

Vegetation management (Continued)

For 2023, we had another year of stormy weather. We experienced 6 MED days and another 9 days in which we had a daily SAIDI between 2 and our threshold of 8.97 due to bad weather events. In 2023, we also realized a large reduction in customer interruptions related to Equipment (see comments above). This reduction in equipment-related customer interruptions ("Equipment CI") reduced the total CI in 2023 by 18%. The customer interruptions related to vegetation remained relatively flat from 2022 to 2023 (5% increase from 2022 to 2023). Due to the 18% decrease in total customer interruptions in 2023 due to the reduction in equipment CI, this resulted in vegetation-related outages increasing as a % of total system SAIFI.

For 2024, the significant weather events were less than 2023. In 2024, we had 5 MED days and 8 days that had a daily SAIDI between 2 and the MED threshold due to bad weather events. We saw improvement in SAIFI due to vegetation outages (.02 reduction). The customer interruptions related to vegetation improved from 2023 to 2024 (8% decrease from 2023 to 2024). In 2024, we had a very effective CEMI (Customers Experiencing Multiple Interruptions) Program which addresses customers that have experienced multiple outages related to vegetation. The % of System SAIFI related to vegetation outages remained steady (Improved from 32% (2023) to 30% (2024)) and this is due to the sustained reduction in Equipment CI that was realized in 2023 and 2024.

Generation

Capacity

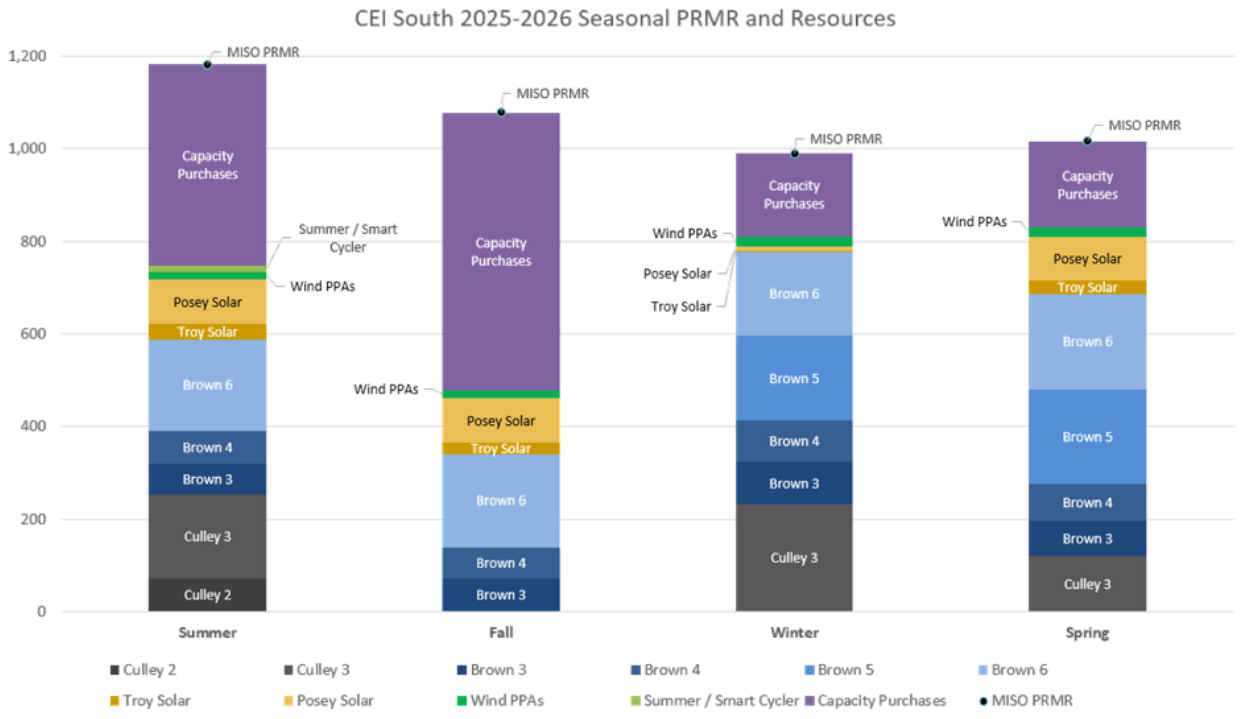
CEIS's current generation portfolio mix includes thermal coal, natural gas peaking and solar resources that are owned by CEIS, as well as purchase agreements for wind energy and capacity. CEIS owns and operates 360 MW of installed coal-fired capacity at the F.B. Culley generating station. An additional 160 MW of installed gas-fired peaking capacity is at the A.B. Brown facility. Additional coal-fired capacity includes a 32 MW share of installed capacity resulting from an ownership position in the Ohio Valley Electric Corporation (OVEC). Renewable resources include the 50 MW (installed capacity) Troy solar facility and 80 MW (installed capacity) of purchased power agreements (PPA) from two wind energy projects located in Indiana (Fowler Ridge and Benton County). CEIS exited from the joint operating agreement for Warrick 4 effective January 1, 2025.

Three new CEIS generation resources are scheduled to be placed in service during the 2025-2026 MISO planning year. The new Brown 6 CT and the Posey Solar facility were placed into service for the 2025 MISO summer season which started June 1. The new Brown 5 CT is scheduled to be available for the 2025 winter season which starts December 1.

The figure below shows the cumulative seasonal accredited capacity of CEI South generation resources by season for the 2025-2026 MISO planning year. The summer value includes 14 MW of residential load cycling ("Summer Cycler and Smart Cycle"). The PRMR value refers to the seasonal MISO Planning Reserve Margin Requirement. Capacity for seasons where the PRMR is greater than the CEIS generation portfolio will be obtained through the MISO planning resource auction (PRA).

Generation (Continued)

Figure 9: CEIS generation resources



Generation (Continued)

Thermal coal units

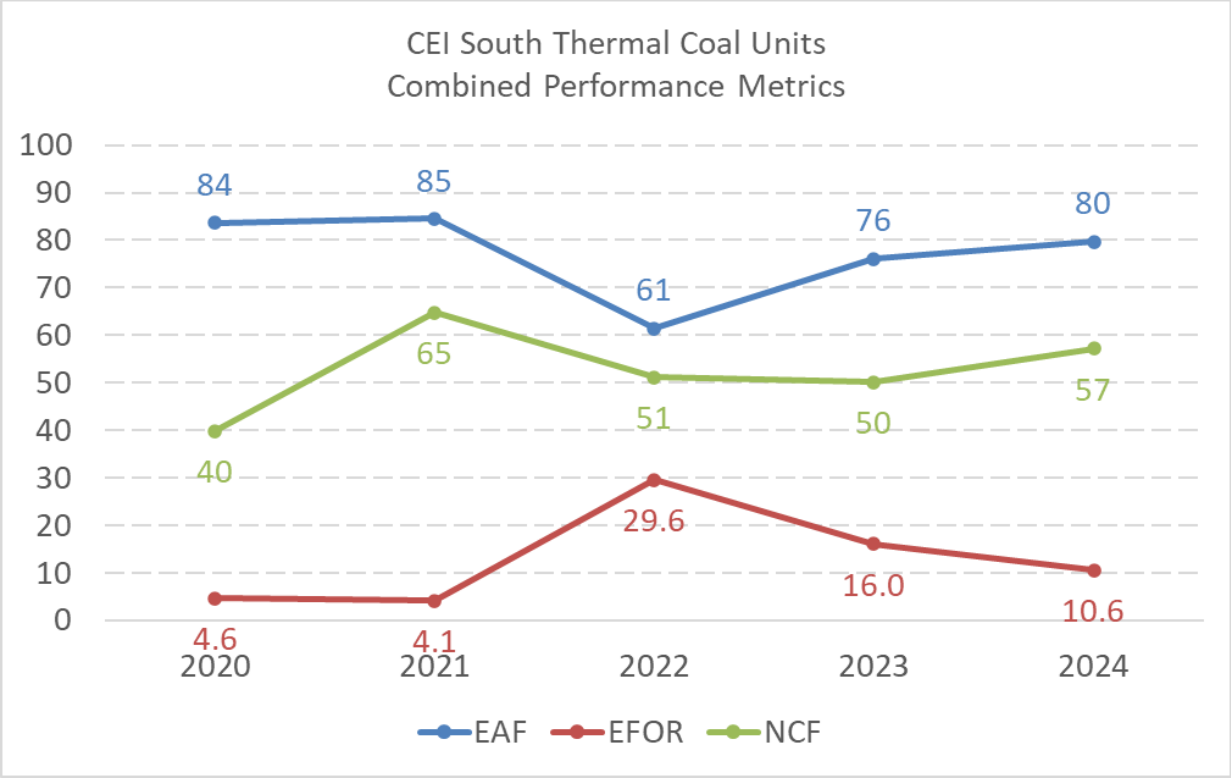
The performance metrics below represent the monthly, combined, weighted measures for the A.B. Brown and F.B. Culley thermal coal units.

Definitions:

All metrics are calculated per the North American Electric Reliability Corporation (NERC) Generating Availability Data System (GADS) data reporting instructions.

- **Equivalent Availability Factor (EAF)**: Percent of time that a unit was available for full load operation.
- **Equivalent Forced Outage Rate (EFOR)**: percent of unit capability that was unavailable when a unit is in service.
- **Net Capacity Factor (NCF)**: Actual production as a percentage of maximum potential production (full load for all hours).

Figure 10: Thermal Coal Units Combined performance metrics



*Retirement of AB Brown units in 2023 are reflected in this chart.

Generation (Continued)

Generating Unit	Year	EAF	EFOR	NCF
Brown 1	2020	94.0	4.0	45.6
	2021	83.0	2.7	61.6
	2022	81.8	13.7	71.6
	2023	76.3	10.7	44.9
Brown 2	2020	82.2	7.2	49.8
	2021	81.7	5.6	64.5
	2022	72.8	8.4	66.4
	2023	80.9	8.6	60.1
Culley 2	2020	80.6	6.3	10.0
	2021	82.5	21.9	28.1
	2022	61.6	26.6	26.8
	2023	78.7	24.8	22.4
	2024	62.7	32.4	31.8
Culley 3	2020	76.7	1.8	35.6
	2021	89.2	1.3	80.2
	2022	33.0	62.7	27.2
	2023	71.7	22.5	56.0
	2024	85.4	5.3	65.7
Combined	2020	83.7	4.6	39.8
	2021	84.5	4.1	64.8
	2022	61.5	29.6	51.2
	2023	76.1	16.0	50.1
	2024	79.7	10.6	57.2

Boiler tube leak outages for Culley 2 were the primary events affecting EAF and EFOR for 2024.

Generation (Continued)

Natural gas peaking units

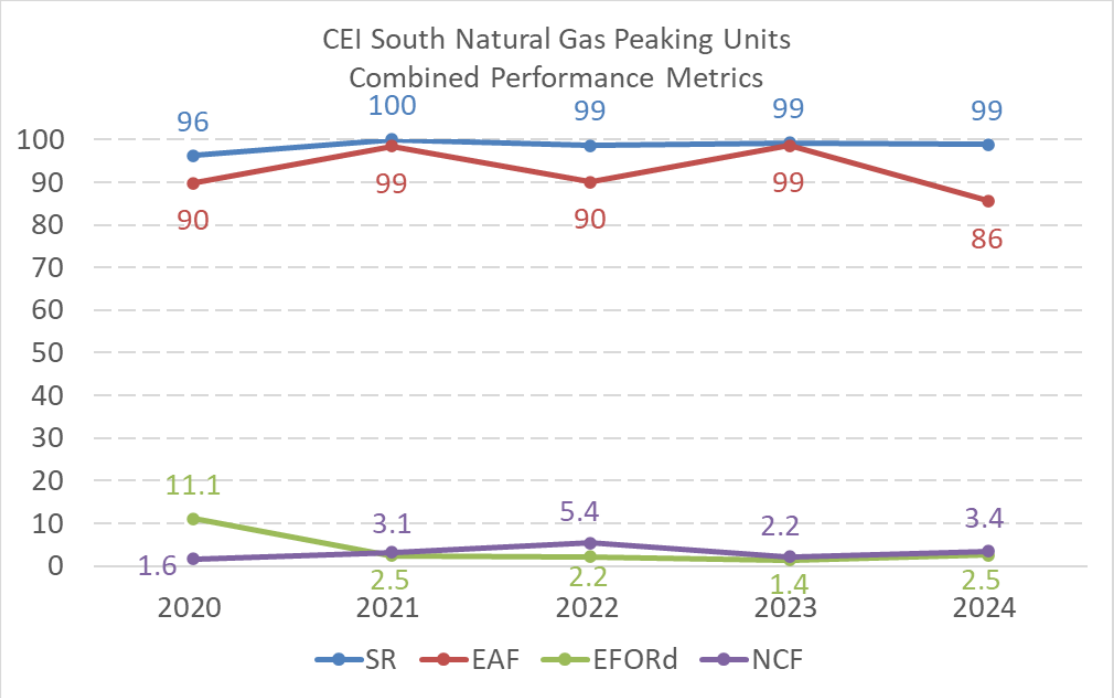
The performance metrics below represent the annual combined measures for the Brown 3 and Brown 4 simple cycle gas peaking units for 2020–2024.

Definitions:

All metrics are calculated per the NERC GADs data reporting instructions.

- **Starting Reliability (SR)**: Percent of attempted unit starts that were successful.
- **Equivalent Availability Factor (EAF)**: Percent of time that a unit was available for full load operation.
- **Equivalent Forced Outage Rate demand (EFORd)**: EFORd is the percent of unit capability that was unavailable when a unit is in service. EFORd is a demand adjusted EFOR to account for reserve shutdowns.
- **Net Capacity Factor (NCF)**: Actual production as a percentage of maximum potential production (full load for all hours).

Figure 11: Peaking units combined Performance Metrics



Generation (Continued)

Generating Unit	Year	SR	EAF	EFORd	NCF
Brown 3	2020	96.8	99.2	4.7	1.3
	2021	100.0	100.0	0.5	2.9
	2022	98.2	99.3	3.0	5.2
	2023	98.6	98.3	0.0	2.0
	2024	97.3	74.0	5.7	2.4
Brown 4	2020	95.9	80.4	16.2	1.9
	2021	100.0	97.1	4.4	3.4
	2022	99.1	80.8	1.3	5.6
	2023	100.0	98.9	2.7	2.4
	2024	100.0	97.1	0.0	4.3
Combined	2020	96.3	89.8	11.1	1.6
	2021	100.0	98.5	2.5	3.1
	2022	98.6	90.1	2.2	5.4
	2023	99.3	98.6	1.4	2.2
	2024	98.8	85.6	2.5	3.4

The availability and reliability of the CT's were favorable for 2024. The primary event affecting CT availability (EAF) for 2024 was a planned combustion inspection outage for Brown 3. There were 218 starts for Brown 3 and Brown 4 combined.

Generation *(Continued)*

Solar

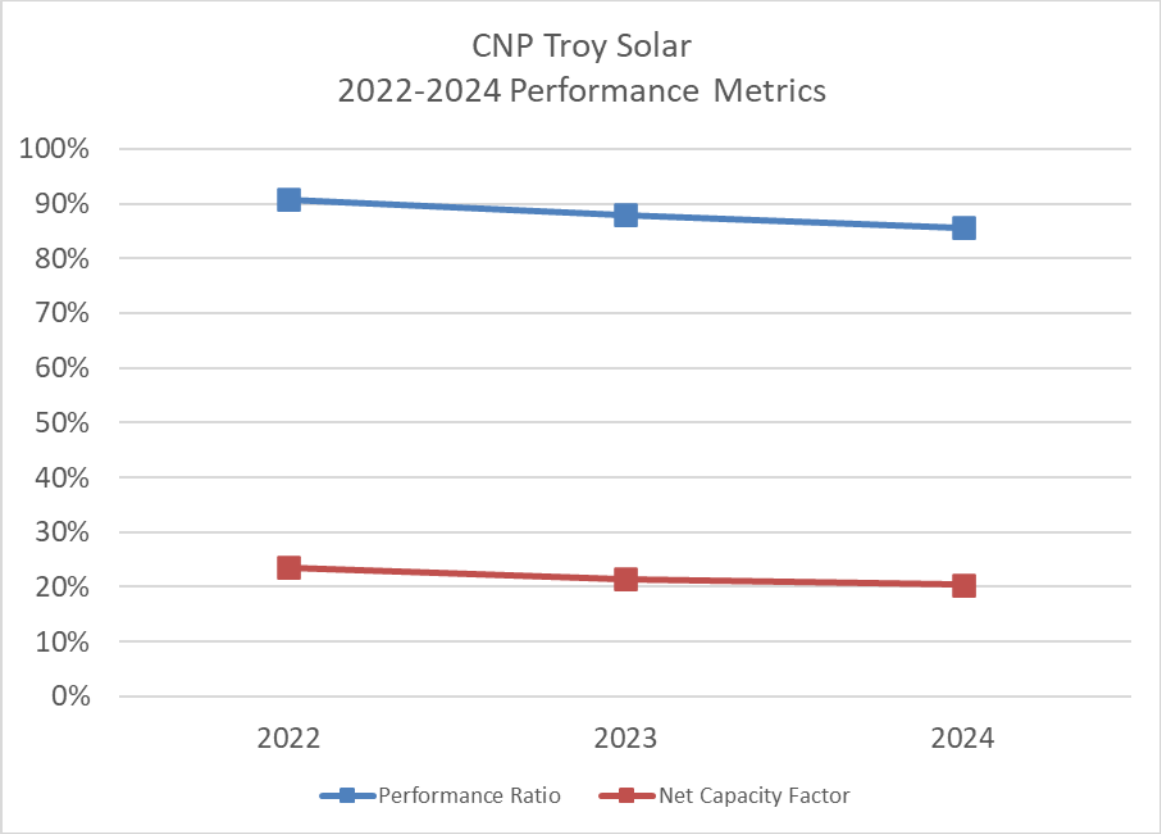
Net Capacity Factor and Performance Ratio are the selected measures for the nominal 50 MW Troy Solar facility.

Definition:

- **Net Capacity Factor (NCF)**: Actual production as a percentage of maximum potential production (full load for all hours).
- **Performance Ratio (PR):** Actual production as a percentage of potential production. Potential production is estimated from on-site irradiance and meteorological instrumentation.

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Figure 12: Troy Solar monthly performance metrics



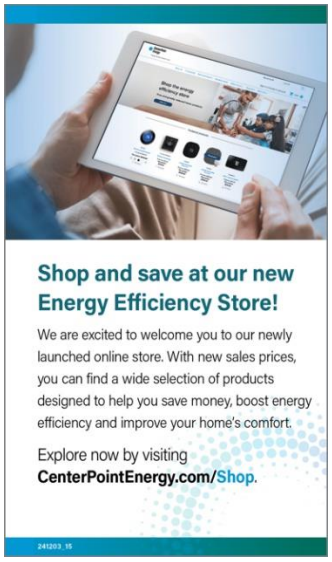
Inverter reliability was the primary cause of production losses for the Troy facility in 2024.

Customer experience

Utility Marketing and Corporate Communications at CenterPoint Energy are working collaboratively to help increase customer satisfaction in Southwestern Indiana.

One metric being utilized to help assess customer satisfaction is the Voice of Customer (VOC) Survey, an internal online survey conducted by CenterPoint Energy. In 2024, the Overall Satisfaction score for Indiana was at 3.62 on a 5-point scale. CenterPoint also subscribes to the Utility Trusted Brand & Customer Engagement Survey conducted by Cogent Syndicated. The Engaged Customer Relationship (ECR) score, another measure of Overall Satisfaction, for CenterPoint Energy – Indiana stood at 538 on a 1,000 point scale in 2024.

CenterPoint is communicating to customers key objectives for the region like exceeding company energy efficiency goals, sharing long-term electric generation transition plans and keeping customers abreast of system enhancements and the benefits they provide.





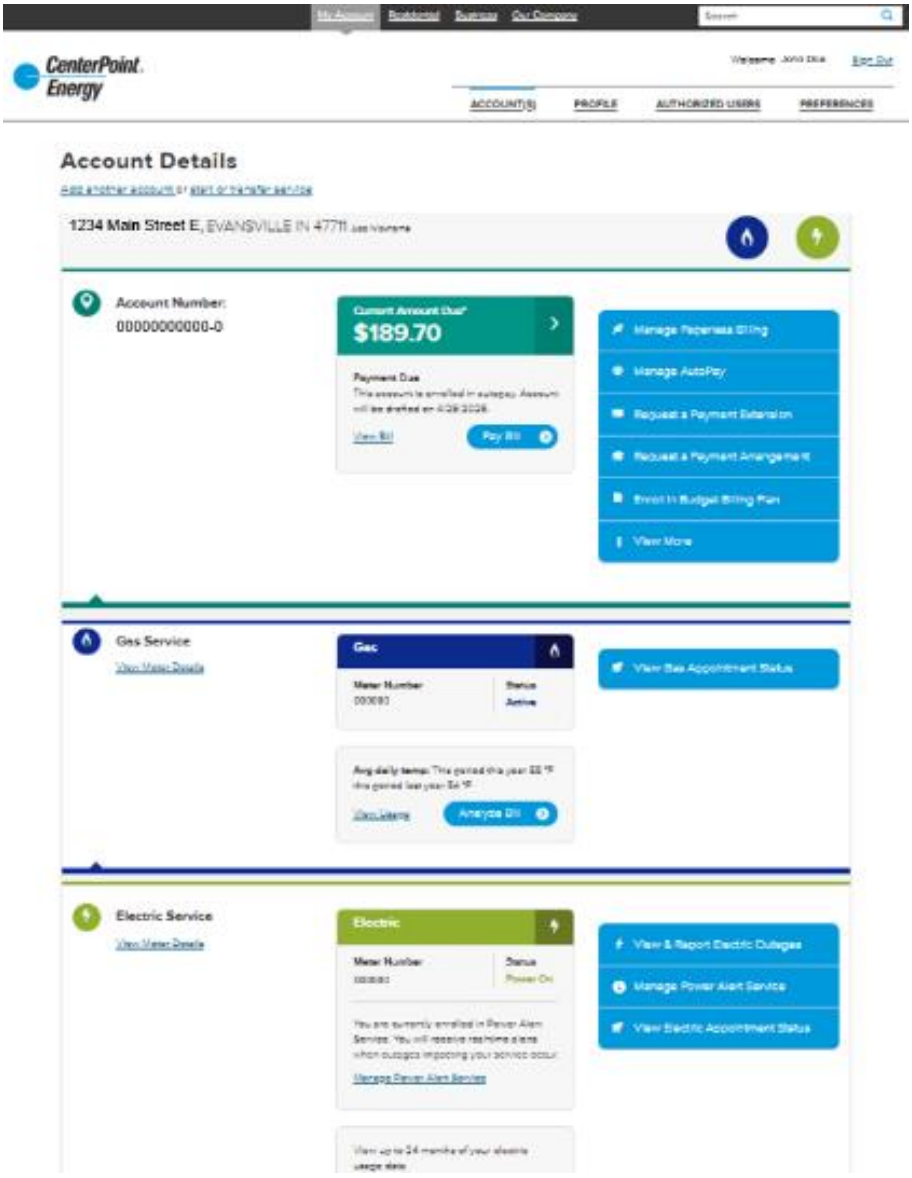
Communications are also focused on educating customers on the value they receive from CenterPoint utility services and encouraging customers to participate in programs which may help better manage their energy usage and learn about assistance opportunities.



Customer experience (Continued)

The redesigned bill layout prioritizes customer clarity displaying essential information such as total amount due, payment deadlines and contact information. The bill includes usage breakdowns to enhance customer understanding.

This improved bill presentation complements our *MyAccount* online portal, which offers expanded self-service capabilities. Through *MyAccount*, customers can manage their accounts efficiently with just a few clicks—applying for payment plans or extensions, accessing usage data and utilizing a suite of tools designed to provide greater control and insight into their service. These improvements to both physical bills and digital portal represent our commitment to enhancing the customer experience.



Advancing First-Contact Resolution

2025 and beyond

Last year, we began the evolution from a First-Call Resolution model to a more comprehensive First-Contact Resolution (FCR) approach, expanding our focus beyond traditional contact center interactions to encompass all customer touchpoints, including online accounts, social media, support-functions and field interactions. To support this initiative, we have partnered with Gartner and other industry experts to refine our strategy and identify key focus areas.

A critical component of our FCR efforts is the ***Repeat Call Analysis***, which leverages Natural Language Understanding (NLU) intent, dashboards and CallMiner, our speech analytics tool, to identify repeat call drivers and contact reasons. By analyzing trends and evaluating our call routing strategy, we are optimizing the data to enhance self-service capabilities and drive operational efficiencies. Additionally, this analysis helps pinpoint knowledge gaps among agents, allowing for targeted training and skill development.

As part of our commitment to FCR, we have implemented a CRM enhancement that provides agents with a real-time alert when a customer has contacted us three or more times within a seven-day period. This feature ensures that agents are equipped with the necessary insights to acknowledge customer concerns, take full ownership of the interaction and work toward a resolution with empathy and efficiency. Agents are also supported with conversation guides that reinforce compassionate listening, clear communication and proactive problem-solving.

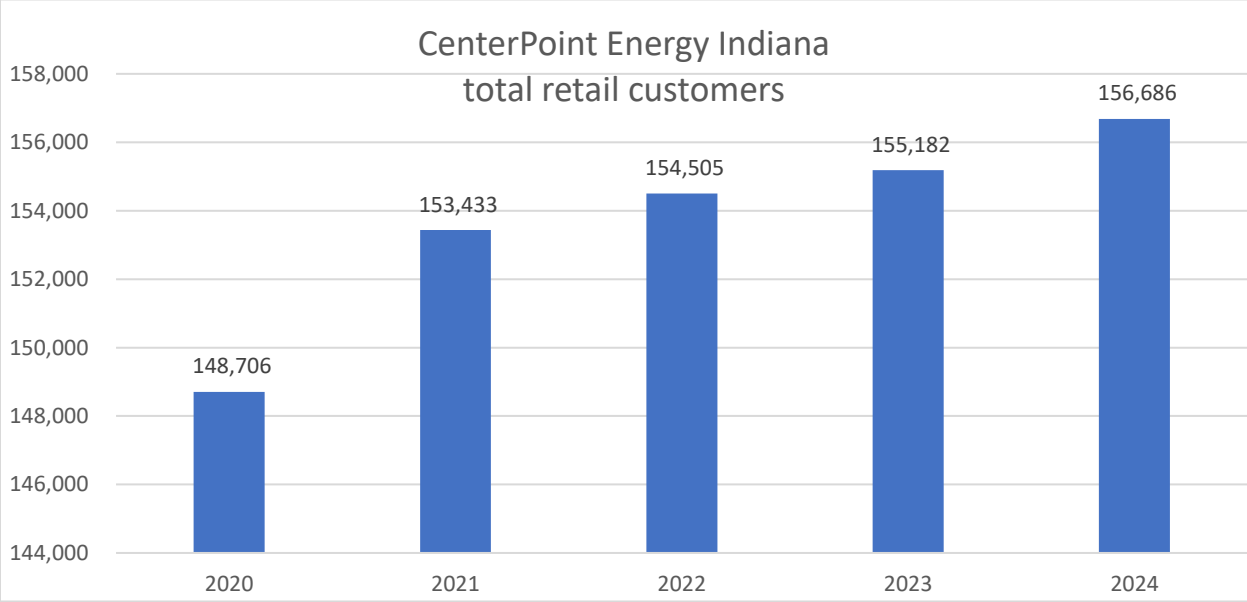
This initiative represents a significant step in our ongoing journey to deliver exceptional customer experiences. By focusing on First-Contact Resolution, customer empowerment and operational excellence, we are aligning with our CEO's vision of becoming '***Customer Obsessed***.' As we move into 2025 and beyond, we remain dedicated to enhancing service and delivery and ensuring that every customer interaction is resolved effectively, reinforcing trust and satisfaction.

Operations metrics

In this section, CenterPoint's operations and maintenance expenses and capital investments are reflected on a cost per metric basis. Where possible, the data used for the comparison is taken from CenterPoint Energy's FERC Form 1. The primary metrics used to present O&M and capital costs are per number of retail customers and MWh sales.

Customers and sales

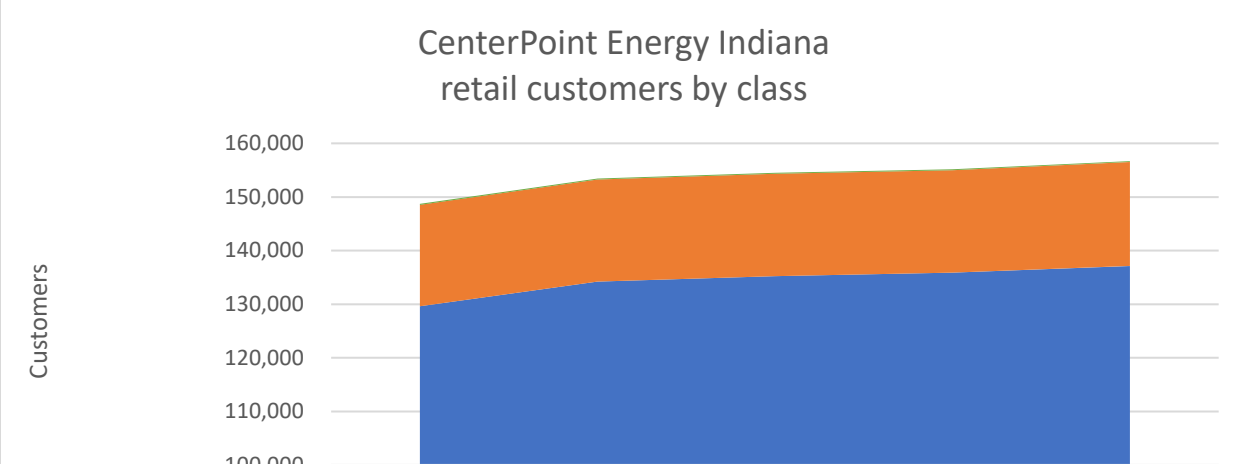
Figure 13: CenterPoint Energy Indiana total retail customers



- Average number of retail customers per month from FERC Form 1, pages 300-301, Line 10.

Operations metrics *(Continued)*

Figure 14: CenterPoint Energy Indiana total retail customers by class

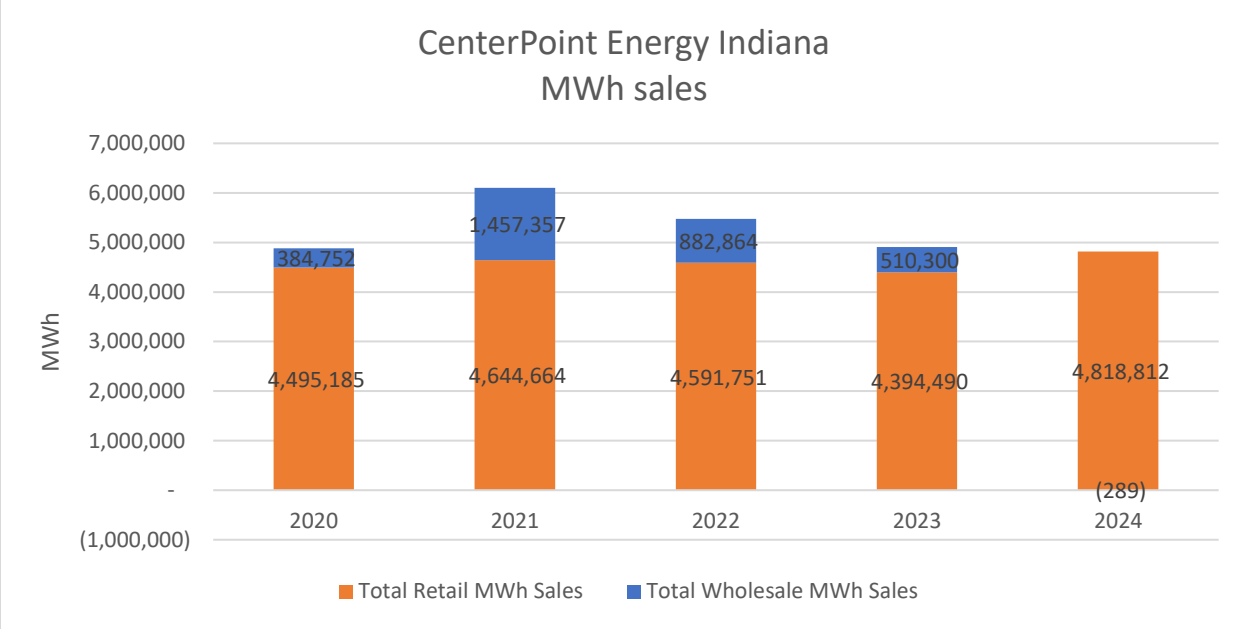


	2020	2021	2022	2023	2024
Total Industrial and Other	192	193	192	189	166
Commercial	18,908	19,048	19,109	19,101	19,410
Residential	129,606	134,192	135,204	135,892	137,110

- Average number of customers per month in major customer classes (Residential, Commercial, Industrial, etc.) from FERC Form 1, pages 300-301, lines 2, 4, 5, 6 and 9.
- Other classification includes public street lighting and interdepartmental sales.
- Customer growth is driven by both residential and commercial customer classes with a compound annual growth rate, or CAGR, of 1.09% over the periods reflected.

Operations metrics *(Continued)*

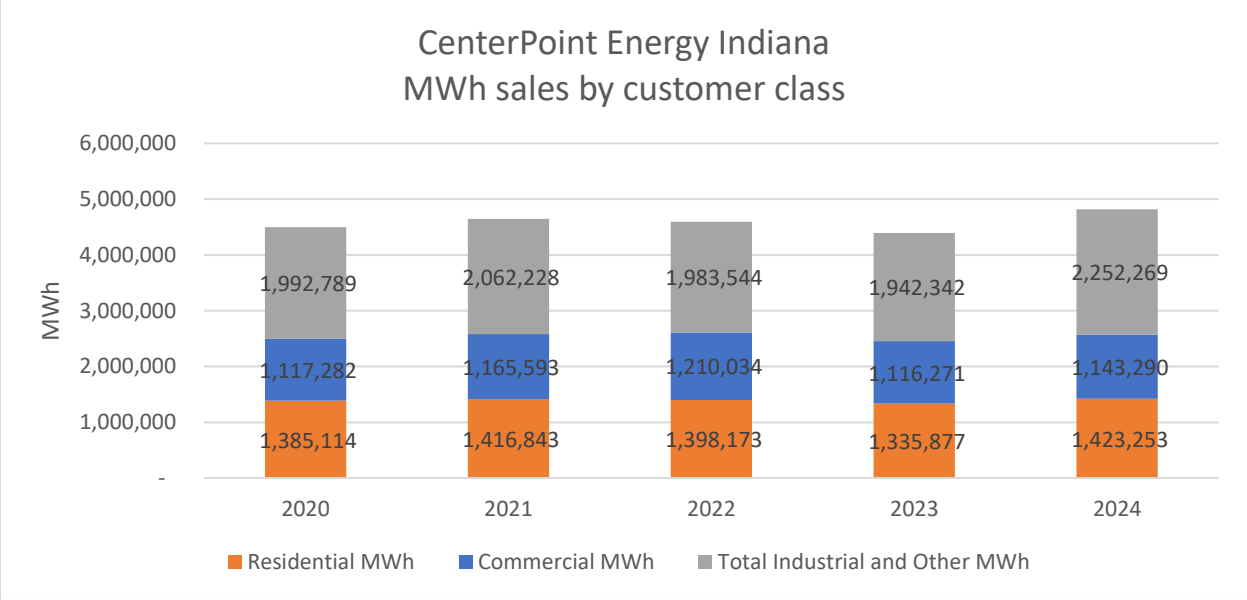
Figure 15: CenterPoint Energy Indiana energy sales (MWh)



- Retail and wholesale sales per FERC Form 1, pages 300-301, lines 10 and 11
- Retail sales remain flat during the periods reflected.
- Wholesale MWh sales are per FERC Account 447 (Sales for Resale), FERC Form 1 page 310-311, line 1.
- Wholesale MWh sales fluctuate year-to-year based on MISO market prices, MISO generator dispatch, availability of CEIS's generators, fuel costs, possible congestion in the system and other factors.
- In 2024, CEIS was a net importer from the MISO wholesale energy market. Generator availability during 2024 was impacted by the retirement of the AB Brown 1 and 2 coal units and CEIS South's exit from Warrick unit 4 joint ownership with Alcoa.

Operations metrics *(Continued)*

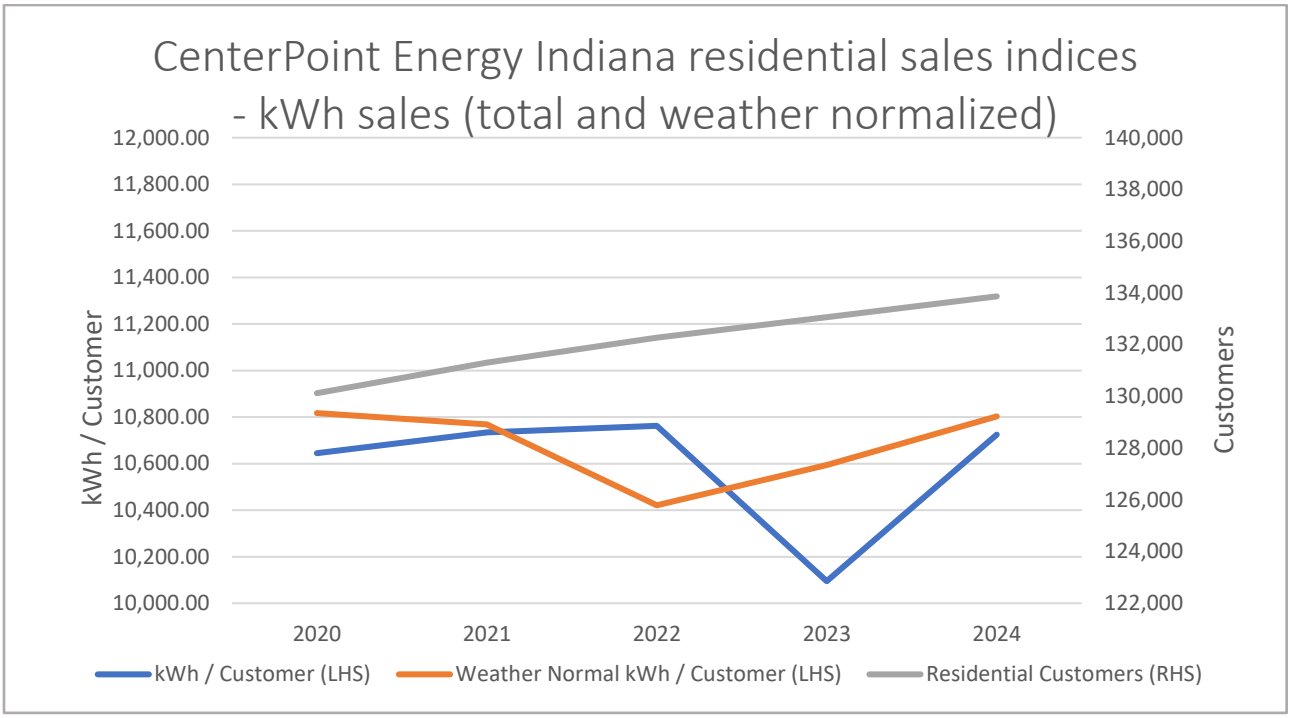
Figure 16: CenterPoint Energy Indiana total retails MWh sales per customer class



- Total MWhs sold in major customer classes (Residential, Commercial, Industrial, etc.) from FERC Form 1, pages 300-301, lines 2, 4, 5, 6 and 9.

Operations metrics *(Continued)*

Figure 17: CenterPoint Energy Indiana residential sales indices (total and weather normalized)



- Weather-normalized residential customer usage is flat over the periods reflected.
- Energy efficiency achieved first-year savings of 35.2m kWh in 2024, which is approximately 1.1% of eligible sales.
- Average use per customer over this period reflects success of utility sponsored energy efficiency programs in addition to the adoption of more efficient appliance standards.

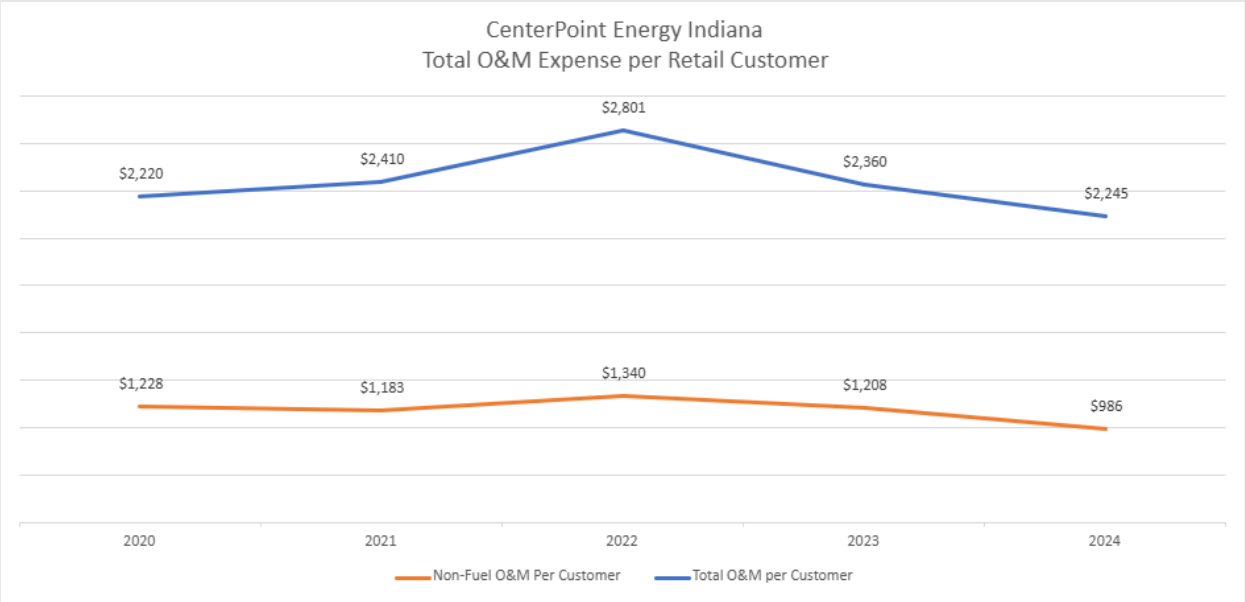
Operations metrics *(Continued)*

Operations and maintenance expenses

Operations and maintenance (O&M) expenses comprise the non-capitalized costs of operating and maintaining the utility's assets. These period expenses are functionalized as prescribed in the FERC Chart of Accounts and are categorized as electrical production, transmission, distribution, customer and administrative, and general.

For comparison purposes, CenterPoint's O&M expenses are reported with and without fuel costs. The "non-fuel" view excludes FERC Accounts 501 (steam fuel), 547 (other generation fuel), 555 (purchased power) and 557 (other power supply).

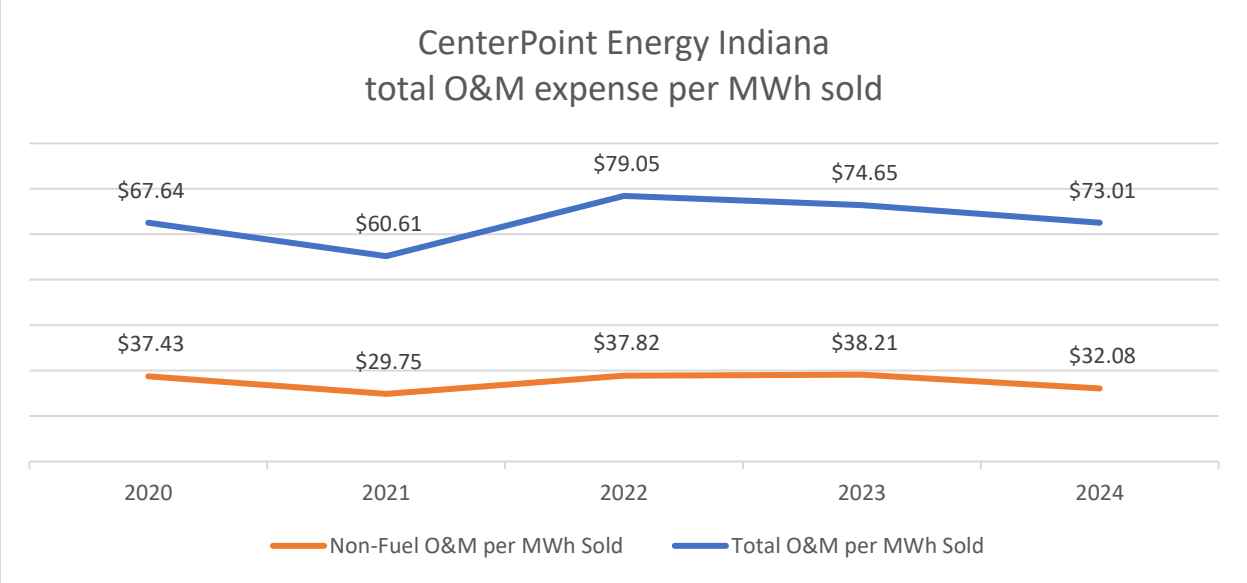
Figure 18: CenterPoint Energy Indiana total O&M per retail customer



- Total O&M and non-fuel O&M per FERC Form 1, pages 320-323.
- O&M decline in 2024 resulting from CEI South's exit of Warrick unit 4 joint ownership with Alcoa and the closure of the AB Brown coal units 1 and 2.

Operations metrics *(Continued)*

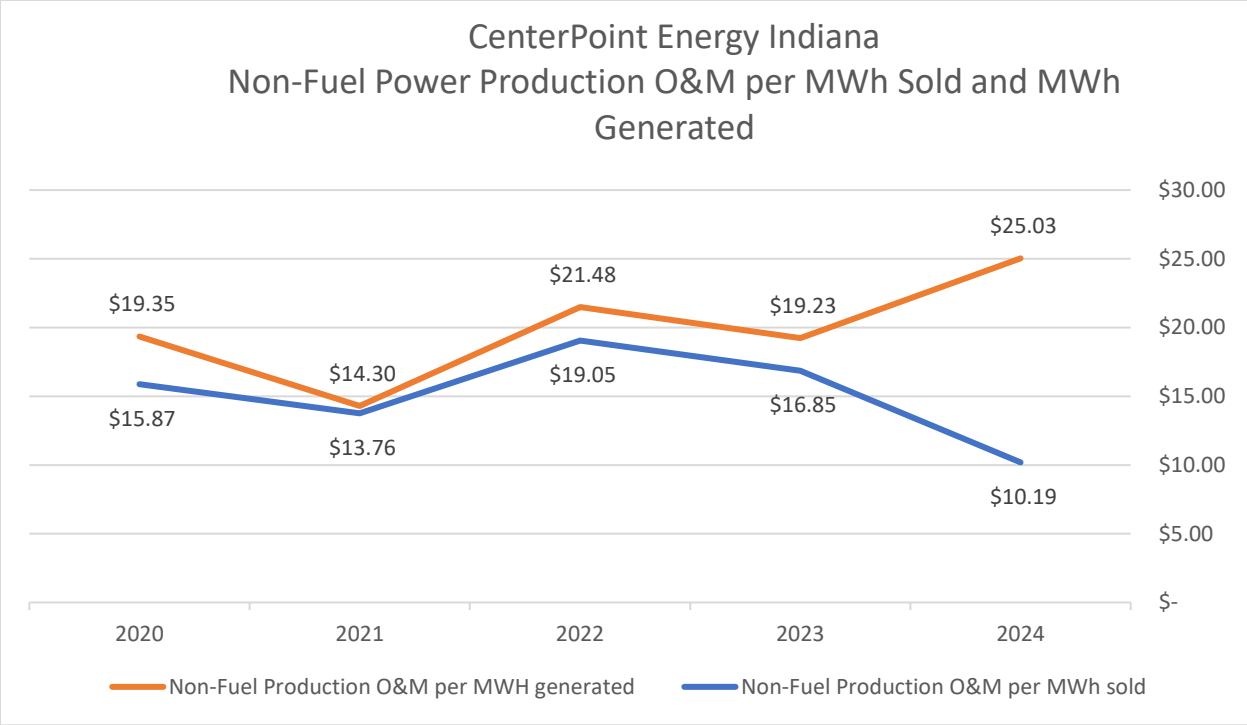
Figure 19: CenterPoint Energy Indiana total O&M per MWh sold



- Total O&M and non-fuel O&M per FERC Form 1, pages 320-323.
- Total MWh sales include retail and wholesale.

Operations metrics *(Continued)*

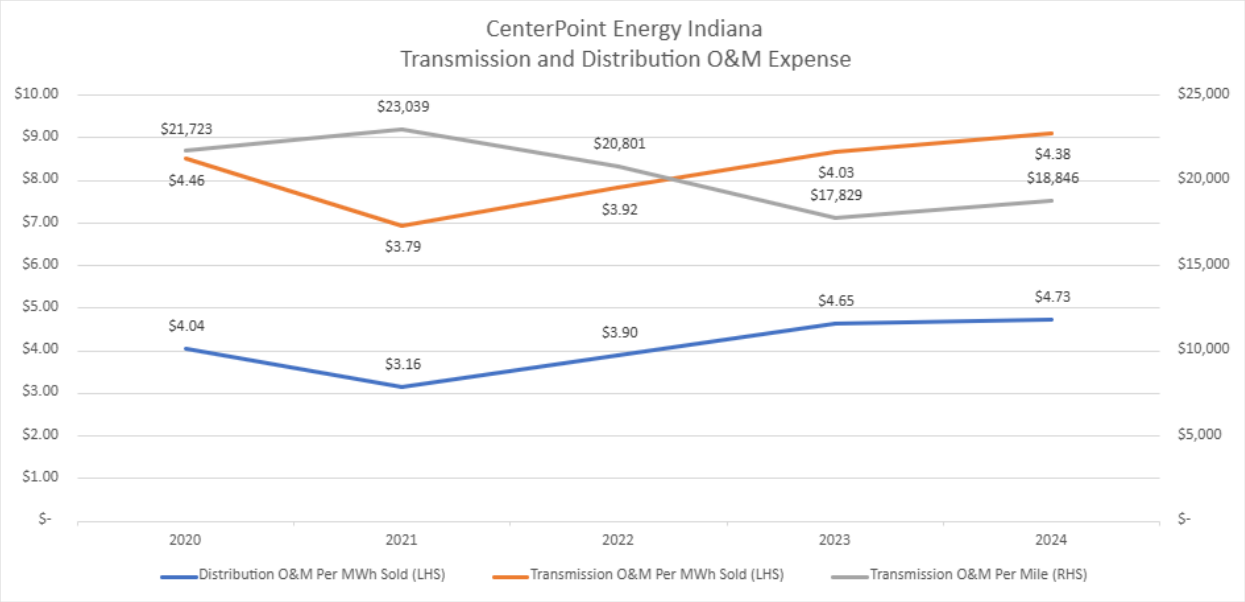
Figure 20: CenterPoint Energy Indiana non-fuel production O&M per MWh sold and per MWh generated



- Non-fuel O&M per FERC Form 1, pages 320-323.
- Total MWh sales include retail and wholesale.

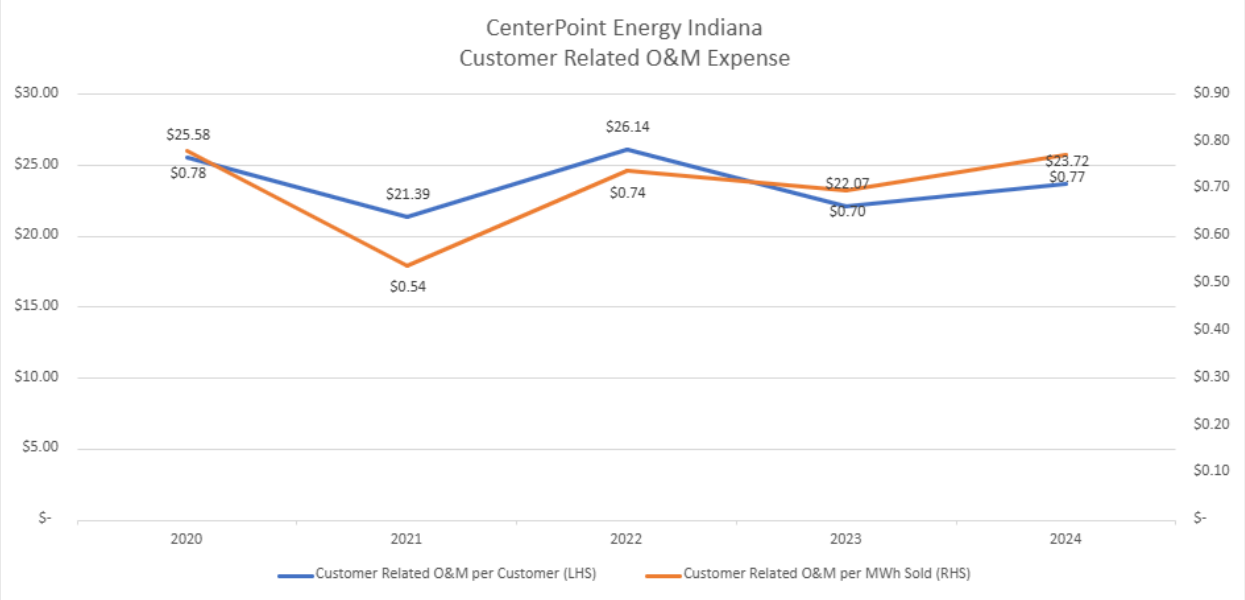
Operations metrics *(Continued)*

Figure 21: CenterPoint Energy Indiana transmission and distribution O&M expense



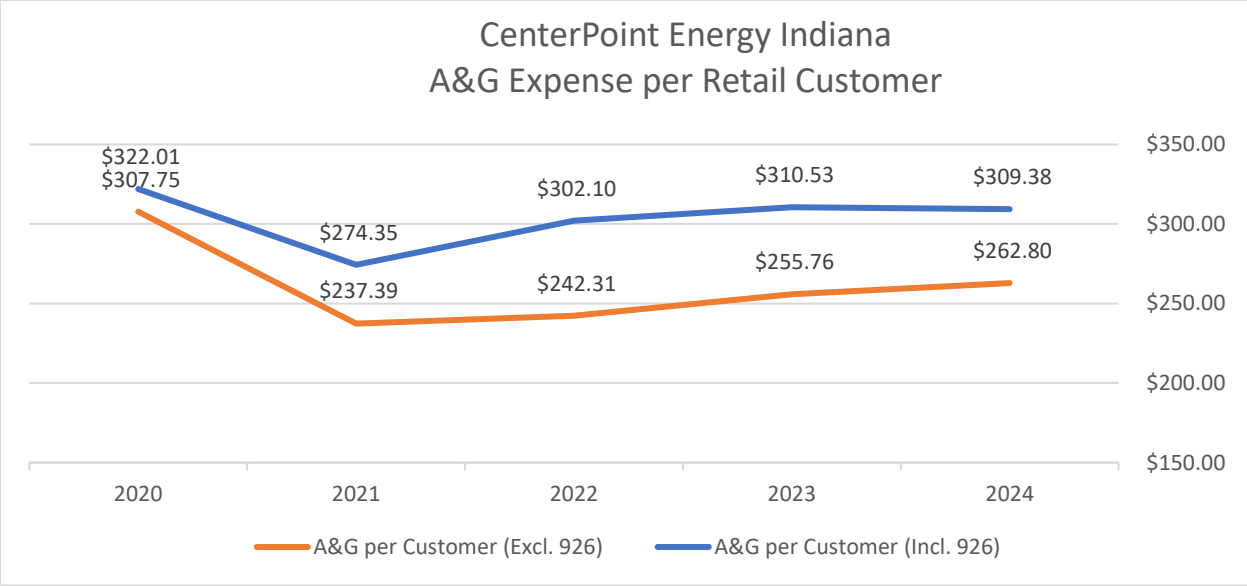
Transmission O&M is impacted by both internal maintenance costs and MISO related costs.

Figure 22: CenterPoint Energy Indiana customer-related O&M expense



Operations metrics *(Continued)*

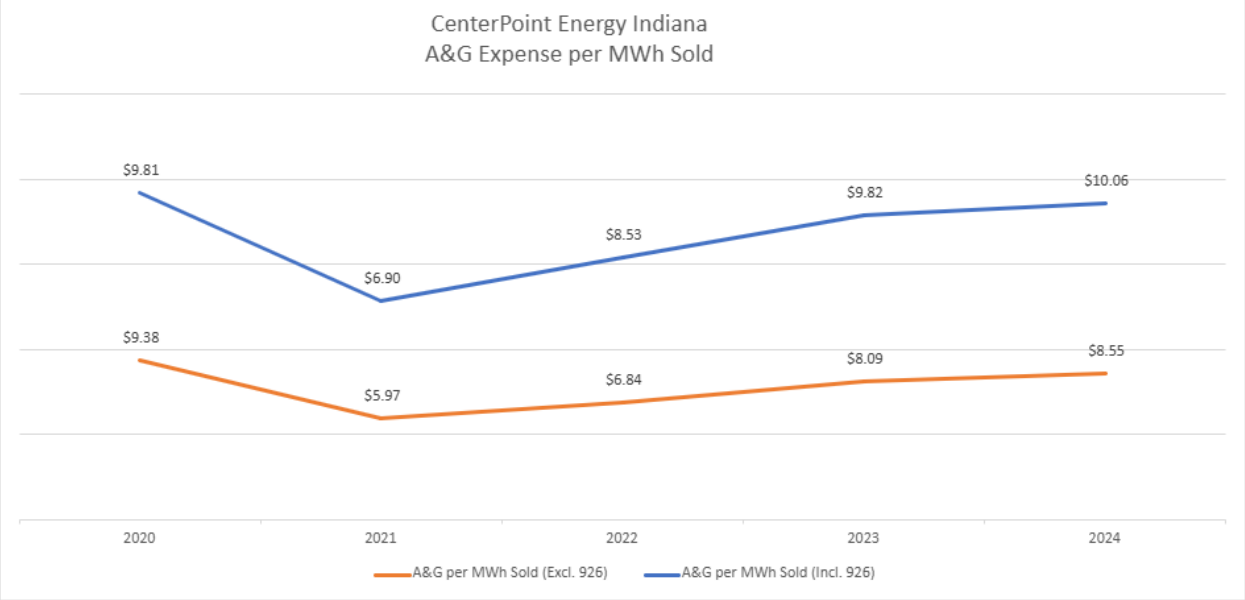
Figure 23: CenterPoint Energy Indiana Administrative and General (A&G) expense per retail customer



- Administrative and General (A&G) refers to the cost of labor, benefits and expenses that are not chargeable directly to operating functions. A&G expenses include employee labor and expenses, employee pensions and benefits, outside services, insurance, office supplies and office maintenance costs.
- For comparison, CenterPoint A&G expenses are reported with and without employee pensions and benefits (FERC Account 926).

Operations metrics *(Continued)*

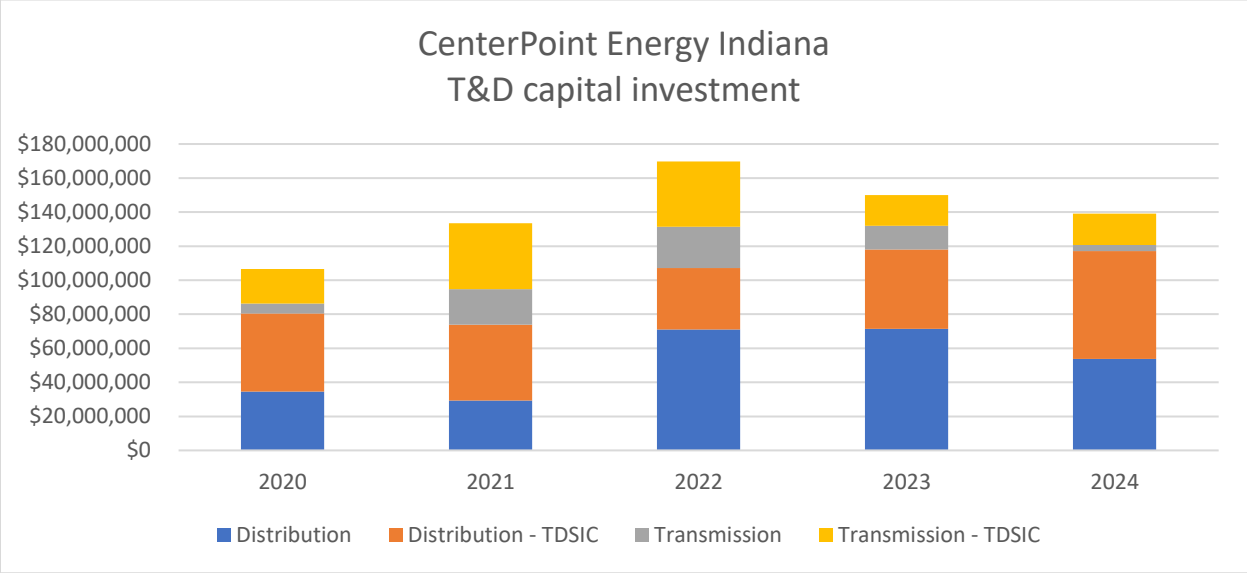
Figure 24: CenterPoint Energy Indiana Administrative and General (A&G) expense per MWh sold



Operations metrics *(Continued)*

Capital investments – T&D

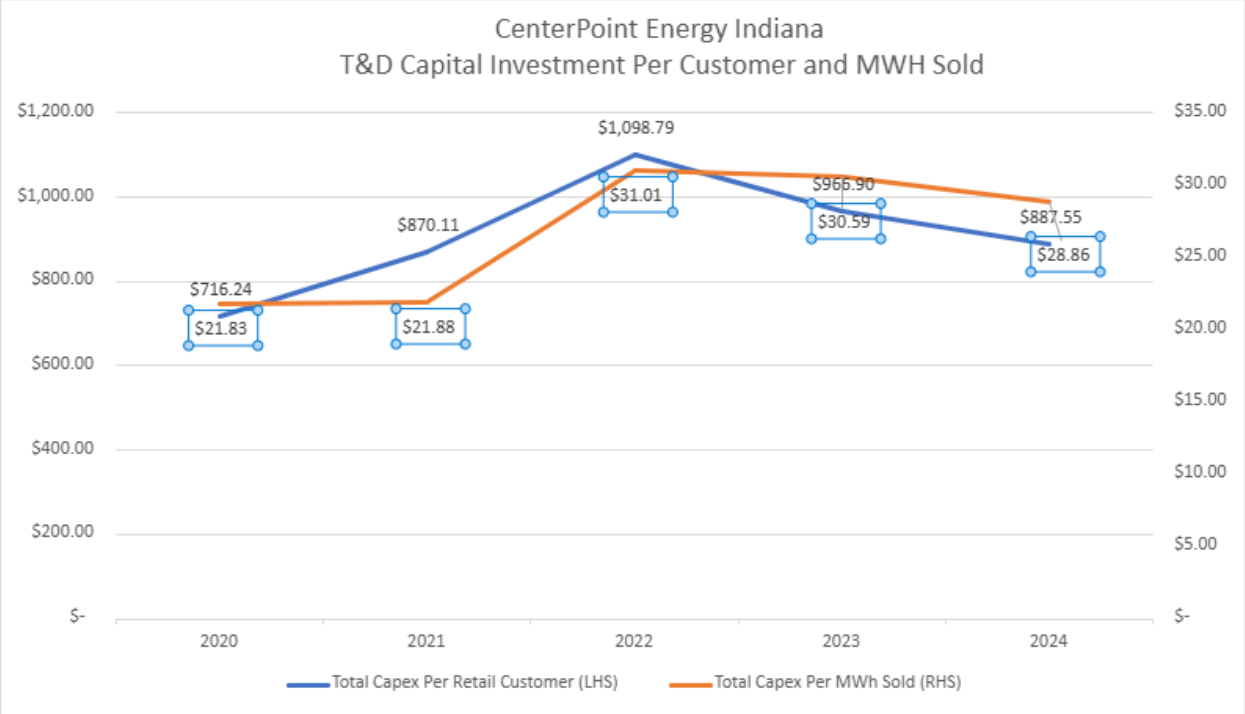
Figure 25: CenterPoint Energy Indiana T&D capital investment



CenterPoint's TDSIC investment first began in 2017. Non-TDSIC capital spending varies year-to-year based on the level of new business, public improvement, storm restoration and other activities.

Operations metrics *(Continued)*

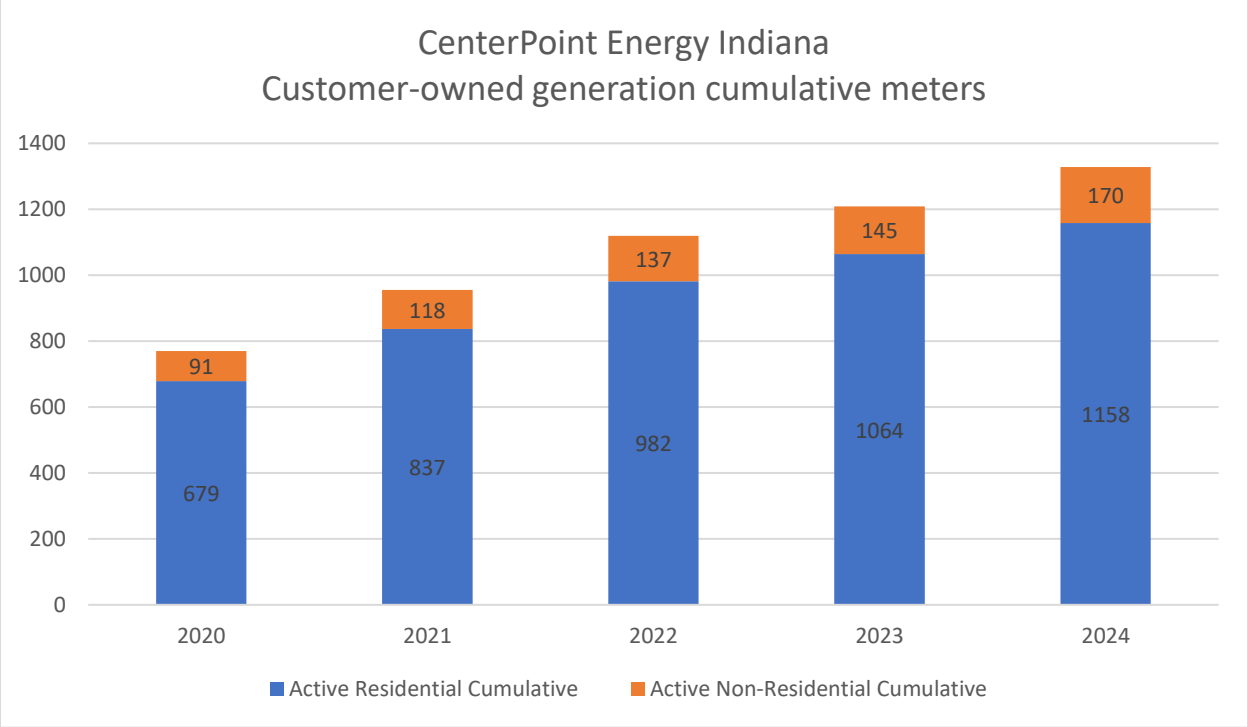
Figure 26: CenterPoint Energy Indiana T&D Capital Investment by retail customer and MWhs sold



CenterPoint's TDSIC investment first began in 2017, driving additional investment in aging T&D infrastructure. Investments in aging infrastructure are improving our reliability performance, as illustrated in the ***Reliability*** section of ***Figure 6: SAIDI Minutes from Equipment Failure***.

Customer-owned generation

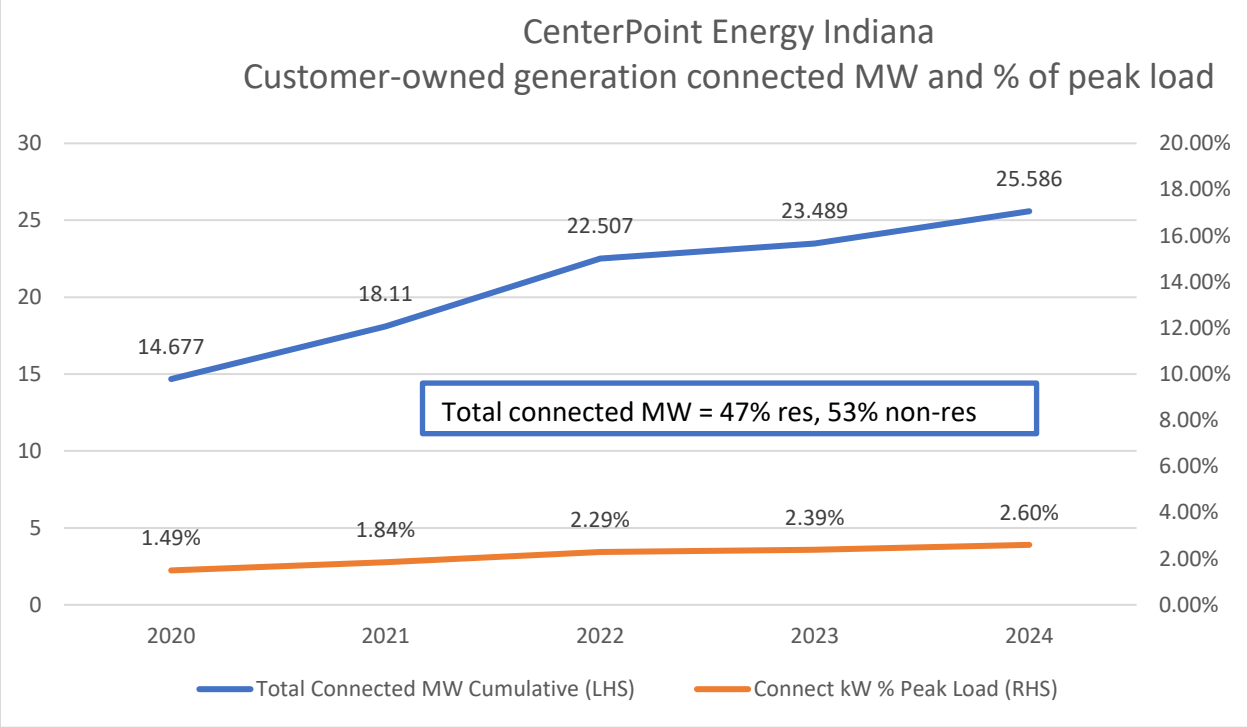
Figure 27: Customer-owned generation cumulative meters by customer class



- Majority of customer-owned distributed generation consists of residential roof-top solar
- To date, CenterPoint has not received a customer request to interconnect a battery energy storage system (BESS) at distribution voltage.
- Since 2024, CenterPoint has identified 16 locations with PV/BESS interconnections at service voltage with an average battery size of 14.4 kW.
- There is only one customer that takes service under CenterPoint's Cogeneration and Small Power Production (CSP) rate.
- Less than one percent of customer base has interconnected their own generator based on meter count.

Customer-owned generation *(Continued)*

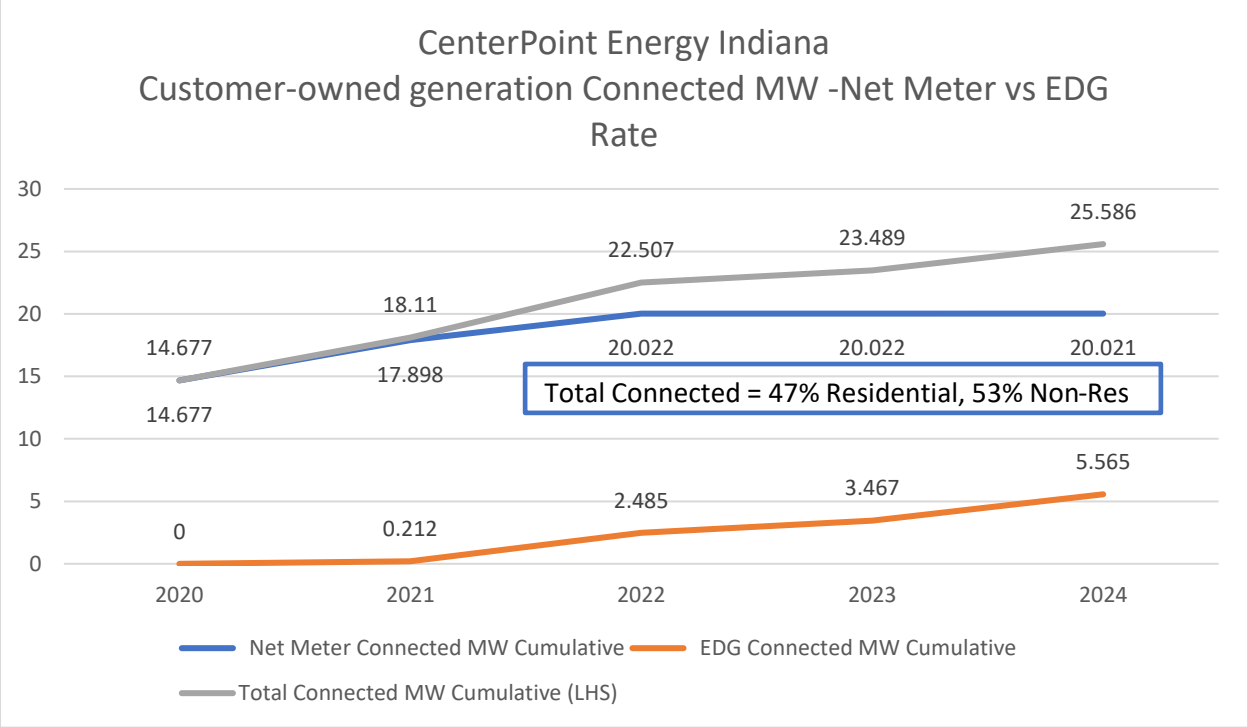
Figure 28A: Customer-owned generation connected MW and % of peak load



- At the end of 2024, customer-owned generation connected to the system was approaching 2.6% of the annual peak load.
- At current penetration levels, CenterPoint's hosting capacity for residential roof top solar on individual distribution circuits does not present planning and operational challenges.
- At the end of 2024, connected customer owned generation was 47% residential and 53% non-residential.

Customer-owned generation *(Continued)*

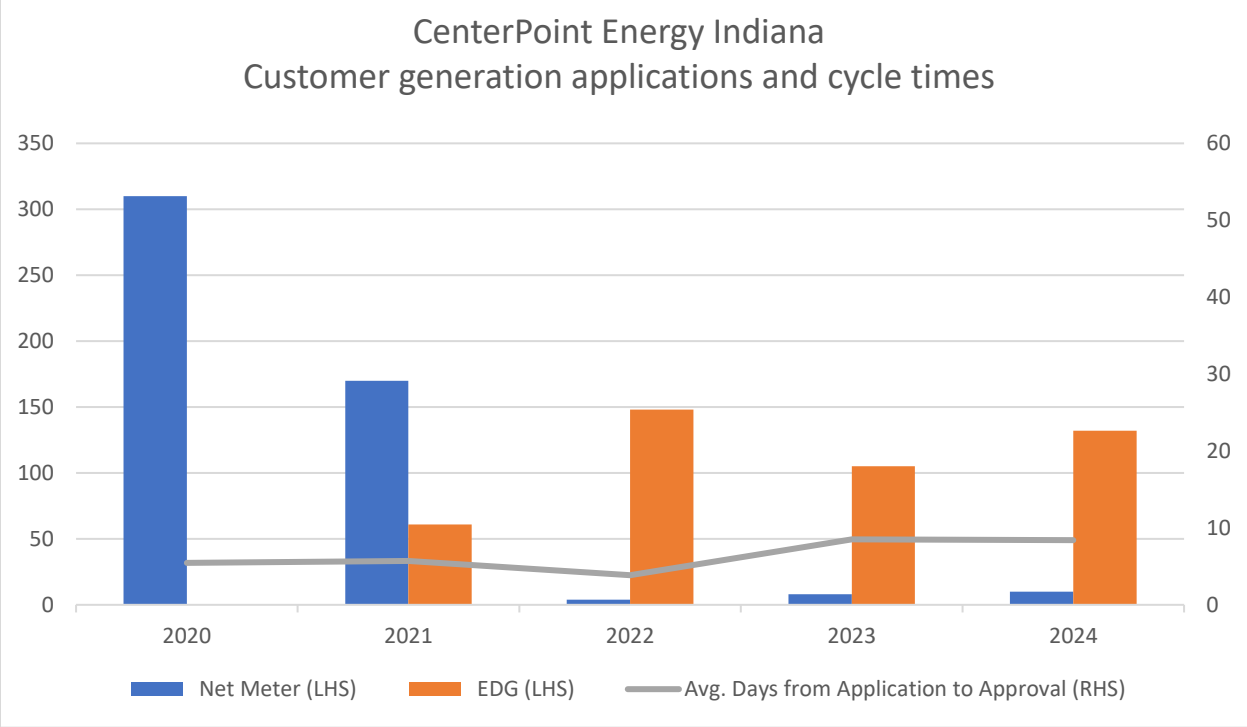
Figure 28B: Customer-owned generation connected MW – Net meter vs EDG rate



- Rate Excess Distributed Generation (EDG) was implemented in 2021 based on the Net Meter cap being met.

Customer-owned generation *(Continued)*

Figure 29: Customer-owned generation applications and cycle times



- Rate Excess Distributed Generation (EDG) was implemented in 2021 based on the Net Meter cap being met.
- Processing time for interconnection requests has averaged seven days since 2017.
- Net meter applications post EDG are transfers of existing grandfathered net meter customers.

Affordability

CEIS residential bills have remained relatively flat over the last 10 years, growing at 1.9% per year on average. As shown in the table below, the Compound Annual Growth Rate (CAGR) for the US Consumer Price Index, a common measure of inflation, has grown by 3.3% per year. In December 2017, the Tax Cuts and Jobs Act was passed, and benefits began flowing back to customers in late 2018, resulting in a significant decrease in customer bills beginning in 2019. The introduction of trackers began in late 2017, which helped to offset the need for a rate case. Recovery of TDSIC costs began near the end of 2017. Recovery of CECA and ECA began in mid-2019 to collect costs associated with renewable energy projects and Federal compliance projects, respectively. The decrease in 2023 is due to the repeal of the Indiana Utility Receipts Tax (IURT) and securitization. These impacts had similar effects on each rate class, as shown in the graphs below. The increase associated with January 1, 2024, is due to a temporary capacity purchase necessary to maintain MISO's planning reserve margin requirement following the closure of A.B. Brown units 1&2 and higher than normal fuel cost; both riders reversed from a credit to a charge over this period. A slight decrease in the 2025 rate was due to a decrease in fuel rate costs during the 2024 year.

Year	Total bill	% Change	CPI-U[1]	CPI-U[1]
2016	$ 155.77	N/A	236.92	N/A
2017	$ 157.04	0.82%	242.84	2.50%
2018	$ 158.75	1.09%	247.87	2.10%
2019	$ 148.01	-6.77%	251.71	1.60%
2020	$ 155.77	5.24%	257.97	2.50%
2021	$ 162.53	4.34%	261.58	1.40%
2022	$ 170.63	4.98%	281.15	7.50%
2023	$ 164.09	-3.83%	299.17	6.40%
2024	$ 187.73	14.41%	308.42	3.10%
2025	$ 184.32	-1.82%	317.67	3.00%
10 Year CAGR	**1.9%**		**3.3%**	

[1] BLS Consumer Price Index (not seasonally adjusted - January).

Affordability (Continued)

Figure 30: Winter residential

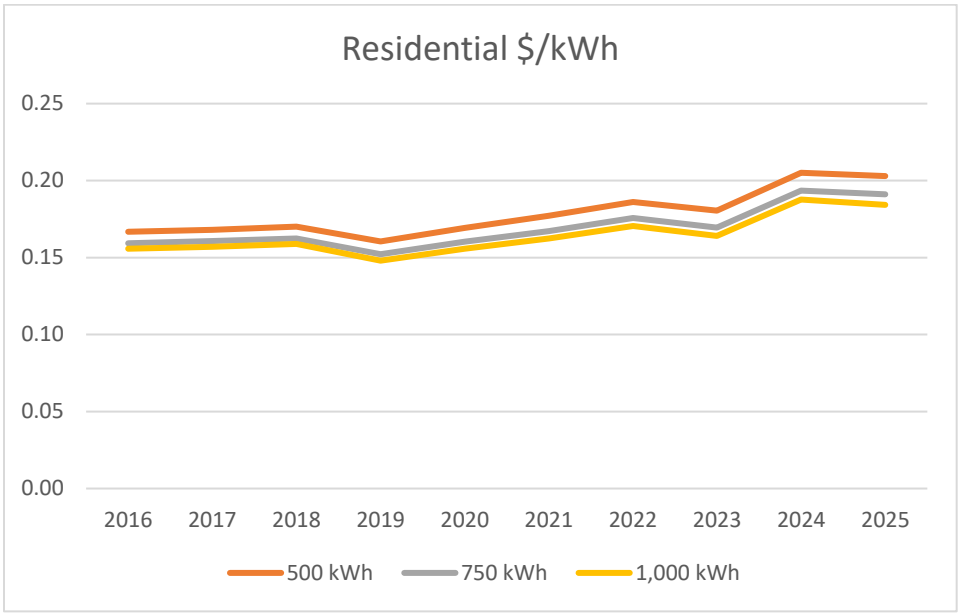
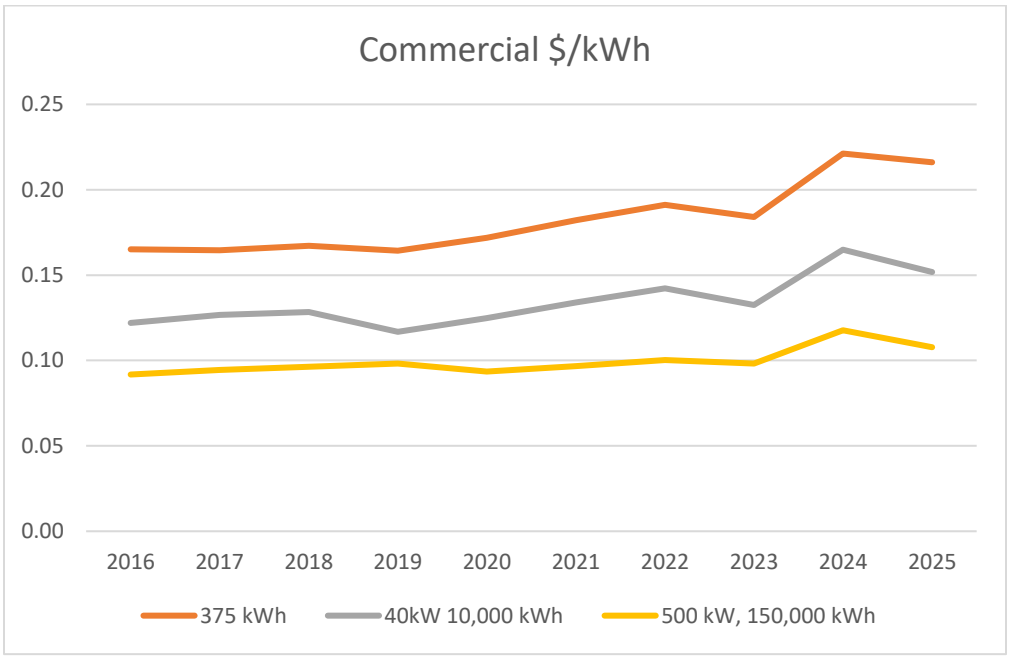
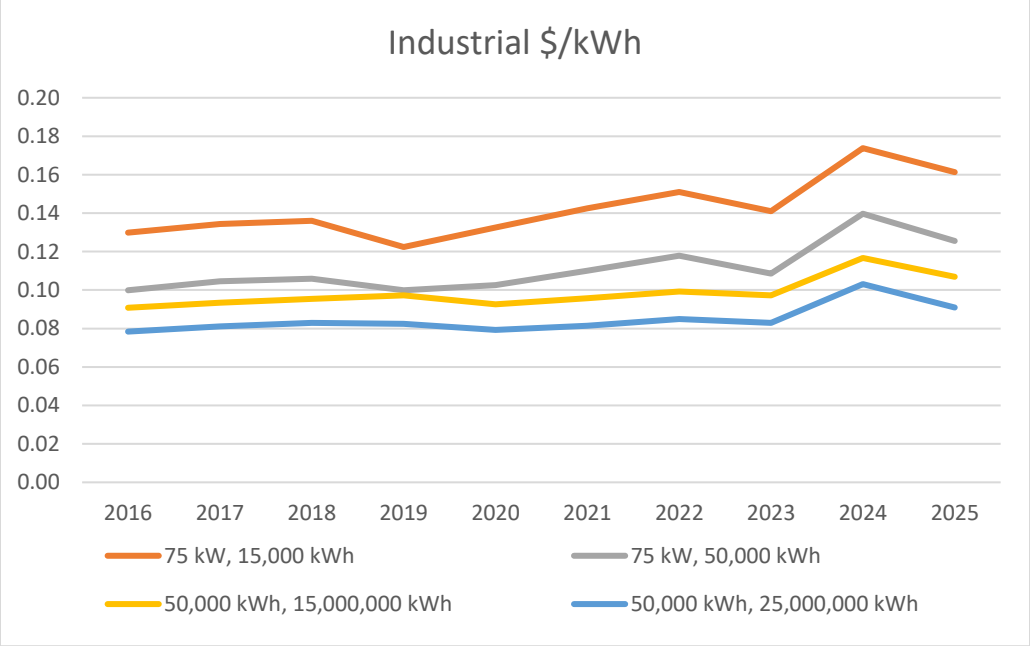


Figure 31: Winter commercial



Affordability (Continued)

Figure 32: Winter industrial



Affordability (Continued)

Figure 33: CEIS residential and non-residential disconnections

CenterPoint Energy Indiana South (Residential)										
		a		b	c	d	e	f	g	h
Year	Month	Number of Gas Accounts	Number of Electric Accounts	# Accounts with 60+ Day Arrears	Total Balance with 60+ Days Arrears	Number of Accounts on Active Payment Arrangements	Total Balance of Active Payment Arrangements	Number of Disconnections	Number of Reconnections	Number of Disconnect Notices
2023	1	104,541	132,404	5,080	$2,252,769	1,251	$ 841,923	360	194	20,071
2023	2	104,558	132,381	4,492	$2,095,536	1,260	$ 922,320	865	401	22,141
2023	3	104,461	132,404	4,590	$2,285,332	1,433	$ 1,093,379	655	340	21,799
2023	4	104,316	132,444	4,951	$2,480,956	1,092	$ 825,552	658	272	18,716
2023	5	103,974	132,396	5,123	$2,552,839	1,406	$ 920,930	912	300	20,610
2023	6	103,676	132,384	4,943	$2,348,159	1,129	$ 728,205	931	411	17,167
2023	7	103,456	132,413	4,966	$2,209,872	1,098	$ 647,820	342	299	17,557
2023	8	103,340	132,427	4,692	$1,890,059	1,436	$ 886,012	318	415	18,936
2023	9	103,344	132,470	4,644	$1,727,540	1,362	$ 885,300	700	540	18,997
2023	10	103,471	132,409	4,606	$1,816,241	1,383	$ 853,311	719	703	19,649
2023	11	104,074	132,682	4,973	$1,918,208	986	$ 574,838	172	354	19,377
2023	12	104,585	133,060	5,449	$2,069,450	1,001	$ 552,552	1	81	20,916
2024	1	104,829	136,568	4,913	$1,801,701	1,013	$ 626,034	310	309	19,288
2024	2	104,858	133,046	4,282	$1,623,515	1,205	$ 844,705	786	910	21,190
2024	3	104,743	133,020	4,271	$1,705,414	1,530	$ 1,176,570	775	717	23,193
2024	4	104,639	133,062	5,235	$2,413,736	1,260	$ 910,980	706	599	19,893
2024	5	104,463	133,000	5,499	$2,412,858	1,155	$ 787,710	629	736	19,286
2024	6	104,397	133,275	5,788	$2,437,519	1,098	$ 747,738	0	64	20,257
2024	7		132,521	419	$ 48,942	1,551	$ 619,051	0	0	0
2024	8		132,774	2,314	$ 463,883	1,341	$ 479,066	0	0	2,018
2024	9		132,900	5,320	$ 883,020	1,240	$ 415,352	376	258	9,844
2024	10		133,289	5,973	$1,341,228	1,120	$ 304,297	799	666	7,639
2024	11		133,527	9,683	$1,750,213	1,148	$ 286,234	968	757	8,472
2024	12		133,866	11,618	$2,183,545	1,097	$ 218,730	651	654	7,733

CenterPoint Energy Indiana South (Non-Residential)										
		a		b	c	d	e	f	g	h
Year	Month	Number of Gas Accounts	Number of Electric Accounts	# Accounts with 60+ Day Arrears	Total Balance with 60+ Days Arrears	Number of Accounts on Active Payment Arrangements	Total Balance of Active Payment Arrangements	Number of Disconnections	Number of Reconnections	Number of Disconnect Notices
2023	1	10,652	19,247	341	$ 373,092			15	9	1,946
2023	2	10,643	19,222	319	$ 451,135			25	10	2,219
2023	3	10,626	19,207	297	$ 494,027			18	6	1,801
2023	4	10,615	19,244	363	$ 452,703			35	10	1,227
2023	5	10,577	19,242	317	$ 536,101			86	28	1,432
2023	6	10,558	19,260	292	$ 666,426			35	9	1,132
2023	7	10,547	19,264	325	$ 838,741			29	11	1,456
2023	8	10,535	19,242	249	$ 990,814			46	15	1,351
2023	9	10,534	19,267	290	$ 208,838			45	15	1,415
2023	10	10,544	19,271	245	$ 377,051			50	30	1,417
2023	11	10,559	19,284	275	$ 537,039			13	21	1,448
2023	12	10,597	19,300	275	$ 687,110			15	7	1,516
2024	1	10,621	19,291	280	$ 442,365			30	10	1,235
2024	2	10,632	19,288	234	$ 579,619			53	29	1,617
2024	3	10,620	19,284	281	$ 721,672			28	40	1,912
2024	4	10,606	19,281	285	$ 509,711			41	70	1,563
2024	5	10,575	19,295	254	$ 121,921			22	27	1,246
2024	6	10,559	19,324	291	$ 117,536			0	1	1,434
2024	7		19,245	177	$ (20,416)			0	0	0
2024	8		19,417	479	$ (314)			0	0	218
2024	9		19,393	692	$ 45,302			35	17	858
2024	10		19,483	361	$ 40,959			42	18	543
2024	11		19,514	569	$ 72,390			36	24	862
2024	12		19,546	611	$ 84,842			22	18	684

Affordability (Continued)

In July 2024, CEI South transitioned to a new customer interface system. As part of this conversion a one-time reset of the past-due collections process was performed for all customers. The new system provides delineation between the gas and electric services. As a result, the shown dataset combines gas and electric service until June 2024 and shows electric only July 2024 forward.

CEI South is aware of the issues related to the affordability of energy utility service, especially in its CEI South electric territory. CEI South actively engages customers in arrears with information about payment plan options, budget billing, payment assistance programs, energy efficiency and other tools to help residential customers manage their payment obligations. CEI South continues to work with local communities and other local resources to improve outreach and assistance efforts. In Q4 2024, CenterPoint Energy, Inc., in partnership with The Salvation Army, launched an independent Customer Assistance Fund, aiding more than 850 residential customers in energy bill assistance.

Per the Settlement Order of Cause Number 45990, we committed to reporting data on the Low Income Energy Assistance Program (LIHEAP), including the number of residential accounts receiving LIHEAP assistance, the number of LIHEAP accounts past due and the total dollars owed from LIHEAP accounts in arrears. Due to our customer interface conversion in July 2024, we can only report on data from November 2024 to April 2025. As we continue to submit this Report, we will include full years' worth of data.

LIHEAP Arrearages - Indiana North and South Combined

Total LIHEAP Customers	Past Due LIHEAP Customers	Past Due Arrearages
24,547	11,181	$3,115,567

LIHEAP Dollars Received - Indiana South

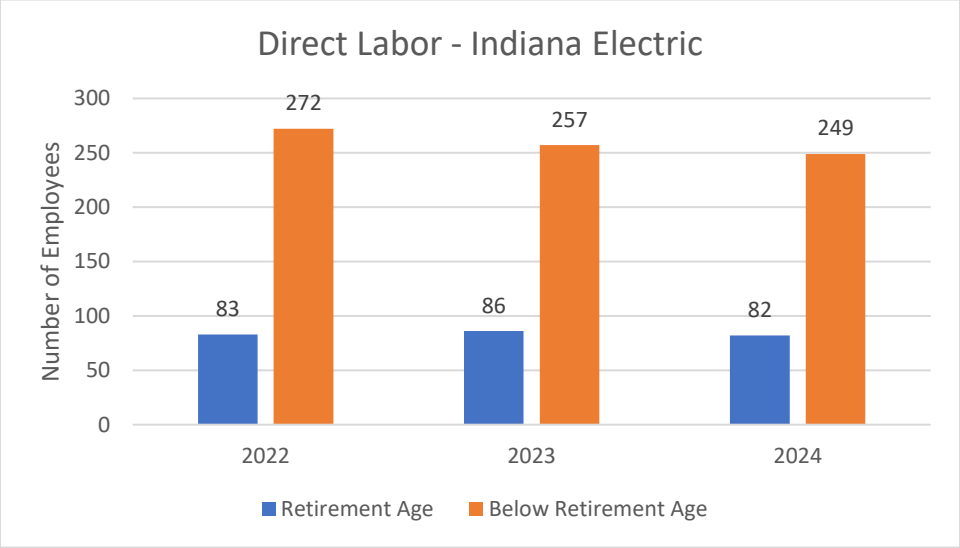
Year/Month	LIHEAP Households	LIHEAP $ Received
2024	**3,244**	**$ 640,359.67**
Nov	156	$ 36,806.94
Dec	3,088	$ 603,552.73
2025	**5,832**	**$ 1,714,422.48**
Jan	2,522	$ 850,548.28
Feb	1,599	$ 412,463.08
Mar	1,138	$ 298,226.17
Apr	552	$ 148,121.13
May	21	$ 5,063.82
Grand Total	**9,076**	**$ 2,354,782.15**

Staffing

Indiana Electric direct labor represents approximately 4% of CenterPoint Energy's total employee population. CenterPoint has approximately 8,840 employees throughout the corporate-wide footprint. Indiana Electric includes employees in the following areas with an average age of 44 years in 2024:

- Transmission System Operations
- MISO Affairs
- Meter Solutions
- Distribution Systems
- Field Operations
- Engineering
- Power Generation Operations
- Generation Development
- Power Supply

Figure 34: Direct labor headcount



Note: Average Retirement Age is 63.67

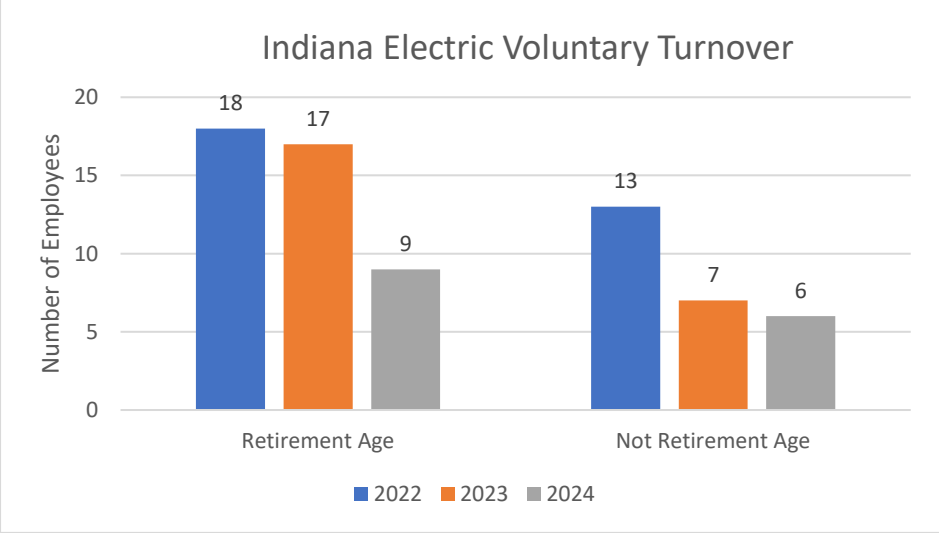
Staffing (Continued)

In addition to the direct labor for Indiana Electric, there are also Shared Services that support Indiana Electric, but they are included in the total company-wide headcount. Some of these Shared Services support include:

- Billing
- Customer Service
- Finance/Accounting
- Facilities
- Human Resources
- Information Technology
- Learning and Organizational Development
- Technical Training

Voluntary turnover for Indiana Electric was less than 5% in 2024 with 60% of these representing retirements.

Figure 35: Separations - Voluntary



Note: Average Retirement Age is 63.67

At CenterPoint Energy, we are committed to supporting our colleagues, customers, contractors, suppliers and community members, regardless of race, gender, color, sexual orientation, age, religion or physical or mental disability, so they have an equal opportunity to thrive.

We believe that recruiting and supporting the best possible workforce is a critical component of our long-term business strategy and a cornerstone of our service, performance and growth. Where possible, we strive to mirror our workforce to the communities in which we serve, and CEIS is always looking for opportunities to improve our candidate pool. Job postings are advertised on websites such as LinkedIn, Indeed and other social media platforms.

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-25-12
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	))))	Order No. 202-25-13

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 23
Wayne Games 2021 Testimony

SOUTHERN INDIANA GAS AND ELECTRIC COMPANY
d/b/a CENTERPOINT ENERGY INDIANA SOUTH
(CENTERPOINT INDIANA SOUTH)

IURC CAUSE NO. 45501

FILED
May 24, 2021
INDIANA UTILITY
REGULATORY COMMISSION

REBUTTAL TESTIMONY
OF
WAYNE D. GAMES
VICE-PRESIDENT POWER GENERATION OPERATIONS

ON

RESPONSE TO THE DIRECT TESTIMONY OF INTERVENING PARTIES ON NEED FOR RESOURCES TO REPLACE EXISTING INEFFICIENT UNITS

SPONSORING PETITIONER'S EXHIBIT NO. 3-R (PUBLIC)
ATTACHMENTS WDG-R1

REBUTTAL TESTIMONY OF WAYNE D. GAMES

I. INTRODUCTION

Q. Please state your name and business address.

A. My name is Wayne D. Games. My business address is 211 NW Riverside Drive, Evansville, Indiana, 47708.

Q. By whom are you employed?

A. I am employed by Vectren Corporation ("Vectren"), a wholly-owned subsidiary of CenterPoint Energy, Inc.

Q. On whose behalf are you submitting testimony?

A. I am submitting testimony on behalf of Southern Indiana Gas and Electric Company d/b/a CenterPoint Energy Indiana South ("CenterPoint Indiana South", "Petitioner", or "Company"), which is an indirect subsidiary of CenterPoint Energy, Inc.

Q. What is your role with respect to Petitioner CenterPoint Indiana South?

A. I am Vice President Power Generation Operations.

Q. Are you the same Wayne D. Games who pre-filed direct testimony in this Cause?

A. Yes.

Q. What is the purpose of your rebuttal testimony in this proceeding?

A. The purpose of my rebuttal testimony is to respond to the direct testimony of witnesses presenting testimony on behalf of the Indiana Office of Utility Consumer Counselor ("OUCC") and Sunrise Coal, LLC ("Sunrise Coal"). I summarize the recommendations made by both the OUCC and Sunrise Coal. I respond to Sunrise Coal Witness Emily Medine's testimony relating to the need to retire A.B. Brown and Warrick Unit #4.

I have not attempted to respond to every argument made by each OUCC or Intervenor witness. The fact that I may not have responded to any particular argument or statement

made by either the OUCC or Intervenor witnesses does not indicate my agreement with that argument or statement.

Q. Are you sponsoring any attachments to your rebuttal testimony in this proceeding?

A. Yes. I sponsor the following attachments:

- Petitioner's Exhibit No. 3-R, **Attachment WDG-R1**: Portions of Alcoa's 2020 Sustainability Plan

Q. Was this attachment prepared by you or under your supervision?

A. No, however, I reviewed it as part of my role as Vice President Power Generation Operations.

II. OVERVIEW OF OUCC AND INTERVENOR TESTIMONY

Q. Does the OUCC contest the reasonableness of adding the Posey County Solar Project and Warrick County Solar Project to CenterPoint Indiana South's generation portfolio.

A. No. Neither OUCC witness contests the need to add energy produced by the proposed Build Transfer Agreement ("BTA") or the Power Purchase Agreement ("PPA"). OUCC Witness Peter Boerger recommends "the Commission approve the projects CenterPoint [Indiana South] proposes in this proceeding." The OUCC makes certain ratemaking recommendations, which are addressed by other witnesses in this proceeding.

Q. What does Sunrise Coal recommend with respect to the Posey County Solar Project and Warrick County Solar Project?

A. Sunrise Coal suggests that the Commission should disapprove the two projects because in Witness Medine's view, it is unclear (1) how approval of the Posey County Solar Project affects other parts of the Preferred Plan and (2) whether a potential extension of the Joint Operating Agreement ("JOA") with Alcoa for Warrick Unit #4 obviates the immediate need for replacement. Sunrise Coal does not dispute the need to retire F.B. Culley Unit 2 ("F.B. Culley 2" or "Culley 2") and in Ms. Medine's Attachment 2 indicates "[t]here is no dispute

Coal states that according to the 2019/2020 Integrated Resource Plan ("IRP"), the need for urgency in approving these projects had been tied to concerns about the expiration of the income tax credit ("ITC") in 2021, which has now been extended.

Q. Is expiration of the ITC a factor in the timing of the need for urgency in approving the Posey County Solar Project and Warrick County Solar Project?

A. It was a factor, but contrary to Ms. Medine's testimony, as indicated in the 2019/2020 IRP, the need for the projects is based on the retirement of Culley 2 and the expiration of the JOA for Warrick Unit #4. The 2019/2020 IRP states:

> Vectren plans to close its smallest, most inefficient coal unit, Culley 2 (90 MWs) and Vectren's contract for joint operations of Warrick unit 4 (150 MWs) expires by the end of 2023. In order to replace this generation, Vectren plans to acquire renewable generation in the next three years in order for Vectren's customers to benefit from expiring renewables tax incentives and, at a minimum, replace this portion of Vectren's coal fleet. This equates to approximately 700-1,000 MWs of capacity from solar generation towards the 2023/2024 and the 2024/2025 MISO planning years, partially dependent on expected solar penetration levels within MISO at that time and MISO resource accreditation.

(Attachment MAR-1; page 284.)[1]

Q. In your opinion, is it unclear how approval of the Posey County Solar Project affects other parts of the Preferred Plan?

A. No. In my direct testimony, I noted that the Posey County Solar Project and the Warrick County Solar Project will replace most of the capacity provided by F.B. Culley 2 and Warrick Unit #4. Specifically, I stated in my direct testimony:

> The 400 MWac of solar generation from these projects will replace the capacity currently supplied by the 150 MWs of CenterPoint [Indiana South]'s share of Warrick Unit #4, co-owned with Alcoa and currently operated and maintained by Alcoa, and a portion of the capacity produced by F.B. Culley 2 – CenterPoint [Indiana South]'s smallest and most inefficient unit. The Preferred Portfolio calls for those units to operate through 2023 only to allow time to obtain replacement capacity, which avoids further investment in the oldest units in CenterPoint [Indiana South]'s generation portfolio.

[1] Southern Indiana Gas & Electric Company, Inc. d/b/a CenterPoint Indiana South formerly conducted business as Vectren.

As I stated in my direct testimony, this filing will be followed by a request to construct two quick start and fast ramping combustion turbines ("CTs") to complement renewable resources and replace dispatchable capacity currently supplied by the A.B. Brown coal units and finally a third filing in 2021 to complete the need for the balance of renewable generation per the 2019/2020 IRP Preferred Portfolio. Nonetheless, much of Ms. Medine's testimony is devoted to discussing the A.B. Brown plant. Among other things, Ms. Medine speculates that an additional 300 MW from the Posey County Solar Project to be connected to the A.B. Brown – Gibson 345 kV transmission line could impact continued operation of the A.B. Brown plant or change the economics of placing replacement CTs at that site. Petitioner's Witnesses F. Shane Bradford and Mathew Rice describe why that concern is unfounded.

Q. Why is it necessary that CenterPoint Indiana South take this first step to enter into a BTA for the Posey County Solar Project and PPA for the Warrick County Solar Project?

A. Absent these projects, CenterPoint Indiana South would need to turn to the market to purchase capacity in the 2024 to 2025 timeframe, which would expose customers to the risk of market prices.

III. UNCONTESTED NEED TO RETIRE F. B. CULLEY 2

Q. Does Sunrise Coal object to the need to retire F.B. Culley 2?

A. No. It did not mention an objection to retiring F.B Culley 2 and, of course, neither did the OUCC witnesses. Sunrise Coal Witness Medine, in fact, does not mention F.B. Culley 2 at all. In the Joint Comments of Sunrise Coal and the Indiana Coal Council ("ICC") that are attached to Ms. Medine's testimony, the ICC and Sunrise Coal stated: "Culley 2 is a small older unit. There is no dispute over whether it should be retired and, therefore, there is no reason to include incremental costs in BAU to 2039 that would allow it to continue to run." (Sunrise Coal; Attachment 2; page 6).

Q. Why do you believe there is no dispute that F.B. Culley 2 should be retired?

A F.B. Culley 2 will be nearly 60 years old in 2023. F.B. Culley 2 is Petitioner's oldest, smallest (90MWs) and least efficient (12,500-13,000 BTU/kWh) coal unit. As a result, the unit only produces energy for customers or the MISO market when energy prices spike to a level that justifies MISO dispatching the unit for a 24-hour period. From 2015 through 2020, the average capacity factor was only 18 percent due to its high cost to produce energy.

Q. Has anything changed regarding the plan to retire F.B. Culley 2 in 2023?

A. Yes. The recent Coal Combustion Residuals ("CCR") Part A Rule has provided CenterPoint Indiana South with a path to continue operating F.B. Culley 2 through 2025 by constructing a CCR compliant pond to dispose of bottom ash. The cost to construct the pond to handle bottom ash from F.B. Culley 2 and maintain the capacity accreditation from F.B. Culley 2 to meet the MISO Planning Reserve Margin Requirement ("PRMR") is estimated at $6 million. This is a lower cost than recent bids the Company received to purchase market capacity to meet the projected shortfall as described in the direct testimony of Witness Bradford.

Q. Does continuing to operate F.B. Culley 2 through 2025 eliminate the need for the Posey County and Warrick County Solar Projects?

A. No. Continued operation of F.B. Culley 2, however, will reduce the amount of market capacity CenterPoint Indiana South has to purchase to meet the MISO PRMR in 2024 and 2025. CenterPoint Indiana South must also take into consideration that the Posey County and/or Warrick County Solar Projects will only receive 50 percent MISO capacity accreditation in the first year of operation and one or both projects could be delayed or the final output reduced due to issues and or challenges discovered during construction.

Q. What would be required to operate F.B. Culley 2 beyond 2025?

A. The proposed new CCR compliant pond, which is required by the U.S. Environmental Protection Agency ("EPA") CCR Part A rule, provides an opportunity to operate F.B. Culley 2 through 2025. I would note that these dollars must be spent even if F.B. Culley 2 were retired in October 2023 as previously planned, due to the CCR Part A Rule requirement to obtain alternative capacity in the fastest technically feasible manner. However, to

operate the unit beyond 2025 would require several million dollars of additional capital investment to comply with the Effluent Limit Guidelines ("ELG") Reconsideration Rule, which requires the bottom ash transport water to be eliminated by the end of 2025 as well as unit upgrades to ensure the unit can operate in a safe and reliable manner. In 2025, the plant will be years past due for a turbine and generator overhaul and will require major boiler work and other capital investments to maintain safe and reliable operation.

Q. In your opinion, is it prudent from a planning perspective to plan on the continued operation of F.B. Culley 2 beyond 2025?

A. No. Beyond the capital investment in a Dry Bottom Ash System, due to the age and current condition of F.B. Culley 2, it doesn't make sense for our customers to continue to invest millions of dollars in this small and inefficient unit. F.B. Culley 2 is the smallest and least efficient unit in the CenterPoint Indiana South fleet, and therefore, both of the two most recent IRPs have identified the plant for retirement. Accordingly, there has been little investment made in the unit over the past several years. The last turbine/generator overhaul was completed in 2011, and the manufacturer recommends an overhaul be completed every seven to eight years. This overhaul alone will cost in the $4 to $6 million range. In addition, the unit will require major boiler work and other capital investments to maintain reliable operation. Once the Warrick County Solar Project and Posey County Solar Project are operational and F.B. Culley 2 is no longer needed to minimize capacity purchases, it can be retired as called for in the two most recent IRPs.

Q. Are there other issues with continued operation of F.B. Culley 2?

A. The year to date equivalent forced outage rate ("EFOR") for F.B. Culley 2 is over 25 percent. If the unit were to have major issues, CenterPoint Indiana South would likely retire it rather than invest further capital. The only reason the Company is planning to delay retirement of F.B. Culley 2 until 2025 is because the U.S. EPA CCR Part A Rule requires CenterPoint Indiana South to construct a CCR compliant pond for Culley bottom ash water even if we were to commit to retire the unit prior to October of 2023 and the ELG Reconsideration Rule provides an opportunity to utilize the new CCR compliant pond for management of the F.B. Culley 2 bottom ash transport water through 2025. Our hope is that CenterPoint Indiana South will be able to continue operating the plant during this

period to mitigate the need to purchase capacity while the Posey County Solar Project and Warrick County Solar Project come on-line and ramp up.

IV. NEED TO EXIT WARRICK UNIT #4 JOA

Q. What does Sunrise Coal recommend with respect to Warrick Unit #4?

A. Sunrise Coal Witness Medine states that continued operation of Warrick Unit #4 is technically still an option subject to negotiation of acceptable terms. Ms. Medine also suggests that the obvious and likely lower cost option for CenterPoint Indiana South customers is to enter into a PPA with Alcoa for the capacity CenterPoint Indiana South currently owns at Warrick Unit #4.

Q. Is continued operation of Warrick Unit #4 "technically still an option"?

A. Technically, remaining in the JOA is still an option. However, from a financial perspective the last two IRPs have both identified that the best option for our customers is to exit the JOA. In addition, from a risk perspective, CenterPoint Indiana South has determined that the risk of further capital and Operations and Maintenance ("O&M") investments in a unit with a partner that has a short-term exit opportunity is not the best decision for our customers. In addition, customers have a strong desire for renewable generation to help meet corporate carbon reduction goals as Ms. Harris discussed in her direct testimony.

Q. Sunrise Coal Witness Medine testifies that "it is hard to believe that Kaiser Aluminum invested $670 million in a rolling mill that it did not intend to operate well into the future, so clearly, the outlook for the Alcoa smelter (to supply aluminum to the rolling mill), and therefore, the Warrick Unit #4 plant (to supply power to both the smelter and rolling mill), seems brighter than reflected in Witness Games testimony." Do you agree that Kaiser Aluminum still will need to purchase electricity to operate the rolling mill?

A. Yes, Kaiser Aluminum will need to purchase electricity. However, those needs may not be met in the manner that Ms. Medine suggests. Furthermore, Kaiser's public filing with the United States Securities and Exchange Commission outlines transition services between

Alcoa and Kaiser, and it alludes to the development of infrastructure necessary for the rolling mill to obtain electricity from a "third party supplier" (aside from Kaiser and Alcoa). This provides a signal that the operation of the rolling mill is not tied to Alcoa Warrick Unit #4 plant.[2]

Q. Ms. Medine notes that Alcoa will enter into a market-based metal supply agreement with Kaiser Aluminum. Does that mean that Alcoa will continue operating Warrick Unit #4 to power the smelter?

A. No. None of us have seen the agreement between Kaiser Aluminum and Alcoa. While I do not doubt that Alcoa has agreed to supply market-based metals to Kaiser Aluminum, it is certainly possible that those metals could be supplied through sources other than the Warrick smelter. I would note that Alcoa has closed the smelter and still operated the rolling mill in the past, and this could be done again. Most recently, Alcoa closed the Warrick smelter in 2016 due to low import alumina prices and continued to operate the rolling mill. The prices later rebounded, and Alcoa restarted a portion of the Warrick smelter operation in 2018.

Q. Ms. Medine cites an Alcoa press release indicating, "Alcoa will enter into a market-based metal supply agreement with Kaiser Aluminum at closing. Alcoa will continue to operate the smelter and the power plant, which together employ approximately 660 people." Does that give you comfort that Alcoa will continue operating the power plant beyond the expiration of the JOA?

A. No. The press release does not state how long Alcoa will continue to operate the power plant. CenterPoint Indiana South has received no indication that Alcoa is interested in continuing to operate the coal plant at Warrick Unit #4 beyond the expiration of the JOA on December 31, 2023. As indicated in my direct testimony, the JOA provides that either party may exit the agreement with [redacted], as opposed to the [redacted]

[2] Form 8-K available at https://investors.kaiseraluminum.com/node/17731/html ("In order to transition the Company's operations from being dependent on the "Support Services" to an independent facility with its own self-sufficient infrastructure, Alcoa will provide "Transition Services," including providing infrastructure and equipment for the production of steam, hot water and compressed air and conveying the filtration plant currently utilized for the supply of potable water. Moreover, the Lease Agreement requires Alcoa to pay for the development of infrastructure necessary for the Rolling Mill to obtain electricity from a third party power supplier, subject to the terms of the Lease Agreement. Alcoa will provide the Support Services through a period to extend no later than June 30, 2024, by which date Alcoa must complete its Transition Services.")

required under the prior agreement. There is a reason the parties negotiated [redacted]. I would note that if Alcoa were to provide notice of its intent to terminate the agreement, CenterPoint Indiana South could not obtain a certificate of public convenience and necessity and construct a plant to replace the energy and capacity within that notice period. Aside from that, Warrick Unit #4 would likely require substantial upgrades to operate beyond to 2023. Warrick Unit #4 has averaged an annual EFOR of over 16 percent in the past five-year period. In my experience, an EFOR Rate this high suggests that the unit requires substantial capital investment.

Q. Are there other reasons that you believe Alcoa may not have an interest in operating coal generation beyond December 31, 2023?

A. Yes. Alcoa, like many companies, has adopted environmental sustainability initiatives. Alcoa's 2020 Sustainability Report shows that approximate 78 percent of the energy used by its smelters comes from renewable resources. Alcoa has established a corporate goal to reduce greenhouse gas emission intensity by 30 percent by 2025 and 50 percent by 2030 from a 2015 baseline. Information regarding Alcoa's sustainability initiatives taken from the 2020 Sustainability Report is included as Petitioner's Exhibit No. 3-R, **Attachment WDG-R1**.[3]

Q. Do you know for certain that Alcoa will not operate its Warrick Unit #4 coal generation beyond the term of the JOA?

A. No. Until Alcoa announces its intentions, there is no way to know for certain what it will do upon the expiration of the JOA. As I said in my direct testimony, the long-term outlook for Warrick Unit #4 is uncertain.

Q. Even if Alcoa were to continue to operate Warrick Unit #4, would it be in customers' interest for CenterPoint Indiana South to enter into a new JOA for the unit.

A. No. As indicated in my direct testimony, Warrick Unit #4 has been the worst performing unit in Petitioner's fleet over the 2016-2019 period based on EFOR performance. Moreover, based on annual O&M cost per MWh of capacity, Warrick Unit #4 is the most

[3] The full report is available on-line athttps://www.alcoa.com/sustainability/en.

expensive unit to operate among the CenterPoint Indiana South coal units. Moreover, if CenterPoint Indiana South were to continue its investment in the Warrick Unit #4 beyond the expiration of the JOA, Petitioner would [redacted].

Q. On page 19 of her testimony, Ms. Medine speculates that continued operation of Warrick Unit #4 may be beneficial to ratepayers. Do you agree?

A. No. The previous two IRPs have identified that exiting the JOA with Aloca for Warrick Unit #4 is beneficial for CenterPoint Indiana South customers.

Q. Respond to Sunrise Coal's contention that the obvious and lower cost option for CenterPoint Indiana South customers is to enter into a PPA with Alcoa for the capacity CenterPoint Indiana South currently owns at Warrick Unit #4.

A. That doesn't seem to be an option [redacted].

Q. In your opinion, is it prudent from a planning perspective to plan on the continued operation of Warrick Unit #4?

A. No. Any plans that relied on CenterPoint Indiana South obtaining capacity and/or energy from Warrick Unit #4 beyond December 31, 2023, would expose ratepayers to significant risk.

V. A.B. BROWN AND OTHER ISSUES

Q. How do you respond to Ms. Medine's testimony that the testimony in this proceeding does not address the A.B. Brown plant?

A. As I mentioned above, the Posey County Solar Project and Warrick County Solar Project

do not impact the A.B. Brown plant. Mr. Bradford and Mr. Rice testify that interconnection of the Posey County Solar Project will not impact the use of the transmission at the A.B. Brown plant at all. Mr. Rice testifies that CenterPoint Indiana South studied that very issue contrary to Ms. Medine's testimony. Mr. Bradford notes that MISO requires a Generator Interconnection Request for every new generator and requires upgrades necessary to ensure that the MISO system can operate in a reliable manner with all resource producing at maximum output.

Q. How do you respond to Ms. Medine's testimony that "the economic analysis [included in the Company's 2019/2020 IRP] was biased against continued operation of A.B. Brown because CenterPoint Indiana South chose not to consider a firm 12-year offer—which it had received well prior to the issuance of the IRP—from the CSX railroad that would have materially reduced the delivered cost of coal and thus lowered both total and dispatch cost"?

A. Again, the proposal in this case does not impact the decision to retire the A.B. Brown plant. The primary drivers to retire the A.B. Brown plant is based on the capital investments and ongoing O&M to make upgrades to continue to operate the facility in a safe and reliable manner while complying with all environmental regulations. In addition, there are risk associated with investing in a facility that will likely be impacted by more strict air and water regulation in the future. Moreover, as Mr. Rice indicates this lower price contract proposal was taken into account when modeling the coal delivery price to Brown in three of the five scenarios including the High Technology scenario portfolio, which became the Preferred Portfolio. That said, the "offer" Ms. Medine is referencing is not as firm as she suggests. The "offer" that CenterPoint Indiana South received was still subject to negotiation and in fact indicated: "[t]his proposal requires Operations and Commercial senior management approval, both within CSXT and the [Evansville Western Railway] EVWR."

Q. How were lower transportation costs reflected in coal-based alternatives?

A. In three of the five scenarios including the High Technology scenario portfolio, the coal delivery price for A.B. Brown was reduced by nearly 25 percent in 2025 through 2030, as compared to the 2019 Base Case delivery price. I believe that this appropriately considers the impact of the CSX railroad offer, assuming it would have been approved by senior

management of CSX and the Evansville Western Railway and materialized.

VI. CONCLUSION

Q. What do you recommend to the Commission?

A. The Posey County and Warrick County Solar Projects are consistent with the Preferred Portfolio in Petitioner's 2019/2020 IRP and are necessary to meet our customers' needs beyond 2023. Accordingly, I recommend that the Commission approve CenterPoint Indiana South's proposed Solar Projects and requested ratemaking and accounting relief.

Q. Does this conclude your rebuttal testimony?

A. Yes, at the present time.

VERIFICATION

I, Wayne D. Games, Vice President Power Generation Operations for Southern Indiana Gas and Electric Company d/b/a CenterPoint Energy Indiana South, under the penalty of perjury, affirm that the answers in the foregoing Rebuttal Testimony are true to the best of my knowledge, information and belief.

Wayne D. Games

Vice President, Power Generation Operations

Alcoa Sustainability Performance 2020

1
contractor fatality

1.6%
decrease in carbon dioxide equivalent emissions

2020

1.1%
decrease in energy intensity

0.61
days away, restricted and transfer rate per 100 full-time workers

Approximately
78%
of electricity consumed by our smelters was from renewable sources

0.92:1
ratio for new active mining disturbance to mine rehabilitation for the 2016 to 2020 period

1.7%
reduction in bauxite residue land requirements per metric ton of alumina produced

95
score on the Corporate Equality Index 2020

2020

6.8%
decrease in freshwater use intensity

4.2%
decrease in landfilled waste

15.6%
of our global employees were women

2,020
employee volunteer hours in the community

US$8.2
billion in purchased goods and services

US$5.6
million in Alcoa Foundation community investments

2020

Strategic Long-term Goals



Our sustainability approach is driven by—and measured against—our strategic long-term goals, which further integrate sustainable practices into our business to minimize environmental impacts and maximize value for our stakeholders.

We review and update these goals on a periodic basis to ensure we are focused on items relevant to our company's strategic priorities and current operations. We also seek input from stakeholders.

In 2020, we began implementing new goals for water conservation, waste management and social management. We also expanded our existing GHG goal to encompass our alumina refining segment in addition to our aluminum smelting operations.

Strategic Long-term Goals

Goal	Progress
Align our GHG (direct + indirect) emissions reduction targets with the below 2° C decarbonization path by reducing GHG emission intensity by 30 percent by 2025 and 50 percent by 2030 from a 2015 baseline. More 	**14.6 percent** reduction from 2015
From a 2015 baseline, reduce the intensity of our total water use from water-scarce locations by 5 percent by 2025 and 10 percent by 2030. More 	**3.0 percent** reduction from 2015

Goal	Progress
From a 2015 baseline, reduce landfilled waste by 15 percent by 2025 and 25 percent by 2030. More 	**14.4 percent** reduction from 2015
From a 2015 baseline, reduce bauxite residue land requirements per metric ton of alumina produced by 15 percent by 2030. More 	**12.8 percent** reduction from 2015
Maintain a corporate-wide running five-year average ratio of 1:1 or better for active mining disturbance (excluding long-term infrastructure) to mine rehabilitation. More 	**0.92:1 ratio** for the 2016 to 2020 period
Zero fatalities and serious injuries (life-threatening or life-altering injuries and illnesses). More 	**One fatality** and **zero serious injuries** in 2020
Attain an inclusive everyone culture that reflects the diversity of the communities in which we operate. More 	• Formed the Alcoa Global Inclusion & Diversity Council to support the execution of our inclusion and diversity strategy. • Deployed the Catalyst for Change program globally to our leaders to support our inclusion and diversity priorities. • Held our first Global Pride Week with events and actions in all regions that celebrated LGBT+ equality. • Launched the Alcoans Working Actively for Racial-Ethnic Equality (AWARE) inclusion group. • Conducted our second gender pay equity analysis.

Goal	Progress
By 2022, implement a social management system at all locations, including the definition of performance metrics and long-term goals to be accomplished by 2025 and 2030 More 	• Engaged external consultants with expertise in social management systems and Indigenous Peoples to help us benchmark the industry. • Conducted a gap analysis of our existing practices to the best-in-class social management systems and have defined a program to close identified gaps by the end of 2022. • Performed human rights due diligence at two additional sites in Brazil—Juruti and Poços de Caldas—and human rights risks assessments in Iceland, Norway and Spain.

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-25-12
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	))))	Order No. 202-25-13

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 24
Schahfer 2020 NPDES Permit

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
We Protect Hoosiers and Our Environment.
100 N. Senate Avenue • Indianapolis, IN 46204
(800) 451-6027 • (317) 232-8603 • www.idem.IN.gov

Eric J. Holcomb
Governor

Bruno Pigott
Commissioner

September 24, 2020

VIA ELECTRONIC MAIL

Mr. Bertil C. Valenkamph
Director Station Chemistry & Environmental Compliance
Northern Indiana Public Service Company LLC
2755 Raystone Drive
Valparaiso, IN 46383

Dear Mr. Valenkamph

Re: NPDES Permit No. IN0053201
Northern Indiana Public Service Company LLC - R. M. Schahfer Generating Station
Wheatfield, IN – Jasper County

Your application for a National Pollutant Discharge Elimination System (NPDES) permit for authorization to discharge into the waters of the State of Indiana has been processed in accordance with Section 402 and 405 of the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251, et seq.), and IC 13-15, IDEM's permitting authority. All discharges from this facility shall be consistent with the terms and conditions of this permit.

One condition of your permit requires periodic reporting of several effluent parameters. You are required to submit both federal discharge monitoring reports (DMRs) and state Monthly Monitoring Reports (MMRs) on a routine basis. The MMR form can be found on IDEM's web site at http://www.in.gov/idem/cleanwater/2396.htm. Once you are on this page, select the "IDEM Forms" page and locate the "Monthly Monitoring Report (MMR) for Industrial Discharge Permits-30530" under the Wastewater Facilities heading. We recommend selecting the "XLS" version because it will complete all of the calculations when you enter the data.

IDEM no longer accepts paper DMR or MMR. All NPDES permit holders are required to submit their monitoring data to IDEM using NetDMR. Please contact Rose McDaniel at (317) 233-2653 or Helen Demmings at (317) 232-8815 for more information on NetDMR. Information is also available on our website at http://IN.gov/idem/cleanwater/2422.htm.

Another condition, which needs to be clearly understood, concerns violation of the effluent limitations in the permit. Exceeding the limitations constitutes a violation of the permit and may subject the permittee to criminal or civil penalties. (See Part II A.2.) It is therefore urged that your office and treatment operator understand this part of the permit.

The draft NPDES permit for NIPSCO R.M. Schahfer Generating Station was made available for public comment from August 5, 2020 through September 4, 2020 as part of Public Notice No. 20200805–IN0053201–D on IDEM's website at https://www.in.gov/idem/6408.htm. A response to the comments contained in the letter September 4, 2020, from Jeffrey Loewe of NIPSCO, pertaining to the draft NPDES permit is contained in the Post Public Notice Addendum. The Post Public Notice Addendum is located at the end of the Fact Sheet.

It should also be noted that any appeal must be filed under procedures outlined in IC 13-15-6, IC 4-21.5, and the enclosed Public Notice. The appeal must be initiated by filing a petition for administrative review with the Office of Environmental Adjudication (OEA) within fifteen (15) days of the emailing of an electronic copy of this letter or within eighteen (18) days of the mailing of this letter by filing at the following addresses:

Director
Office of Environmental Adjudication
Indiana Government Center North
Room N103
100 North Senate Avenue
Indianapolis, Indiana 46204

Commissioner
Indiana Department of Environmental Management
Indiana Government Center North
Room 1301
100 North Senate Avenue
Indianapolis, Indiana 46204

If you have any questions concerning the permit, please contact Trisha Williams at 317/234-8210 or twilliam@idem.in.gov. More information on the appeal review process is available at the website for the Office of Environmental Adjudication at http://www.in.gov/oea.

Sincerely,



Jerry Dittmer, Chief
Permits Branch
Office of Water Quality

Enclosures
cc: Jasper County Health Department
Nicholas Babbitt, NiSource
Jeff Loewe, NiSource
Craig Myers, NiSource
Mark Hein, Certified Operator, NiSource
Chief, Permits Section, U.S. EPA, Region 5
Aaron Deeter, IDEM inspector

STATE OF INDIANA

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

AUTHORIZATION TO DISCHARGE UNDER THE

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act, as amended, (33 U.S.C. 1251 et seq., the "Act"), and IDEM's authority under IC 13-15,

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC
R.M. SCHAHFER GENERATING STATION

is authorized to discharge from a coal-fired and natural gas-fired electric generating facility that is located 2723 East 1500 North, Wheatfield, Indiana to receiving waters identified as Davis Ditch, Stalbaum Ditch, and the Kankakee River in accordance with effluent limitations, monitoring requirements, and other conditions set forth in Parts I II, III, and IV hereof. This permit may be revoked for the nonpayment of applicable fees in accordance with IC 13-18-20.

Effective Date: October 1, 2020

Expiration Date: September 30, 2025

In order to receive authorization to discharge beyond the date of expiration, the permittee shall submit such information and forms as are required by the Indiana Department of Environmental Management no later than 180 days prior to the date of expiration.

Issued on _September 24, 2020_ for the Indiana Department of Environmental Management.



_____
Jerry Dittmer, Chief
Permits Branch
Office of Water Quality

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. The permittee is authorized to discharge from the outfall listed below in accordance with the terms and conditions of this permit. The permittee is authorized to discharge from Outfalls 001 and 002, located at Latitude 41° 15' 2.34", Longitude -87° 1' 40.55" and Latitude 41° 13' 35.87", Longitude -87° 1' 18.43", respectively. The discharge from the Final Basin (Outfall 001) and the Final Basin Overflow (Outfall 002) is limited to FGD WWTP discharge, low volume waste, bottom ash transport water, cooling tower blowdown, coal pile runoff, treated sanitary wastewater, construction dewater water [10], and stormwater. Samples taken in compliance with the monitoring requirements below shall be taken at a point representative of the discharge but prior to entry into the Kankakee River. Such discharge shall be limited and monitored by the permittee as specified below:

DISCHARGE LIMITATIONS [1][2][3][4][20]
Outfall 001 [17] & 002

Table 1

	Quantity or Loading			Quality or Concentration			Monitoring Requirements	
Parameter	Monthly Average	Daily Maximum	Units	Monthly Average	Daily Maximum	Units	Measurement Frequency	Sample Type
Intake Flow	Report	39	MGD	----	----	----	1 X Daily	Continuous
Flow [5]	Report	Report	MGD	----	----	----	1 X Daily	Continuous
Cycles of Conc. (COC)	Report	Report	number	----	----	----	1 X Daily	Report
Temperature [16][21]	---	----	----	Report	Report	°F	1 X Weekly	Grab
TSS [19]	----	----	----	15	30	mg/l	1 X Weekly	24-Hr. Comp.
O&G [19]	----	----	----	5	15	mg/l	1 X Weekly	Grab
Chromium [6]	----	----	----	0.2	0.2	mg/l	1 X Monthly [9]	Grab
Zinc [6]	----	----	----	0.301	0.604	mg/l	1 X Monthly [9]	Grab
Mercury [6,7,8]	----	----	----	12.0	20.0	ng/l	6 X Yearly	Grab
Sulfate	----	----	----	748	1,501	mg/l	1 X Weekly	Grab
TRC [11,12]								
Continuous [13]	----	----	----	0.02	0.04	mg/l	1 X Daily	Grab
Intermittent [14]	----	----	----	----	0.2	mg/l	1 X Daily	Grab
Chlorination [14,15]								
Frequency	----	----	----	----	4	Times/Day	1 X Daily	Report
Duration	----	----	----	----	40	Minutes/Dose	1 X Daily	Report
Ammonia (as N)	----	----	----	Report	Report	mg/l	2 X Monthly	Grab
Arsenic [6][11]	----	----	----	Report	Report	ug/l	1 X Weekly	Grab
Boron [6]	----	----	----	Report	Report	ug/l	1 X Weekly	Grab
Chloride	----	----	----	Report	Report	mg/l	2 X Monthly	Grab
Manganese [6]	----	----	----	Report	Report	mg/l	1 X Weekly	Grab
Selenium [6][11]	----	----	----	Report	Report	ug/l	1 X Weekly	Grab
Nitrate/Nitrite	----	----	----	Report	Report	mg/l	1 X Weekly	Grab

Table 2

Parameter	Quality or Concentration Daily Minimum	Daily Maximum	Units	Monitoring Requirements Measurement Frequency	Sample Type
pH [18]	6.0	9.0	s.u.	1 X Weekly	Grab

[1] See Part I.B. of the permit for the Narrative Water Quality Standards.

[2] The Storm Water Monitoring and Non Numeric Effluent Limits and the Storm Water Pollution Prevention Plan (SWPPP) requirements can be found in Part I.D. and I.E. of this permit.

[3] See Permit Part III (Other Requirements) & Permit Part IV (Intake Structure Requirements) for additional requirements.

[4] In the event that a new water treatment additive is to be used that will contribute to this Outfall, or changes are to be made in the use of water treatment additives, including dosage, the permittee must apply for and receive approval from IDEM prior to such discharge. Discharges of any such additives must meet Indiana water quality standards. The permittee must apply for permission to use water treatment additives by completing and submitting State Form 50000 (Application for Approval to Use Water Treatment Additives) currently available at: http://www.in.gov/idem/5157.htm

[5] Pump hour flow meter calculations are adequate to monitor the discharge flow in lieu of an electronic continuous monitoring device at Outfall 001. Outfall 002 is an emergency overflow outfall only. In the event of an emergency overflow discharge at Outfall 002, the flow reporting may be an estimate based upon flow duration and estimated discharge rate and TSS may be monitored by grab sample.

[6] The permittee shall measure and report the identified metal as total recoverable metal.

[7] Mercury monitoring shall be conducted bi-monthly in the months of February, April, June, August, October, and December of each year for the term of the permit using EPA Test Method 1631, Revision E.

[8] The following EPA test methods and/or Standard Methods and associated LODs and LOQs are to be used in the analysis of the effluent samples. Alternative methods may be used if first approved by IDEM.

Parameter	Test Method	LOD	LOQ
Mercury	1631, Revision E	0.2 ng/l	0.5 ng/l

[9] Monitoring frequency shall increase to 1 X Weekly during periods during which construction dewatering is being discharged through outfall 001.

[10] NIPSCO shall submit to the Industrial NPDES Permit Section of IDEM a groundwater sample when construction dewatering takes place that is representative of that dewatering water and includes the following: Arsenic, Boron, Chromium, Manganese, Selenium, Zinc, Sulfate, and the BTEX parameters. Other parameters should be included if NIPSCO believes them to be present in the groundwater.

[11]

Parameter	Test Method	LOD	LOQ
Chlorine	4500-Cl-D,E or 4500-Cl-G	0.02 mg/l	0.06 mg/l
Arsenic	3113B-2004	1 ug/l	3.2 ug/l
Arsenic	200.9	0.5 ug/l	1.6 ug/l
Arsenic	200.8	0.4 ug/l	1.3 ug/l
Selenium	3113B-2004 or 3114B-2009	2 ug/l	6.4 ug/l
Selenium	200.8	2.1 ug/l	6.7 ug/l
Selenium	200.9	0.6 ug/l	1.9 ug/l

[12] The chlorine limits are applicable when chlorine may be expected to be in the effluent. Chlorine monitoring is required on days when chlorination occurs and shall be commenced on such days within an hour of initial chlorination.

[13] The water quality based effluent limit (WQBEL) for TRC is less than the limit of quantitation (LOQ) as specified below. Compliance with this permit will be demonstrated if the effluent concentrations measured are less than the LOQ.

If the measured concentration of TRC is greater than the water quality based effluent limitations and above the respective LOD specified in the table below in any three (3) consecutive analyses, or any five (5) out of nine (9) analyses, then the discharger shall:

(1) Determine the source of the parameter through an evaluation of sampling techniques, analytical/laboratory procedures, and waste streams (including internal waste streams); and re-examine the chlorination /dechlorination procedures.

(2) The sampling and analysis for TRC shall be increased to 2 X Daily and remain at this increased sampling frequency until:

(a) The increased sampling frequency for TRC has been in place for at least two weeks.

(b) At least nine (9) samples have been taken under this increased sampling frequency; and

(c) The measured concentration of TRC is less than the LOD specified in the table above in at least seven (7) out of the nine (9) most recent analyses.

Case-Specific LOD/LOQ The permittee may determine a case-specific LOD or LOQ using the analytical method specified above, or any other test method which is approved by the Commissioner prior to use. The LOD shall be derived by the procedure specified for method detection limits contained in 40 CFR Part 136, Appendix B, and the LOQ shall be set equal to 3.18 times the LOD. Other methods may be used if first approved by the Commissioner.

[14] The limit is based on 327 IAC 2-1-6 Table 6-1. “To be considered an intermittent discharge, total residual chlorine shall not be detected in the discharge for a period of more than forty (40) minutes in duration, and such periods shall be separated by at least five (5) hours”.

[15] Reporting requirements for chlorination frequency and duration apply only when the facility is chlorinating intermittently, as defined in [14].

[16] The following conditions apply to Temperature outside the mixing zone:

(1) There shall be no abnormal temperature changes that may adversely affect aquatic life unless caused by natural conditions.

(2) The normal daily and seasonal temperature fluctuations that existed before the addition of heat due to other than natural causes shall be maintained.

(3) The maximum temperature rise at any time or place above natural shall not exceed:

(i) five (5) degrees Fahrenheit (two and eight-tenths (2.8) degrees Celsius) in streams.

[17] The discharge of cooling tower blowdown is regulated by the 40 CFR 423.13(d). 40 CFR 423.13(d)(1) prohibits the discharge of the 126 priority pollutants listed in Appendix A of this regulation in detectable amounts with the exception of total zinc and total chromium which have specific numeric limits. In accordance with 423.13(d)(3), instead of the monitoring specified in 40 CFR 122.48(b), compliance with the limitations for the 126 priority pollutants in paragraph (d)(1) of 40 CFR 423.13 may be determined by engineering calculations which demonstrate that the regulated pollutants are not detectable in the final discharge by the analytical methods in 40 CFR part 136. However, compliance with the above limitations for the 126 priority pollutants (with the exception of zinc and chromium) in paragraph (d)(1) of 40 CFR 423.13 must be reported each time there is a change in the chemicals added for cooling tower maintenance.

[18] If the permittee collects more than one grab sample on a given day for pH, the values shall not be averaged for reporting daily maximums or daily minimums. The permittee must report the individual minimum and the individual maximum pH value of any sample during the month on the Monthly Monitoring Report form.

[19] In the event that wastestreams from various sources are combined for treatment or discharge, the quantity of each pollutant or pollutant property attributable to each controlled waste source shall not exceed the specified limitation for that waste source.

In lieu of establishing new internal outfalls for low volume waste and bottom ash wastewater, should the permittee require a permit to continue operations beyond December 31, 2023, the permittee must submit an evaluation of alternate limitations for TSS and Oil & Grease developed using building the block approach and provide supporting documentation. The evaluation should be submitted with the next permit renewal.

[20] The permittee shall comply with the requirements of the effluent limitation guidelines for Steam Electric Generating Stations, 40 CFR 423.13(k)(1)(i), for bottom ash transport water by December 31, 2023.

[21] The “daily maximum” means the highest temperature value measured for any calendar day.

2. The permittee is authorized to discharge from the outfall listed below in accordance with the terms and conditions of this permit. The permittee is authorized to discharge from Internal Outfall 101, located at Latitude 41° 15' 2.34", Longitude -87° 0' 40.55". The discharge is limited to Sanitary Wastewater. Samples taken in compliance with the monitoring requirements below shall be taken at a point representative of the discharge but prior to entry into the Final Basin. Such discharge shall be limited and monitored by the permittee as specified below:

DISCHARGE LIMITATIONS [1]
Internal Outfall 101

Table 1

	Quantity or Loading			Quality or Concentration			Monitoring Requirements	
Parameter	Monthly Average	Daily Maximum	Units	Monthly Average	Daily Maximum	Units	Measurement Frequency	Sample Type
Flow [2]	Report	Report	MGD	----	----	----	2 X Monthly	24-Hr. Total
$CBOD_5$	----	----	----	25	40	mg/l	2 X Monthly	24-Hr. Comp.
TSS	----	----	----	30	45	mg/l	2 X Monthly	Grab
E. coli [3][4]	----	----	----	125	235	cfu/100 ml	2 X Monthly	Grab

[1] Discharge from Internal Outfall 101, which flows to the Final Basin, is limited solely to sanitary wastewater, free from process or other wastewater discharges.

[2] Pump hour flow meter calculations are adequate to monitor the discharge flow at Internal Outfall 101.

[3] The *E. coli* limitations and monitoring requirements apply from April 1 through October 31 annually. IDEM has specified the following methods as allowable for the detection and enumeration of *Escherichia coli* (*E. coli*):

1. Coliscan MF® Method
2. EPA Method 1603 Modified m-TEC agar
3. mColi Blue-24®.
4. Colilert® MPN Method or Colilert-18® MPN Method

If less than ten samples are taken and analyzed for *E. coli* in a calendar month, no samples may exceed two hundred thirty-five (235) cfu or mpn as a daily maximum. However, when ten (10) or more samples are taken and analyzed for *E. coli* in a calendar month, not more than ten percent (10%) of those samples may exceed two hundred thirty-five (235) cfu or mpn as a daily maximum. When calculating ten percent, the result must not be rounded up. In reporting for compliance purposes on the Discharge Monitoring Report (DMR) form, the permittee shall record the highest nonexcluded value for the daily maximum.

[4] The monthly average E. coli value shall be calculated as a geometric mean. Per 327 IAC 5-10-6, the concentration of E. coli shall not exceed one hundred twenty-five (125) cfu or mpn per 100 milliliters as a geometric mean of the effluent samples taken in a calendar month. No samples may be excluded when calculating the monthly geometric mean.

3. The permittee is authorized to discharge from the internal outfalls listed below in accordance with the terms and conditions of this permit. The permittee is authorized to discharge from Internal Outfall 201, located at Latitude 41° 13' 3", Longitude -87° 1' 14". The permittee is also authorized to discharge from proposed Internal Outfall 301. The discharge is limited to FGD WWTP discharge. The discharge from the WWTP discharge is limited to Unit 14/15 FGD wastewater, Unit 17/18 FGD wastewater, and leachate from the on-site Type I landfill. Samples taken in compliance with the monitoring requirements below shall be taken at a point prior to entry into the Final Basin. Such discharge shall be limited and monitored by the permittee as specified below:

DISCHARGE LIMITATIONS

Internal Outfall 201 and Internal Outfall 301 (Proposed)

Table 1

	Quantity or Loading			Quality or Concentration			Monitoring Requirements	
Parameter	Monthly Average	Daily Maximum	Units	Monthly Average	Daily Maximum	Units	Measurement Frequency	Sample Type
Flow	Report	Report	MGD	----	----	----	2 X Monthly	24-Hr. Total
TSS	----	----	----	30.0	100.0	mg/l	2 X Monthly	24-Hr. Comp.
O&G	----	----	----	15.0	20.0	mg/l	2 X Monthly	Grab
Arsenic [1,4]								
Interim	----	----	----	Report	Report	ug/l	2 X Monthly	Grab
Final [5]	----	----	----	8	11	ug/l	2 X Monthly	Grab
Mercury [1,2,4]								
Interim	----	----	----	Report	Report	ng/l	6 X Yearly	Grab
Final [5]	----	----	----	356	788	ng/l	6 X Yearly	Grab
Selenium [1,4]								
Interim	----	----	----	Report	Report	ug/l	2 X Monthly	Grab
Final [5]	----	----	----	12	23	ug/l	2 X Monthly	Grab
Nitrate/Nitrite (as N)								
Interim	----	----	----	Report	Report	mg/l	2 X Monthly	Grab
Final [5]	----	----	----	4.4	17.0	mg/l	2 X Monthly	Grab
Ammonia (as N)	----	----	----	Report	Report	mg/l	2 X Monthly	Grab
Boron [1]	----	----	----	Report	Report	ug/l	2 X Monthly	Grab
Chloride	----	----	----	Report	Report	mg/l	2 X Monthly	Grab
Manganese [1]	----	----	----	Report	Report	mg/l	2 X Monthly	Grab
Zinc [1]	----	----	----	Report	Report	mg/l	2 X Monthly	Grab

Table 2

	Quality or Concentration			Monitoring Requirements	
Parameter	Daily Minimum	Daily Maximum	Units	Measurement Frequency	Sample Type
pH [3]	6.0	9.0	s.u.	2 X Monthly	Grab

[1] The permittee shall measure and report these parameters as total recoverable metal.

[2] Mercury monitoring shall be conducted be-monthly (every other month) in the months of February, April, June, August, October, and December of each year for the term of the permit from the effective date of this permit using EPA Test Method 1631, Revision E.

[3] If the permittee collects more than one grab sample on a given day for pH, the values shall not be averaged for reporting daily maximums or daily minimums. The permittee must report the individual minimum and the individual maximum pH value of any sample during the month on the Monthly Monitoring Report form.

[4] The following EPA approved test methods and associated LODs and LOQs are to be used in the analysis of the effluent samples. Alternative methods may be used if first approved by IDEM and EPA, if applicable.

Parameter	Test Method	LOD	LOQ
Mercury	1631E	0.2 ng/l	0.5 ng/l
Arsenic	3113B-2004	1 ug/l	3.2 ug/l
Arsenic	200.9	0.5 ug/l	1.6 ug/l
Arsenic	200.8	0.4 ug/l	1.3 ug/l
Selenium	3113B-2004 or 3114B-2009	2 ug/l	6.4 ug/l
Selenium	200.8	2.1 ug/l	6.7 ug/l
Selenium	200.9	0.6 ug/l	1.9 ug/l

[5] The permittee must comply with the limits established under 40 CFR 423.13(g)(1)(i) no later than December 31, 2023 for both Outfalls 201 and 301.

4. The permittee is authorized to discharge storm water from the outfalls listed below in accordance with the terms and conditions of this permit. The permittee is authorized to discharge from Outfalls 003S, 004S, 005S, 006S, and 007S. The permittee shall also sample Stream Monitoring Sites 010S, 011S (both from Davis Ditch), 012S, and 013S (both from Stalbaum Ditch). The location of each of these outfalls is listed below:

003S: Latitude 41° 13' 8.55", Longitude -87° 0' 20"
004S: Latitude 41° 12' 22", Longitude -87° 1' 38"
005S: Latitude 41° 12' 31", Longitude -87° 1' 38"
006S: Latitude 41° 13' 31", Longitude -87° 1' 36"
007S: Latitude 41° 12' 17.46", Longitude -87° 1' 47.3"
010S: Latitude 41° 12' 5.22", Longitude -87° 0' 56.4"
011S: Latitude 41° 13' 19.21", Longitude -87° 1' 47.3"
012S: Latitude 41° 12' 29.88", Longitude -87° 0' 3.9"
013S: Latitude 41° 13' 24.52", Longitude -87° 1' 21.3"

Such discharge shall be limited and monitored by the permittee as specified below:

DISCHARGE LIMITATIONS [1, 3, 4]
Stormwater Outfalls 003S, 004S [5], 007S
Stream Monitoring Sites 010S, 011S, 012S, 013S

			Monitoring Requirements	
Parameter	Daily Maximum	Units	Measurement Frequency	Sample Type
Flow	Report	MGD	Annually	Estimate Total
TSS	Report	mg/l	Annually	Grab
pH	Report	s.u.	Annually	Grab
Oil & Grease	Report	mg/l	Annually	Grab
Arsenic [2]	Report	mg/l	Annually	Grab
Cadmium [2]	Report	mg/l	Annually	Grab
Chromium [2]	Report	mg/l	Annually	Grab
Copper [2]	Report	mg/l	Annually	Grab
Lead [2]	Report	mg/l	Annually	Grab
Nickel [2]	Report	mg/l	Annually	Grab
Selenium [2]	Report	mg/l	Annually	Grab
Zinc [2]	Report	mg/l	Annually	Grab
Sulfate	Report	mg/l	Annually	Grab

[1] The Storm Water Monitoring and Non Numeric Effluent Limits and the Storm Water Pollution Prevention Plan (SWPPP) requirements can be found in Part I.D. and I.E. of this permit.

[2] The permittee shall measure and report the identified metal as total recoverable metal.

[3] See Part I.B. of the permit for the Narrative Water Quality Standards.

[4] All samples shall be collected from the discharge resulting from a storm event that is greater than 0.1 inches and at least 72 hours from the previously measurable (greater than 0.1 inch rainfall) storm event. There shall be a minimum of three (3) months between reported sampling events.

For each sample taken, the permittee shall record the duration and total rainfall of the storm event, the number of hours between beginning of the storm measured and the end of the previous measurable rain event, and the outside temperature at the time of sampling.

A grab sample shall be taken during the first thirty (30) minutes of the discharge (or as soon thereafter as practicable).

The permittee shall conduct a visual inspection at the outfall(s) on an annual basis. During visual inspections the permittee shall report the presence of turbidity, color, foam, solids, floatables, and oil sheen. The results of the visual inspections shall be recorded and maintained as part of the SWPPP plan. Visual inspections should allow for timely adjustments to be made to the SWPPP. If BMPs are performing ineffectively, corrective action must be implemented. A set of tracking or follow-up procedures must be used to ensure that appropriate actions are taken in response to the examinations.

[5] Outfall 004S discharge shall be representative of discharge from Outfalls 005S and 006S.

B. NARRATIVE WATER QUALITY STANDARDS

1. At all times and at all places, including waters within the mixing zone, the discharge shall meet the minimum conditions of being free from substances, materials, floating debris, oil, or scum attributable to municipal, industrial, agricultural, and other land use practices, or other discharges that do any of the following:

   a. will settle to form putrescent, or otherwise objectionable deposits;

   b. are in amounts sufficient to be unsightly or deleterious;

   c. produce color, visible oil sheen, odor, or other conditions in such degree as to create a nuisance;

   d. are in amounts sufficient to be acutely toxic to, or to otherwise severely injure or kill aquatic life, other animals, plants, or humans;

   e. are in concentrations or combinations that will cause or contribute to the growth of aquatic plants or algae to such a degree as to create a nuisance, be unsightly, or otherwise impair the designated uses.

2. At all times, outside the mixing zone, the discharge shall be free of substances in concentrations that on the basis of available scientific data are believed to be sufficient to injure, be chronically toxic to, or be carcinogenic, mutagenic, or teratogenic to humans, animals, aquatic life, or plants.

C. MONITORING AND REPORTING

1. Representative Sampling

   Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge flow and shall be taken at times which reflect the full range and concentration of effluent parameters normally expected to be present. Samples shall not be taken at times to avoid showing elevated levels of any parameters.

2. Monthly Reporting

   The permittee shall submit monitoring reports to the Indiana Department of Environmental Management (IDEM) containing results obtained during the previous month and shall be submitted no later than the 28th day of the month following each completed monitoring period. The first report shall be submitted by the 28th day of the month following the month in which the permit becomes effective.

These reports shall include, but not necessarily be limited to, the Discharge Monitoring Report (DMR) and the Monthly Monitoring Report (MMR). All reports shall be submitted electronically by using the NetDMR application, upon registration, receipt of the NetDMR Subscriber Agreement, and IDEM approval of the proposed NetDMR Signatory. Access the NetDMR website (for initial registration and DMR/MMR submittal) via CDX at: https://cdx.epa.gov/. The Regional Administrator may request the permittee to submit monitoring reports to the Environmental Protection Agency if it is deemed necessary to assure compliance with the permit. See Part II.C.10 of this permit for Future Electronic Reporting Requirements.

a. Calculations that require averaging of measurements of daily values (both concentrations and mass) shall use an arithmetic mean, except the monthly average for *E. coli* shall be calculated as a geometric mean.

b. Daily effluent values (both mass and concentration) that are less than the LOQ that are used to determine the monthly average effluent level shall be accommodated in calculation of the average using statistical methods that have been approved by the Commissioner.

c. Effluent concentrations less than the LOD shall be reported on the Discharge Monitoring Report (DMR) forms as < (less than) the value of the LOD. For example, if a substance is not detected at a concentration of 0.1 µg/l, report the value as <0.1 µg/l.

d. Effluent concentrations greater than or equal to the LOD and less than the LOQ that are reported on a DMR shall be reported as the actual value and annotated on the DMR to indicate that the value is not quantifiable.

e. Mass discharge values which are calculated from concentrations reported as less than the value of the limit of detection shall be reported as less than the corresponding mass discharge value.

f. Mass discharge values that are calculated from effluent concentrations greater than the limit of detection shall be reported as the calculated value.

3. Definitions

a. “Monthly Average” means the total mass or flow-weighted concentration of all daily discharges during a calendar month on which daily discharges are sampled or measured, divided by the number of daily discharges sampled and/or measured during such calendar month.

The monthly average discharge limitation is the highest allowable average monthly discharge for any calendar month.

b. "Daily Discharge" means the total mass of a pollutant discharged during the calendar day or, in the case of a pollutant limited in terms other than mass pursuant to 327 IAC 5-2-11(e), the average concentration or other measurement of the pollutant specified over the calendar day or any twenty-four hour period that reasonably represents the calendar day for the purposes of sampling.

c. "Daily Maximum" means the maximum allowable daily discharge for any calendar day.

d. A "24-hour composite sample" means a sample consisting of at least 3 individual flow-proportioned samples of wastewater, taken by the grab sample method or by an automatic sampler, which are taken at approximately equally spaced time intervals for the duration of the discharge within a 24-hour period and which are combined prior to analysis. A flow-proportioned composite sample may be obtained by:

(1) recording the discharge flow rate at the time each individual sample is taken,

(2) adding together the discharge flow rates recorded from each individuals sampling time to formulate the "total flow" value,

(3) the discharge flow rate of each individual sampling time is divided by the total flow value to determine its percentage of the total flow value,

(4) then multiply the volume of the total composite sample by each individual sample's percentage to determine the volume of that individual sample which will be included in the total composite sample.

e. "Concentration" means the weight of any given material present in a unit volume of liquid. Unless otherwise indicated in this permit, concentration values shall be expressed in milligrams per liter (mg/l).

f. The "Regional Administrator" is defined as the Region 5 Administrator, U.S. EPA, located at 77 West Jackson Boulevard, Chicago, Illinois 60604.

g. The “Commissioner” is defined as the Commissioner of the Indiana Department of Environmental Management, which is located at the following address: 100 North Senate Avenue, Indianapolis, Indiana 46204.

h. “Limit of Detection” or “LOD” means the minimum concentration of a substance that can be measured and reported with ninety-nine percent (99%) confidence that the analyte concentration is greater than zero (0) for a particular analytical method and sample matrix.

i. “Limit of Quantitation” or “LOQ” means a measurement of the concentration of a contaminant obtained by using a specified laboratory procedure calibrated at a specified concentration above the method detection level. It is considered the lowest concentration at which a particular contaminant can be quantitatively measured using a specified laboratory procedure for monitoring of the contaminant. This term is also sometimes called limit of quantification or quantification level.

j. “Method Detection Level” or “MDL” means the minimum concentration of an analyte (substance) that can be measured and reported with a ninety-nine percent (99%) confidence that the analyte concentration is greater than zero (0) as determined by procedure set forth in 40 CFR 136, Appendix B. The method detection level or MDL is equivalent to the LOD.

k. “Grab Sample” means a sample which is taken from a wastestream on a one-time basis without consideration of the flow rate of the wastestream and without considerations of time.

4. Test Procedures

The analytical and sampling methods used shall conform to the version of 40 CFR 136 incorporated by reference in 327 IAC 5. Different but equivalent methods are allowable if they receive the prior written approval of the Commissioner and the U.S. Environmental Protection Agency. When more than one test procedure is approved for the purposes of the NPDES program under 40 CFR 136 for the analysis of a pollutant or pollutant parameter, the test procedure must be sufficiently sensitive as defined at 40 CFR 122.21(e)(3) and 122.44(i)(1)(iv).

5. Recording of Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall maintain records of all monitoring information and monitoring activities, including:

a. The date, exact place and time of sampling or measurement;

b. The person(s) who performed the sampling or measurements;

c. The date(s) analyses were performed;

d. The person(s) who performed the analyses;

e. The analytical techniques or methods used; and

f. The results of such measurements and analyses.

6. Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of this monitoring shall be included in the calculation and reporting of the values required in the monthly Discharge Monitoring Report (DMR) and Monthly Monitoring Report (MMR). Such increased frequency shall also be indicated. Other monitoring data not specifically required in this permit (such as internal process or internal waste stream data) which is collected by or for the permittee need not be submitted unless requested by the Commissioner.

7. Records Retention

All records and information resulting from the monitoring activities required by this permit, including all records of analyses performed and calibration and maintenance of instrumentation and recording from continuous monitoring instrumentation, shall be retained for a minimum of three (3) years. In cases where the original records are kept at another location, a copy of all such records shall be kept at the permitted facility. The three years shall be extended:

a. automatically during the course of any unresolved litigation regarding the discharge of pollutants by the permittee or regarding promulgated effluent guidelines applicable to the permittee; or

b. as requested by the Regional Administrator or the Indiana Department of Environmental Management.

D. STORM WATER MONITORING AND NON-NUMERIC EFFLUENT LIMITS

Within twelve (12) months of the effective date of this permit, the permittee shall implement the non-numeric permit conditions in this Section of the permit for the entire site as it relates to storm water associated with industrial activity regardless which outfall the storm water is discharged from.

1. Control Measures and Effluent Limits

In the technology-based limits included in Part D.2-4., the term “minimize” means reduce and/or eliminate to the extent achievable using control measures (including best management practices) that are technologically available and economically practicable and achievable in light of best industry practice.

2. Control Measures

Select, design, install, and implement control measures (including best management practices) to address the selection and design considerations in Part D.3 to meet the non-numeric effluent limits in Part D.4. The selection, design, installation, and implementation of these control measures must be in accordance with good engineering practices and manufacturer’s specifications. Any deviation from the manufacturer’s specifications shall be documented. If the control measures are not achieving their intended effect in minimizing pollutant discharges, the control measures must be modified as expeditiously as practicable. Regulated storm water discharges from the facility include storm water run-on that commingles with storm water discharges associated with industrial activity at the facility.

3. Control Measure Selection and Design Considerations

When selecting and designing control measures consider the following:

a. preventing storm water from coming into contact with polluting materials is generally more effective, and cost-effective, than trying to remove pollutants from storm water;

b. use of control measures in combination is more effective than use of control measures in isolation for minimizing pollutants in storm water discharge;

c. assessing the type and quantity of pollutants, including their potential to impact receiving water quality, is critical to designing effective control measures that will achieve the limits in this permit;

d. minimizing impervious areas at your facility and infiltrating runoff onsite (including bioretention cells, green roofs, and pervious pavement, among other approaches), can reduce runoff and improve groundwater recharge and stream base flows in local streams, although care must be taken to avoid ground water contamination;

e. flow can be attenuated by use of open vegetated swales and natural depressions;

f. conservation and/or restoration of riparian buffers will help protect streams from storm water runoff and improve water quality; and

g. use of treatment interceptors (e.g. swirl separators and sand filters) may be appropriate in some instances to minimize the discharge of pollutants.

4. Technology-Based Effluent Limits (BPT/BAT/BCT): Non-Numeric Effluent Limits:

a. Minimize Exposure

Minimize the exposure of raw, final, or waste materials to rain, snow, snowmelt, and runoff. To the extent technologically available and economically practicable and achievable, either locate industrial materials and activities inside or protect them with storm resistant coverings in order to minimize exposure to rain, snow, snowmelt, and runoff (although significant enlargement of impervious surface area is not recommended). In minimizing exposure, pay particular attention to the following areas:

Loading and unloading areas: locate in roofed or covered areas where feasible; use grading, berming, or curbing around the loading area to divert run-on; locate the loading and unloading equipment and vehicles so that leaks are contained in existing containment and flow diversion systems.

Material storage areas: locate indoors, or in roofed or covered areas where feasible; install berms/dikes around these areas; use dry cleanup methods.

Note: Industrial materials do not need to be enclosed or covered if storm water runoff from affected areas will not be discharged to receiving waters.

b. Good Housekeeping

Keep clean all exposed areas that are potential sources of pollutants, using such measures as sweeping at regular intervals, keeping materials orderly and labeled, and stowing materials in appropriate containers.

As part of the developed good housekeeping program, include a cleaning and maintenance program for all impervious areas of the facility where particulate matter, dust, or debris may accumulate, especially areas where material loading and unloading, storage, handling, and processing occur; and where practicable, the paving of areas where vehicle traffic or material storage occur but where vegetative or other stabilization methods are not practicable (institute a sweeping program in these areas too). For unstabilized areas where sweeping is not practicable, consider using storm water management devices such as sediment traps, vegetative buffer strips, filter fabric fence, sediment filtering boom, gravel outlet protection, or other equivalent measures that effectively trap or remove sediment.

c. Maintenance

Maintain all control measures which are used to achieve the effluent limits required by this permit in effective operating condition. Nonstructural control measures must also be diligently maintained (e.g., spill response supplies available, personnel appropriately trained). If control measures need to be replaced or repaired, make the necessary repairs or modifications as expeditiously as practicable.

d. Spill Prevention and Response Procedures

You must minimize the potential for leaks, spills and other releases that may be exposed to storm water and develop plans for effective response to such spills if or when they occur. At a minimum, you must implement:

(1) Procedures for plainly labeling containers (e.g., "Used Oil", "Spent Solvents", "Fertilizers and Pesticides", etc.) that could be susceptible to spillage or leakage to encourage proper handling and facilitate rapid response if spills or leaks occur;

(2) Preventive measures such as barriers between material storage and traffic areas, secondary containment provisions, and procedures for material storage and handling;

(3) Procedures for expeditiously stopping, containing, and cleaning up leaks, spills, and other releases. Employees who may cause, detect or respond to a spill or leak must be trained in these procedures and have necessary spill response equipment available. If possible, one of these individuals should be a member of your storm water pollution prevention team;

(4) Procedures for notification of appropriate facility personnel, emergency response agencies, and regulatory agencies. State or local requirements may necessitate reporting spills or discharges to local emergency response, public health, or drinking water supply agencies. Contact information must be in locations that are readily accessible and available;

(5) Procedures for documenting where potential spills and leaks could occur that could contribute pollutants to storm water discharges, and the corresponding outfalls that would be affected by such spills and leaks; and

(6) A procedure for documenting all significant spills and leaks of oil or toxic or hazardous pollutants that actually occurred at exposed areas, or that drained to a storm water conveyance.

e. Erosion and Sediment Controls

Through the use of structural and/or non-structural control measures stabilize, and contain runoff from, exposed areas to minimize onsite erosion and sedimentation, and the resulting discharge of pollutants. Among other actions to meet this limit, place flow velocity dissipation devices at discharge locations and within outfall channels where necessary to reduce erosion and/or settle out pollutants. In selecting, designing, installing, and implementing appropriate control measures, you are encouraged to check out information from both the State and EPA websites. The following two websites are given as information sources:

http://www.in.gov/idem/stormwater/2363.htm
and
https://www.epa.gov/npdes/stormwater-discharges-industrial-activities

f. Management of Runoff

Divert, infiltrate, reuse, contain or otherwise reduce storm water runoff, to minimize pollutants in the discharge.

g. Salt Storage Piles or Piles Containing Salt

Enclose or cover storage piles of salt, or piles containing salt, used for deicing or other commercial or industrial purposes, including maintenance of paved surfaces. You must implement appropriate measures (e.g., good housekeeping, diversions, containment) to minimize exposure resulting from adding to or removing materials from the pile. Piles do not need to be enclosed or covered if storm water runoff from the piles is not discharged.

h. Waste, Garbage, and Floatable Debris

Ensure that waste, garbage, and floatable debris are not discharged to receiving waters by keeping exposed areas free of such materials or by intercepting them before they are discharged.

i. Employee Training

Train all employees who work in areas where industrial material or activities are exposed to storm water, or who are responsible for implementing activities necessary to meet the conditions of this permit (e.g., inspectors, maintenance personnel), including all members of your Pollution Prevention Team. Training must cover the specific control measures used to achieve the effluent limits in this part, and monitoring, inspection, planning, reporting, and documentation requirements in other parts of this permit.

j. Non-Storm water Discharges

You must determine if any non-storm water discharges not authorized by an NPDES permit exist. Any non-storm water discharges discovered must either be eliminated or modified into this permit. The following non-storm water discharges are authorized and must be documented in the Storm Water Pollution Prevention Plan:

Discharges from fire-fighting activities;
Fire Hydrant flushings;
Potable water, including water line flushings;
Uncontaminated condensate from air conditioners, coolers, and other compressors and from the outside storage of refrigerated gases or liquids;
Irrigation drainage;
Landscape watering provided all pesticides, herbicides, and fertilizer have been applied in accordance with the approved labeling;

Pavement wash water where no detergents are used and no spills or leaks of toxic or hazardous material have occurred (unless all spilled material has been removed);
Routine external building washdown that does not use detergents;
Uncontaminated ground water or spring water;
Foundation or footing drains where flows are not contaminated with process materials;
Incidental windblown mist from cooling towers that collects on rooftops or adjacent portions of the facility, but not intentional discharges from cooling towers (e.g., “piped cooling tower blowdown or drains);
Vehicle wash- waters where uncontaminated water without detergents or solvents is utilized; and
Runoff from the use of dust suppressants approved for use by IDEM.

k. Dust Generation and Vehicle Tracking of Industrial Materials

You must minimize generation of dust and off-site tracking of raw, final, or waste materials.

l. Fugitive Dust Emission.

Minimize fugitive dust emissions from coal handling areas. To minimize the tracking of coal dust offsite, consider procedures such as installing specially designed tires or washing vehicles in a designated area before they leave the site and controlling the wash water.

m. Delivery Vehicles

Minimize contamination of storm water runoff from delivery vehicles arriving at the plant site. Consider procedures to inspect delivery vehicles arriving at the plant site and ensure overall integrity of the body or container and procedures to deal with leakage or spillage from vehicles or containers.

n. Fuel Oil Unloading Areas

Minimize contamination of precipitation or surface runoff from fuel oil unloading areas. Consider using containment curbs in unloading areas, having personnel familiar with spill prevention and response procedures present during deliveries to ensure that any leaks or spills are immediately contained and cleaned up, and using spill and overflow protection devices (e.g., drip pans, drip diapers, or other containment devices placed beneath fuel oil connectors to contain potential spillage during deliveries or from leaks at the connectors).

o. Chemical Loading and Unloading

Minimize contamination of precipitation or surface runoff from chemical loading and unloading areas. Consider using containment curbs at chemical loading and unloading areas to contain spills, having personnel familiar with spill prevention and response procedures present during deliveries to ensure that any leaks or spills are immediately contained and cleaned up, and loading and unloading in covered areas and storing chemicals indoors.

p. Miscellaneous Loading and Unloading Areas

Minimize contamination of precipitation or surface runoff from loading and unloading areas. Consider covering the loading area; grading, berming, or curbing around the loading area to divert run-on; locating the loading and unloading equipment and vehicles so that leaks are contained in existing containment and flow diversion systems; or equivalent procedures.

q. Liquid Storage Tanks

Minimize contamination of surface runoff from above-ground liquid storage tanks. Consider protective guards around tanks, containment curbs, spill and overflow protection, dry cleanup methods, or equivalent measures.

r. Large Bulk Fuel Storage Tanks

Minimize contamination of surface runoff from large bulk fuel storage tanks. Consider containment berms (or their equivalent). You must also comply with applicable State and Federal laws, including Spill Prevention, Control and Countermeasure (SPCC) Plan requirements.

s. Spill Reduction Measures

Minimize the potential for an oil or chemical spill, or reference the appropriate part of your SPCC plan. Visually inspect as part of your routine facility inspection the structural integrity of all above-ground tanks, pipelines, pumps, and related equipment that may be exposed to storm water, and make any necessary repairs immediately.

t. Oil-Bearing Equipment in Switchyards

Minimize contamination of surface runoff from oil-bearing equipment in switchyard areas. Consider using level grades and gravel surfaces to retard flows and limit the spread of spills, or collecting runoff in perimeter ditches.

u. Residue-Hauling Vehicles

Inspect all residue-hauling vehicles for proper covering over the load, adequate gate sealing, and overall integrity of the container body. Repair vehicles without load covering or adequate gate sealing, or with leaking containers or beds.

v. Ash Loading Areas

Reduce or control the tracking of ash and residue from ash loading areas. Clear the ash building floor and immediately adjacent roadways of spillage, debris, and excess water before departure of each loaded vehicle.

w. Areas Adjacent to Disposal Ponds or Landfills

Minimize contamination of surface runoff from areas adjacent to disposal ponds or landfills. Reduce ash residue that may be tracked on to access roads traveled by residue handling vehicles, and reduce ash residue on exit roads leading into and out of residue handling areas.

x. Landfills, Scrap yards, Surface Impoundments, Open Dumps, General Refuse Sites

Minimize the potential for contamination of runoff from these areas.

5. Annual Review

At least once every twelve (12) months, you must review the selection, design, installation, and implementation of your control measures to determine if modifications are necessary to meet the effluent limitations in this permit. You must document the results of your review in a report that shall be retained within the SWPPP. You must also submit the report to the Industrial NPDES Permit Section, as well as the Compliance Branch, on an annual basis. The report may be submitted by email to the Industrial NPDES Permit Section at OWQWWPER@idem.in.gov and to the Compliance Branch at wwReports@idem.in.gov. The email subject line should include the NPDES Permit # and the type of report being submitted (Annual Storm Water Report). The permittee's first annual review report will be due twelve (12) months from the effective date of the permit.

6. Corrective Actions – Conditions Requiring Review

a. If any of the following conditions occur, you must review and revise the selection, design, installation, and implementation of your control measures to ensure that the condition is eliminated and will not be repeated:

(1) an unauthorized release or discharge (e.g., spill, leak, or discharge of non-storm water not authorized by this NPDES permit) occurs at this facility;

(2) it is determined that your control measures are not stringent enough for the discharge to meet applicable water quality standards;

(3) it is determined in your routine facility inspection, an inspection by EPA or IDEM, comprehensive site evaluation, or the Annual Review required in Part D.5 that modifications to the control measures are necessary to meet the effluent limits in this permit or that your control measures are not being properly operated and maintained; or

(4) Upon written notice by the Commissioner that the control measures prove to be ineffective in controlling pollutants in storm water discharges exposed to industrial activity.

b. If construction or a change in design, operation, or maintenance at your facility significantly changes the nature of pollutants discharged in storm water from your facility, or significantly increases the quantity of pollutants discharged, you must review and revise the selection, design, installation, and implementation of your control measures to determine if modifications are necessary to meet the effluent limits in this permit.

7. Corrective Action Deadlines

You must document your discovery of any of the conditions listed in Part I.D.6 within thirty (30) days of making such discovery. Subsequently, within one-hundred and twenty (120) days of such discovery, you must document any corrective action(s) to be taken to eliminate or further investigate the deficiency or if no corrective action is needed, the basis for that determination. Specific documentation required within 30 and 120 days is detailed below. If you determine that changes to your control measures are necessary following your review, any modifications to your control measures must be made before the next storm event if possible, or as soon as practicable following that storm event. These time intervals are not grace periods, but schedules considered reasonable for the documenting of your findings and for making repairs and improvements. They are included in this permit to ensure that the conditions prompting the need for these repairs and improvements are not allowed to persist indefinitely.

8. Corrective Action Report

a. Within 30 days of a discovery of any condition listed in Part I.D.6, you must document the following information:

(1) Brief description of the condition triggering corrective action;

(2) Date condition identified; and

(3) How deficiency identified.

b. Within 120 days of discovery of any condition listed in Part I.D.6, you must document the following information:

(1) Summary of corrective action taken or to be taken (or, for triggering events identified in Part I.D.6.b.(1), where you determine that corrective action is not necessary, the basis for this determination)

(2) Notice of whether SWPPP modifications are required as a result of this discovery or corrective action;

(3) Date corrective action initiated; and

(4) Date corrective action completed or expected to be completed.

9. Inspections

The inspections in this Part must be conducted at this facility when the facility is operating. Any corrective action required as a result of an inspection or evaluation conducted under Part I.D.9. must be performed consistent with Part I.D.6 of this permit.

a. Monthly Site Compliance Inspection

The following areas shall be inspected monthly: coal handling areas, loading or unloading areas, switchyards, fueling areas, bulk storage areas, ash handling areas, areas adjacent to disposal ponds and landfills, maintenance areas, liquid storage tanks, and long term and short term material storage areas.

Areas contributing to a storm water discharge associated with industrial activity shall be visually inspected for evidence of, or the potential for, pollutants entering the drainage system. Measures to reduce pollutant loadings shall be evaluated to determine whether they are adequate and properly implemented in accordance with the terms of the permit or whether additional control measures are needed. Structural storm water management measures, sediment and erosion control measures, and other structural pollution prevention measures identified in the plan shall be observed to ensure that they are operating correctly. A visual inspection of equipment needed to implement the plan, such as spill response equipment, shall be made.

b. Quarterly Routine Facility Inspections

At least once during the calendar year, a routine facility inspection must be conducted while a discharge is occurring.

1. Routine Facility Inspection - At a minimum, quarterly routine inspections of the storm water management measures and storm water run-off conveyances. The routine inspections must be performed by qualified personnel with at least one member of your storm water pollution prevention team.

2. Routine Facility Inspection Documentation – You must document the findings of each routine facility inspection performed and maintain this documentation within your SWPPP or have the on-site record keeping location referenced in the SWPPP. At a minimum, your documentation must include:

   i. The inspection date and time;

   ii. The name(s) and signature(s) of the inspectors;

   iii. Weather information and a description of any discharges occurring at the time of the inspection;

   iv. Any previously unidentified discharges of pollutants from the site;

   v. Any control measures needing maintenance or repairs;

   vi. Any failed control measures that need replacement;

   vii. Any incidents of noncompliance observed; and

   viii. Any additional control measures needed to comply with the permit requirements.

c. Annual Comprehensive Site Inspections

Comprehensive Site Inspection - Qualified personnel and at least one member of your Pollution Prevention Team shall conduct a comprehensive site inspection, at least once per calendar year, to confirm the accuracy of the description of potential pollution sources contained in the plan, determine the effectiveness of the plan, and assess compliance with the permit. Each Comprehensive Site Inspection shall include:

1. Each Comprehensive Site Inspection shall address all potential sources of pollutants, including (if applicable) air pollution control equipment (e.g., baghouses, electrostatic precipitator, scrubbers, and cyclones), for any signs of degradation (e.g., leaks, corrosion, or improper operation) that could limit their efficiency and lead to excessive emissions. Considering monitoring air flow at inlets and outlets (or use equivalent measures) to check for leaks (e.g., particulate deposition) or blockage in ducts.

Also inspect all process and material handling equipment (e.g., conveyors, cranes, and vehicles) for leaks, drips, or the potential loss of material; and material storage areas (e.g., piles, bins, or hoppers for storing coke, coal, scrap, or slag, as well as chemicals stored in tanks and drums) for signs of material loss due to wind or storm water runoff.

2. Based on the results of the inspection, the description of potential pollutant sources identified in the SWPPP in accordance with Part I.E.2.b of this permit and pollution prevention measures and controls identified in the SWPPP in accordance with Part I.D.4. of this permit shall be revised as appropriate within the timeframes contained in Part I.D.7 of this permit.

3. A report summarizing the scope of the inspection, personnel conducting the inspection, the date(s) of the inspection, major observations relating to the implementation of the storm water pollution prevention plan, and actions taken in accordance with the above paragraph must be documented and either contained in, or have on-site record keeping location referenced in, the SWPPP at least 3 years after the date of the inspection. The report shall identify any incidents of noncompliance. Where a report does not identify any incidents of noncompliance, the report shall contain a certification that the facility is in compliance with the storm water pollution prevention plan and this permit. The report shall be signed in accordance with the signatory requirements of Part II.C.6 of this permit.

4. Where the inspection schedules overlap under this section, the Comprehensive Site Inspection may be conducted in place of one such inspection.

E. STORM WATER POLLUTION PREVENTION PLAN

1. Development of Plan

Within 12 months from the effective date of this permit, the permittee is required to revise and update the current Storm Water Pollution Prevention Plan (SWPPP) for the permitted facility. The plan shall at a minimum include the following:

a. Identify potential sources of pollution, which may reasonably be expected to affect the quality of storm water discharges associated with industrial activity from the facility. Storm water associated with industrial activity (defined in 40 CFR 122.26(b)(14)) includes, but is not limited to, the discharge from any conveyance which is used for collecting and conveying storm water and which is directly related to manufacturing, processing or materials storage areas at an industrial plant;

b. Describe practices and measure to be used in reducing the potential for pollutants to be exposed to storm water; and

c. Assure compliance with the terms and conditions of this permit.

2. Contents

The plan shall include, at a minimum, the following items:

a. Pollution Prevention Team -The plan shall list, by position title, the member or members of the facility organization as members of a Storm Water Pollution Prevention Team who are responsible for developing the storm water pollution prevention plan (SWPPP) and assisting the facility or plant manager in its implementation, maintenance, and revision. The plan shall clearly identify the responsibilities of each storm water pollution prevention team member. Each member of the storm water pollution prevention team must have ready access to either an electronic or paper copy of applicable portions of this permit and your SWPPP.

b. Description of Potential Pollutant Sources – The plan shall provide a description of areas at the site exposed to industrial activity and have a reasonable potential for storm water to be exposed to pollutants. The plan shall identify all activities and significant materials (defined in 40 CFR 122.26(b)), which may potentially be significant pollutant sources. As a minimum, the plan shall contain the following:

(1) A soils map indicating the types of soils found on the facility property and showing the boundaries of the facility property.

(2) A graphical representation, such as an aerial photograph or site layout maps, drawn to an appropriate scale, which contains a legend and compass coordinates, indicating, at a minimum, the following:

(A) All on-site storm water drainage and discharge conveyances, which may include pipes, ditches, swales, and erosion channels, related to a storm water discharge.

(B) Known adjacent property drainage and discharge conveyances, if directly associated with run-off from the facility.

(C) All on-site and known adjacent property water bodies, including wetlands and springs.

(D) An outline of the drainage area for each outfall.

(E) An outline of the facility property, indicating directional flows, via arrows, of surface drainage patterns.

(F) An outline of impervious surfaces, which includes pavement and buildings, and an estimate of the impervious and pervious surface square footage for each drainage area placed in a map legend.

(G) On-site injection wells, as applicable.

(H) On-site wells used as potable water sources, as applicable.

(I) All existing major structural control measures to reduce pollutants in storm water run-off.

(J) All existing and historical underground or aboveground storage tank locations, as applicable.

(K) All permanently designated plowed or dumped snow storage locations.

(L) All loading and unloading areas for solid and liquid bulk materials.

(M) All existing and historical outdoor storage areas for raw materials, intermediary products, final products, and waste materials. Include materials handled at the site that potentially may be exposed to precipitation or runoff, areas where deposition of particulate matter from process air emissions or losses during material-handling activities.

(N) All existing or historical outdoor storage areas for fuels, processing equipment, and other containerized materials, for example, in drums and totes.

(O) Outdoor processing areas.

(P) Dust or particulate generating process areas.

(Q) Outdoor assigned waste storage or disposal areas.

(R) Pesticide or herbicide application areas.

(S) Vehicular access roads.

(T) Identify any storage or disposal of wastes such as spent solvents and baths, sand, slag and dross; liquid storage tanks and drums; processing areas including pollution control equipment (e.g., baghouses); and storage areas of raw material such as coal, coke, scrap, sand, fluxes, refractories, or metal in any form. In addition, indicate where an accumulation of significant amounts of particulate matter could occur from such sources as furnace or oven emissions, losses from coal and coke handling operation, etc., and could result in a discharge of pollutants.

(U) The mapping of historical locations is only required if the historical locations have a reasonable potential for storm water exposure to historical pollutants.

(3) An area site map that indicates:

(A) The topographic relief or similar elevations to determine surface drainage patterns;

(B) The facility boundaries;

(C) All receiving waters;

(D) All known drinking water wells; and

Includes at a minimum, the features in clauses (A), (C), and (D) within a one-fourth (1/4) mile radius beyond the property boundaries of the facility. This map must be to scale and include a legend and compass coordinates.

(4) A narrative description of areas that generate storm water discharges exposed to industrial activity including descriptions for any existing or historical areas listed in subdivision 2.b.(2)(J) through (T) of this Part, and any other areas thought to generate storm water discharges exposed to industrial activity. The narrative descriptions for each identified area must include the following:

(A) Type and typical quantity of materials present in the area.

(B) Methods of storage, including presence of any secondary containment measures.

(C) Any remedial actions undertaken in the area to eliminate pollutant sources or exposure of storm water to those sources. If a corrective action plan was developed, the type of remedial action and plan date shall be referenced.

(D) Any significant release or spill history dating back a period of three (3) years from the effective date of this permit, in the identified area, for materials spilled outside of secondary containment structures and impervious surfaces in excess of their reportable quantity, including the following:

i. The date and type of material released or spilled.

ii. The estimated volume released or spilled.

iii. A description of the remedial actions undertaken, including disposal or treatment.

Depending on the adequacy or completeness of the remedial actions, the spill history shall be used to determine additional pollutant sources that may be exposed to storm water. In subsequent permit terms, the history shall date back for a period of five (5) years from the date of the permit renewal application.

(E) Where the chemicals or materials have the potential to be exposed to storm water discharges, the descriptions for each identified area must include a risk identification analysis of chemicals or materials stored or used within the area. The analysis must include the following:

i. Toxicity data of chemicals or materials used within the area, referencing appropriate material safety data sheet information locations.

ii. The frequency and typical quantity of listed chemicals or materials to be stored within the area.

iii. Potential ways in which storm water discharges may be exposed to listed chemicals and materials.

iv. The likelihood of the listed chemicals and materials to come into contact with water.

(5) A narrative description of existing and planned management practices and measures to improve the quality of storm water run-off entering a water of the state. Descriptions must be created for existing or historical areas listed in subdivision 2.b.(2)(J) through (T) and any other areas thought to generate storm water discharges exposed to industrial activity. The description must include the following:

(A) Any existing or planned structural and nonstructural control practices and measures.

(B) Any treatment the storm water receives prior to leaving the facility property or entering a water of the state.

(C) The ultimate disposal of any solid or fluid wastes collected in structural control measures other than by discharge.

(D) Describe areas that due to topography, activities, or other factors have a high potential for significant soil erosion.

(E) Document the location of any storage piles containing salt used for deicing.

(F) Information or other documentation required under Part I.E.2(d) of this permit.

(6) The results of storm water monitoring. The monitoring data must include completed field data sheets, chain-of-custody forms, and laboratory results. If the monitoring data are not placed into the facility's SWPPP, the on-site location for storage of the information must be reference in the SWPPP.

(7) Drainage Area Site Map. Document in your SWPPP the locations of any of the following activities or sources that may be exposed to precipitation or surface runoff: storage tanks, scrap yards, and general refuse areas; short- and long-term storage of general materials (including but not limited to supplies, construction materials, paint equipment, oils, fuels, used and unused solvents, cleaning materials, paint, water treatment chemicals, fertilizer, and pesticides); landfills and construction sites; and stock pile areas (e.g., coal or limestone piles).

(8) Documentation of Good Housekeeping Measures. You must document in your SWPPP the good housekeeping measures implemented to meet the effluent limits in Part I.D.4 of this NPDES permit.

c. Non-Storm water Discharges – You must document that you have evaluated for the presence of non-storm water discharges not authorized by an NPDES permit. Any non-storm water discharges have either been eliminated or incorporated into this permit. Documentation of non-storm water discharges shall include:

(1) A written non-storm water assessment, including the following:

(A) A certification letter stating that storm water discharges entering a water of the state have been evaluated for the presence of illicit discharges and non-storm water contributions.

(B) Detergent or solvent-based washing of equipment or vehicles that would allow washwater additives to enter any storm water only drainage system shall not be allowed at this facility unless appropriately permitted under this NPDES permit.

(C) All interior maintenance area floor drains with the potential for maintenance fluids or other materials to enter storm water only storm sewers must be either sealed, connected to a sanitary sewer with prior authorization, or appropriately permitted under this NPDES permit. The sealing, sanitary sewer connecting, or permitting of drains under this item must be documented in the written non-storm water assessment program.

(D) The certification shall include a description of the method used, the date of any testing, and the on-site drainage points that were directly observed during the test.

d. General Requirements – The SWPPP must meet the following general requirements:

(1) The plan shall be certified by a qualified professional. The term qualified professional means an individual who is trained and experienced in water treatment techniques and related fields as may be demonstrated by state registration, professional certification, or completion of course work that enable the individual to make sound, professional judgments regarding storm water control/treatment and monitoring, pollutant fate and transport, and drainage planning.

(2) The plan shall be retained at the facility and be available for review by a representative of the Commissioner upon request. IDEM may provide access to portions of your SWPPP to the public.

(3) The plan must be revised and updated as required. Revised and updated versions of the plan must be implemented on or before three hundred sixty-five (365) days from the effective date of this permit. The Commissioner may grant an extension of this time frame based on a request by the person showing reasonable cause.

(4) If the permittee has other written plans, required under applicable federal or state law, such as operation and maintenance, spill prevention control and countermeasures (SPCC), or risk contingency plans, which fulfill certain requirements of an SWPPP, these plans may be referenced, at the permittee's discretion, in the appropriate sections of the SWPPP to meet those section requirements.

(5) The permittee may combine the requirements of the SWPPP with another written plan if:

(A) The plan is retained at the facility and available for review;

(B) All the requirements of the SWPPP are contained within the plan; and

(C) A separate, labeled section is utilized in the plan for the SWPPP requirements.

F. REOPENING CLAUSES

This permit may be modified, or alternately, revoked and reissued, after public notice and opportunity for hearing:

1. to comply with any applicable effluent limitation or standard issued or approved under 301(b)(2)(C),(D) and (E), 304 (b)(2), and 307(a)(2) of the Clean Water Act, if the effluent limitation or standard so issued or approved:

   a. contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or

   b. controls any pollutant not limited in the permit.

2. to incorporate any of the reopening clause provisions cited at 327 IAC 5-2-16.

3. to include a case-specific Limit of Detection (LOD) and/or Limit of Quantitation (LOQ). The permittee must demonstrate that such action is warranted in accordance with the procedures specified under Appendix B, 40 CFR Part 136, using the most sensitive analytical methods approved by EPA under 40 CFR Part 136, or approved by the Commissioner.

4. to include effluent limitations and requirements for a revised Storm Water Pollution Prevention Plan.

5. to comply with any applicable standards, regulations and requirements issued or approved under section 316(b) of the Clean Water Act.

6. to incorporate applicable limits and/or requirements based on newly promulgated and effective Federal Effluent Limitation Guidelines for Steam Electric Generating Stations under 40 CFR 423.

PART II

STANDARD CONDITIONS FOR NPDES PERMITS

A. GENERAL CONDITIONS

1. Duty to Comply

The permittee shall comply with all terms and conditions of this permit in accordance with 327 IAC 5-2-8(1) and all other requirements of 327 IAC 5-2-8. Any permit noncompliance constitutes a violation of the Clean Water Act and IC 13 and is grounds for enforcement action or permit termination, revocation and reissuance, modification, or denial of a permit renewal application.

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of the permit.

2. Duty to Mitigate

In accordance with 327 IAC 5-2-8(3), the permittee shall take all reasonable steps to minimize or correct any adverse impact to the environment resulting from noncompliance with this permit. During periods of noncompliance, the permittee shall conduct such accelerated or additional monitoring for the affected parameters, as appropriate or as requested by IDEM, to determine the nature and impact of the noncompliance.

3. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must obtain and submit an application for renewal of this permit in accordance with 327 IAC 5-2-8(2). It is the permittee's responsibility to obtain and submit the application. In accordance with 327 IAC 5-2-3(c), the owner of the facility or operation from which a discharge of pollutants occurs is responsible for applying for and obtaining the NPDES permit, except where the facility or operation is operated by a person other than an employee of the owner in which case it is the operator's responsibility to apply for and obtain the permit. Pursuant to 327 IAC 5-3-2(a)(2), the application must be submitted at least 180 days before the expiration date of this permit. This deadline may be extended if all of the following occur:

a. permission is requested in writing before such deadline;

b. IDEM grants permission to submit the application after the deadline; and

c. the application is received no later than the permit expiration date.

4. Permit Transfers

In accordance with 327 IAC 5-2-8(4)(D), this permit is nontransferable to any person except in accordance with 327 IAC 5-2-6(c). This permit may be transferred to another person by the permittee, without modification or revocation and reissuance being required under 327 IAC 5-2-16(c)(1) or 16(e)(4), if the following occurs:

a. the current permittee notified the Commissioner at least thirty (30) days in advance of the proposed transfer date;

b. a written agreement containing a specific date of transfer of permit responsibility and coverage between the current permittee and the transferee (including acknowledgment that the existing permittee is liable for violations up to that date, and the transferee is liable for violations from that date on) is submitted to the Commissioner;

c. the transferee certifies in writing to the Commissioner their intent to operate the facility without making such material and substantial alterations or additions to the facility as would significantly change the nature or quantities of pollutants discharged and thus constitute cause for permit modification under 327 IAC 5-2-16(d). However, the Commissioner may allow a temporary transfer of the permit without permit modification for good cause, e.g., to enable the transferee to purge and empty the facility's treatment system prior to making alterations, despite the transferee's intent to make such material and substantial alterations or additions to the facility; and

d. the Commissioner, within thirty (30) days, does not notify the current permittee and the transferee of the intent to modify, revoke and reissue, or terminate the permit and to require that a new application be filed rather than agreeing to the transfer of the permit.

The Commissioner may require modification or revocation and reissuance of the permit to identify the new permittee and incorporate such other requirements as may be necessary under the Clean Water Act or state law.

5. Permit Actions

a. In accordance with 327 IAC 5-2-16(b) and 327 IAC 5-2-8(4), this permit may be modified, revoked and reissued, or terminated for cause, including, but not limited to, the following:

1. Violation of any terms or conditions of this permit;

2. Failure of the permittee to disclose fully all relevant facts or misrepresentation of any relevant facts in the application, or during the permit issuance process; or

3. A change in any condition that requires either a temporary or a permanent reduction or elimination of any discharge controlled by the permit, e.g., plant closure, termination of discharge by connection to a POTW, a change in state law that requires the reduction or elimination of the discharge, or information indicating that the permitted discharge poses a substantial threat to human health or welfare.

b. Filing of either of the following items does not stay or suspend any permit condition: (1) a request by the permittee for a permit modification, revocation and reissuance, or termination, or (2) submittal of information specified in Part II.A.3 of the permit including planned changes or anticipated noncompliance.

The permittee shall submit any information that the permittee knows or has reason to believe would constitute cause for modification or revocation and reissuance of the permit at the earliest time such information becomes available, such as plans for physical alterations or additions to the permitted facility that:

1. could significantly change the nature of, or increase the quantity of pollutants discharged; or
2. the commissioner may request to evaluate whether such cause exists.

c. In accordance with 327 IAC 5-1-3(a)(5), the permittee must also provide any information reasonably requested by the Commissioner.

6. Property Rights

Pursuant to 327 IAC 5-2-8(6) and 327 IAC 5-2-5(b), the issuance of this permit does not convey any property rights of any sort or any exclusive privileges, nor does it authorize any injury to persons or private property or invasion of other private rights, any infringement of federal, state, or local laws or regulations. The issuance of the permit also does not preempt any duty to obtain any other state, or local assent required by law for the discharge or for the construction or operation of the facility from which a discharge is made.

7. Severability

In accordance with 327 IAC 1-1-3, the provisions of this permit are severable and, if any provision of this permit or the application of any provision of this permit to any person or circumstance is held invalid, the invalidity shall not affect any other provisions or applications of the permit which can be given effect without the invalid provision or application.

8. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject to under Section 311 of the Clean Water Act.

9. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Clean Water Act or state law.

10. Penalties for Violation of Permit Conditions

Pursuant to IC 13-30-4, a person who violates any provision of this permit, the water pollution control laws; environmental management laws; or a rule or standard adopted by the Environmental Rules Board is liable for a civil penalty not to exceed twenty-five thousand dollars ($25,000) per day of any violation.

Pursuant to IC 13-30-5, a person who obstructs, delays, resists, prevents, or interferes with (1) the department; or (2) the department's personnel or designated agent in the performance of an inspection or investigation performed under IC 13-14-2-2 commits a class C infraction.

Pursuant to IC 13-30-10-1.5(e), a person who willfully or negligently violates any NPDES permit condition or filing requirement, or any applicable standards or limitations of IC 13-18-3-2.4, IC 13-18-4-5, IC 13-18-12, IC 13-18-14, IC 13-18-15, or IC 13-18-16, commits a Class A misdemeanor.

Pursuant to IC 13-30-10-1.5(i), an offense under IC 13-30-10-1.5(e) is a Level 4 felony if the person knowingly commits the offense and knows that the commission of the offense places another person in imminent danger of death or serious bodily injury. The offense becomes a Level 3 felony if it results in serious bodily injury to any person, and a Level 2 felony if it results in death to any person.

Pursuant to IC 13-30-10-1.5(g), a person who willfully or recklessly violates any applicable standards or limitations of IC 13-18-8 commits a Class B misdemeanor.

Pursuant to IC 13-30-10-1.5(h), a person who willfully or recklessly violates any applicable standards or limitations of IC 13-18-9, IC 13-18-10, or IC 13-18-10.5 commits a Class C misdemeanor.

Pursuant to IC 13-30-10-1, a person who knowingly or intentionally makes any false material statement, representation, or certification in any NPDES form, notice, or report commits a Class B misdemeanor.

11. Penalties for Tampering or Falsification

In accordance with 327 IAC 5-2-8(10), the permittee shall comply with monitoring, recording, and reporting requirements of this permit. The Clean Water Act, as well as IC 13-30-10-1, provides that any person who knowingly or intentionally (a) destroys, alters, conceals, or falsely certifies a record, (b) tampers with, falsifies, or renders inaccurate or inoperative a recording or monitoring device or method, including the data gathered from the device or method, or (c) makes a false material statement or representation in any label, manifest, record, report, or other document; all required to be maintained under the terms of a permit issued by the department commits a Class B misdemeanor.

12. Toxic Pollutants

If any applicable effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Clean Water Act for a toxic pollutant injurious to human health, and that standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be modified or revoked and reissued to conform to the toxic effluent standard or prohibition in accordance with 327 IAC 5-2-8(5). Effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants injurious to human health are effective and must be complied with, if applicable to the permittee, within the time provided in the implementing regulations, even absent permit modification.

13. Wastewater treatment plant and certified operators

The permittee shall have the wastewater treatment facilities under the responsible charge of an operator certified by the Commissioner in a classification corresponding to the classification of the wastewater treatment plant as required by IC 13-18-11-11 and 327 IAC 5-22. In order to operate a wastewater treatment plant the operator shall have qualifications as established in 327 IAC 5-22-7.

327 IAC 5-22-10.5(a) provides that a certified operator may be designated as being in responsible charge of more than one (1) wastewater treatment plant, if it can be shown that he will give adequate supervision to all units involved. Adequate supervision means that sufficient time is spent at the plant on a regular basis to assure that the certified operator is knowledgeable of the actual operations and that test reports and results are representative of the actual operations conditions. In accordance with 327 IAC 5-22-3(11), “responsible charge operator” means the person responsible for the overall daily operation, supervision, or management of a wastewater facility.

Pursuant to 327 IAC 5-22-10(4), the permittee shall notify IDEM when there is a change of the person serving as the certified operator in responsible charge of the wastewater treatment facility. The notification shall be made no later than thirty (30) days after a change in the operator.

14. Construction Permit

In accordance with IC 13-14-8-11.6, a discharger is not required to obtain a state permit for the modification or construction of a water pollution treatment or control facility if the discharger has an effective NPDES permit.

If the discharger modifies their existing water pollution treatment or control facility or constructs a new water pollution treatment or control facility for the treatment or control of any new influent pollutant or increased levels of any existing pollutant, then, within thirty (30) days after commencement of operation, the discharger shall file with the Department of Environment Management a notice of installation for the additional pollutant control equipment and a design summary of any modifications.

The notice and design summary shall be sent to the Office of Water Quality, Industrial NPDES Permits Section, 100 North Senate Avenue, Indianapolis, IN 46204-2251.

15. Inspection and Entry

In accordance with 327 IAC 5-2-8(8), the permittee shall allow the Commissioner, or an authorized representative, (including an authorized contractor acting as a representative of the Commissioner) upon the presentation of credentials and other documents as may be required by law, to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept pursuant to the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the terms and conditions of this permit;

c. Inspect at reasonable times any facilities, equipment or methods (including monitoring and control equipment), practices, or operations regulated or required pursuant to this permit; and

d. Sample or monitor at reasonable times, any discharge of pollutants or internal wastestreams for the purposes of evaluating compliance with the permit or as otherwise authorized.

16. New or Increased Discharge of Pollutants

This permit prohibits the permittee from undertaking any action that would result in a new or increased discharge of a bioaccumulative chemical of concern (BCC) or a new or increased permit limit for a regulated pollutant that is not a BCC unless one of the following is completed prior to the commencement of the action:

a. Information is submitted to the Commissioner demonstrating that the proposed new or increased discharges will not cause a significant lowering of water quality as defined under 327 IAC 2-1.3-2(50). Upon review of this information, the Commissioner may request additional information or may determine that the proposed increase is a significant lowering of water quality and require the submittal of an antidegradation demonstration.

b. An antidegradation demonstration is submitted to and approved by the Commissioner in accordance with 327 IAC 2-1.3-5 and 327 IAC 2-1.3-6.

B. MANAGEMENT REQUIREMENTS

1. Proper Operation and Maintenance

The permittee shall at all times maintain in good working order and efficiently operate all facilities and systems (and related appurtenances) for the collection and treatment which are installed or used by the permittee and which are necessary for achieving compliance with the terms and conditions of this permit in accordance with 327 IAC 5-2-8(9).

Neither 327 IAC 5-2-8(9), nor this provision, shall be construed to require the operation of installed treatment facilities that are unnecessary for achieving compliance with the terms and conditions of the permit.

2. Bypass of Treatment Facilities

Pursuant to 327 IAC 5-2-8(12), the following are requirements for bypass:

a. The following definitions:

(1) “Bypass” means the intentional diversion of a waste stream from any portion of a treatment facility.

(2) “Severe property damage” means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. The permittee may allow a bypass to occur that does not cause a violation of the effluent limitations contained in this permit, but only if it is also for essential maintenance to assure efficient operation. These bypasses are not subject to Part II.B.2.c. and d.

c. The permittee must provide the Commissioner with the following notice:

(1) If the permittee knows or should have known in advance of the need for a bypass (anticipated bypass), it shall submit prior written notice. If possible, such notice shall be provided at least ten (10) days before the date of the bypass for approval by the Commissioner.

(2) As required by 327 IAC 5-2-8(11)(C), the permittee shall orally report an unanticipated bypass that exceeds any effluent limitations in the permit within twenty-four (24) hours from the time the permittee becomes aware of such noncompliance. A written submission shall also be provided within five (5) days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times; and if the cause of noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate and prevent recurrence of the noncompliance. If a complete report is submitted by e-mail within 24 hours of the noncompliance, then that e-mail report will satisfy both the oral and written reporting requirement. E-mails should be sent to wwreports@idem.in.gov.

d. The following provisions are applicable to bypasses:

(1) Except as provided by Part II.B.2.b., bypass is prohibited, and the Commissioner may take enforcement action against a permittee for bypass, unless the following occur:

(A) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage.

(B) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment down time. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance.

(C) The permittee submitted notices as required under Part II.B.2.c.

(2) The Commissioner may approve an anticipated bypass, after considering its adverse effects, if the Commissioner determines that it will meet the conditions listed above in Part II.B.2.d.(1). The Commissioner may impose any conditions determined to be necessary to minimize any adverse effects.

e. Bypasses that result in death or acute injury or illness to animals or humans must be reported in accordance with the "Spill Response and Reporting Requirements" in 327 IAC 2-6.1, including calling 888/233-7745 as soon as possible, but within two (2) hours of discovery. However, under 327 IAC 2-6.1-3(1), when the constituents of the bypass are regulated by this permit, and death or acute injury or illness to animals or humans does not occur, the reporting requirements of 327 IAC 2-6.1 do not apply.

3. Upset Conditions

Pursuant to 327 IAC 5-2-8(13):

a. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

b. An upset shall constitute an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of Paragraph c of this section, are met.

c. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs or other relevant evidence, that:

(1) An upset occurred and the permittee has identified the specific cause(s) of the upset;

(2) The permitted facility was at the time being properly operated;

(3) The permittee complied with any remedial measures required under Part II.A.2; and

(4) The permittee submitted notice of the upset as required in the "Twenty-Four Hour Reporting Requirements," Part II.C.3, or 327 IAC 2-6.1, whichever is applicable. However, under 327 IAC 2-6.1-3(1), when the constituents of the discharge are regulated by this permit, and death or acute injury or illness to animals or humans does not occur, the reporting requirements of 327 IAC 2-6.1 do not apply.

d. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof pursuant to 40 CFR 122.41(n)(4).

4. Removed Substances

Solids, sludges, filter backwash, or other pollutants removed from or resulting from treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering waters of the State and to be in compliance with all Indiana statutes and regulations relative to liquid and/or solid waste disposal. The discharge of pollutants in treated wastewater is allowed in compliance with the applicable effluent limitations in Part I. of this permit.

C. REPORTING REQUIREMENTS

1. Planned Changes in Facility or Discharge

Pursuant to 327 IAC 5-2-8(11)(F), the permittee shall give notice to the Commissioner as soon as possible of any planned physical alterations or additions to the permitted facility. In this context, permitted facility refers to a point source discharge, not a wastewater treatment facility. Notice is required only when either of the following applies:

a. The alteration or addition may meet one of the criteria for determining whether the facility is a new source as defined in 327 IAC 5-1.5.

b. The alteration or addition could significantly change the nature of, or increase the quantity of, pollutants discharged. This notification applies to pollutants that are subject neither to effluent limitations in Part I.A. nor to notification requirements in Part II.C.9. of this permit.

Following such notice, the permit may be modified to revise existing pollutant limitations and/or to specify and limit any pollutants not previously limited.

2. Monitoring Reports

Pursuant to 327 IAC 5-2-8(10) and 327 IAC 5-2-13 through 15, monitoring results shall be reported at the intervals and in the form specified in "Monthly Reporting", Part I.C.2.

3. Twenty-Four Hour Reporting Requirements

Pursuant to 327 IAC 5-2-8(11)(C), the permittee shall orally report to the Commissioner information on the following types of noncompliance within 24 hours from the time permittee becomes aware of such noncompliance. If the noncompliance meets the requirements of item b (Part II.C.3.b) or 327 IAC 2-6.1, then the report shall be made within those prescribed time frames. However, under 327 IAC 2-6.1-3(1), when the constituents of the discharge that is in noncompliance are regulated by this permit, and death or acute injury or illness to animals or humans does not occur, the reporting requirements of 327 IAC 2-6.1 do not apply.

a. Any unanticipated bypass which exceeds any effluent limitation in the permit;

b. Any noncompliance which may pose a significant danger to human health or the environment. Reports under this item shall be made as soon as the permittee becomes aware of the noncomplying circumstances;

c. Any upset (as defined in Part II.B.3 above) that causes an exceedance of any effluent limitation in the permit; or

d. Violation of a maximum daily discharge limitation for any of the following toxic pollutants or hazardous substances: Chromium, Zinc, Mercury.

The permittee can make the oral reports by calling (317)232-8670 during regular business hours and asking for the Compliance Data Section or by calling (317) 233-7745 ((888)233-7745 toll free in Indiana) during non-business hours. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and, if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce and eliminate the noncompliance and prevent its recurrence. The Commissioner may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

Alternatively the permittee may submit a "Bypass/Overflow Report" (State Form 48373) or a "Noncompliance 24-Hour Notification Report" (State Form 52415), whichever is appropriate, to IDEM at (317) 232-8637 or wwreports@idem.in.gov. If a complete e-mail submittal is sent within 24 hours of the time that the permittee became aware of the occurrence, then the email report will satisfy both the oral and written reporting requirements.

4. Other Compliance/Noncompliance Reporting

Pursuant to 327 IAC 5-2-8(11)(D), the permittee shall report any instance of noncompliance not reported under the "Twenty-Four Hour Reporting Requirements" in Part II.C.3, or any compliance schedules at the time the pertinent Discharge Monitoring Report is submitted. The report shall contain the information specified in Part II.C.3;

The permittee shall also give advance notice to the Commissioner of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements; and

All reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.

5. Other Information

Pursuant to 327 IAC 5-2-8(11)(E), where the permittee becomes aware of a failure to submit any relevant facts or submitted incorrect information in a permit application or in any report, the permittee shall promptly submit such facts or corrected information to the Commissioner.

6. Signatory Requirements

Pursuant to 327 IAC 5-2-22 and 327 IAC 5-2-8(15):

a. All reports required by the permit and other information requested by the Commissioner shall be signed and certified by a person described below or by a duly authorized representative of that person:

(1) For a corporation: by a responsible corporate officer. A "responsible corporate officer" means either of the following:

a. A president, secretary, treasurer, any vice president of the corporation in charge of a principal business function, or any other person who performs similar policymaking or decision making functions for the corporation; or

b. The manager of one (1) or more manufacturing, production, or operating facilities provided the manager is authorized to make management decisions that govern the operation of the regulated facility including having the explicit or implicit duty to make major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(2) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or

(3) For a Federal, State, or local governmental body or any agency or political subdivision thereof: by either a principal executive officer or ranking elected official.

b. A person is a duly authorized representative only if:

(1) The authorization is made in writing by a person described above.

(2) The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, or position of equivalent responsibility. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.); and

(3) The authorization is submitted to the Commissioner.

c. Electronic Signatures. If documents described in this section are submitted electronically by or on behalf of the NPDES-regulated facility, any person providing the electronic signature for such documents shall meet all relevant requirements of this section, and shall ensure that all of the relevant requirements of 40 CFR part 3 (including, in all cases, subpart D to part 3) (Cross-Media Electronic Reporting) and 40 CFR part 127 (NPDES Electronic Reporting Requirements) are met for that submission.

d. Certification. Any person signing a document identified under Part II.C.6., shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

7. Availability of Reports

Except for data determined to be confidential under 327 IAC 12.1, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Indiana Department of Environmental Management and the Regional Administrator. As required by the Clean Water Act, permit applications, permits, and effluent data shall not be considered confidential.

8. Penalties for Falsification of Reports

IC 13-30 and 327 IAC 5-2-8(15) provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance, shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 180 days per violation, or by both.

9. Changes in Discharge of Toxic Substances

Pursuant to 327 IAC 5-2-9, the permittee shall notify the Commissioner as soon as it knows or has reason to know:

a. That any activity has occurred or will occur which would result in the discharge of any toxic pollutant that is not limited in the permit if that discharge will exceed the highest of the following notification levels.

(1) One hundred micrograms per liter (100 µg/l);

(2) Two hundred micrograms per liter (200 µg/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 µg/l) for 2,4-dinitrophenol and 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;

(3) Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

(4) A notification level established by the Commissioner on a case-by-case basis, either at the Commissioner's own initiative or upon a petition by the permittee. This notification level may exceed the level specified in subdivisions (1), (2), or (3) but may not exceed the level which can be achieved by the technology-based treatment requirements applicable to the permittee under the CWA (see 327 IAC 5-5-2).

b. That it has begun or expects to begin to use or manufacture, as an intermediate or final product or byproduct, any toxic pollutant that was not reported in the permit application under 40 CFR 122.21(g)(9). However, this subsection b. does not apply to the permittee's use or manufacture of a toxic pollutant solely under research or laboratory conditions.

10. Future Electronic Reporting Requirements

IDEM is currently developing the technology and infrastructure necessary to allow compliance with the EPA Phase 2 e-reporting requirements per 40 CFR 127.16 and to allow electronic reporting of applications, notices, plans, reports, and other information not covered by the federal e-reporting regulations.

IDEM will notify the permittee when IDEM's e-reporting system is ready for use for one or more applications, notices, plans, reports, or other information. This IDEM notice will identify the specific applications, notices, plans, reports, or other information that are to be submitted electronically and the permittee will be required to use the IDEM electronic reporting system to submit the identified application(s), notice(s), plan(s), report(s), or other information.

See Part I.C.2. of this permit for the current electronic reporting requirements for the submittal of monthly monitoring reports such as the Discharge Monitoring Report (DMR) and the Monthly Monitoring Report (MMR).

PART III
Other Requirements

A. Polychlorinated Biphenyl

There shall be no discharge of polychlorinated biphenyl (PCBs) compounds such as those commonly used for transformer fluid.

Many electrical transformers manufactured prior to 1978 contained PCBs. Therefore, in order to determine compliance with the PCB prohibition, the permittee shall provide the following PCB* data for Outfall 001 within twelve (12) months of the effective date of the permit. The permittee shall submit the data to the Industrial NPDES Permit Section at OWQWWPER@idem.in.gov and the Compliance Branch at wwReports@idem.in.gov.

Parameter	Test Method	LOD	LOQ
*Total PCBs	608	0.1 ug/l	0.3 ug/l

*Total PCBs is the sum of the following aroclors: PCB-1016, PCB-1221, PCB-1232, PCB-1242, PCB-1248, PCB-1254, and PCB-1260.

Part IV
Cooling Water Intake Structures

A. Best Technology Available (BTA) Determination

In accordance with 40 CFR 401.14, the location, design, construction and capacity of cooling water intake structures of any point source for which a standard is established pursuant to section 301 or 306 of the Clean Water Act (CWA) shall reflect the best technology available for minimizing adverse environmental impact.

The EPA promulgated a CWA section 316(b) regulation on August 15, 2014, which became effective on October 14, 2014. 79 Fed. Reg. 48300-439 (August 15, 2014). This regulation established application requirements and standards for cooling water intake structures. The regulation is applicable to point sources with a cumulative design intake flow (DIF) greater than 2 MGD where 25% or more of the water withdrawn (using the actual intake flow (AIF)) is used exclusively for cooling purposes. The regulation establishes best technology available (BTA) standards to reduce impingement and entrainment of aquatic organisms at existing power generation and manufacturing facilities.

Impingement is the process by which fish and other aquatic organisms are trapped and often killed or injured when they are pulled against the cooling water intake structures (CWIS's) outer structure or screens as water is withdrawn from a water body. Entrainment is the process by which fish larvae and eggs and other aquatic organisms in the intake flow enter and pass through a CWIS and into a cooling water system, including the condenser or heat exchanger, which often results in the injury or the death of the organisms (see definitions at 40 CFR § 125.92(h) and (n)).

The R.M. Schahfer facility's design intake flow (DIF) rate is 57.7 MGD, almost all of which is used for non-contact cooling water. Therefore, since the facility has a DIF greater than 2 MGD, and because the percentage of flow used at the facility exclusively for cooling is greater than 25%, the facility is required to meet the BTA standards for impingement mortality and entrainment, including any measures to protect Federally-listed threatened and endangered species and designated critical habitat established under 40 CFR 125.94(g).

Based on available information, IDEM has determined that the impingement BTA option for the operation of a cooling water intake structure (CWIS) with a maximum actual through screen intake velocity of 0.5 fps will result in compliance with the BTA to minimize adverse environmental impact from impingement. Further, IDEM has determined that the existing facility meets BTA for entrainment. Primary in this entrainment BTA determination is that the facility will cease operations no later than December 31, 2023 and the permittee does have closed-cycle cooling via a single multi-cell mechanical draft cooling tower on each unit which has allowed the permittee to achieve substantial reductions in water usage.

B. Permit Requirements

The permittee must comply with requirements below:

1. In accordance with 40 CFR 125.98(b)(1), nothing in this permit authorizes take for the purposes of a facility's compliance with the Endangered Species Act.

2. The permittee must at all times properly operate and maintain the cooling water intake structure and associated intake equipment.

3. The permittee must inform IDEM of any proposed changes to the CWIS or proposed changes to operations at the facility that affect the information taken into account in the current BTA evaluation.

4. There shall be no discharge of intake screen backwash.

5. In accordance with 40 CFR 125.97(c), by January 31 of each year, the permittee must submit to Industrial NPDES Permit Section IDEM-OWQ an annual certification statement for the preceding calendar year signed by the responsible corporate officer as defined in §122.22 (see 327 IAC 5-2-22) subject to the following:

    a. If the information contained in the previous year's annual certification is still pertinent, you may simply state as such in a letter to IDEM and the letter, along with any applicable data submission requirements specified in this section shall constitute the annual certification.

    b. If you have substantially modified operation of any unit at your facility that impacts cooling water withdrawals or operation of your cooling water intake structures, you must provide a summary of those changes in the report. In addition, you must submit revisions to the information required at §122.21(r) of this chapter in your next permit application.

6. Best technology available (BTA) determinations for entrainment mortality and impingement mortality at cooling water intake structures will be made in each permit reissuance, in accordance with 40 CFR 125.90-98. The permittee shall submit all the information required by the applicable provisions of 40 CFR 122.21(r)(2) through (r)(8) with the next renewal application. Since the permittee has submitted the studies required by 40 CFR 122.21(r), the permittee may, in subsequent renewal applications pursuant to 40 CFR 125.95(c), request to reduce the information required, if conditions at the facility and in the waterbody remain substantially unchanged since the previous application so long as the relevant previously submitted information remains representative of current source water, intake structure, cooling water system, and operating conditions. Any habitat designated as critical or species listed as threatened or endangered after issuance of the current permit whose range of habitat or designated critical habitat includes waters where a facility intake is located constitutes potential for a substantial change that

must be addressed by the owner/operator in subsequent permit applications, unless the facility received an exemption pursuant to 16 U.S.C. 1536(o) or a permit pursuant to 16 U.S.C. 1539(a) or there is no reasonable expectation of take. The permittee must submit a request for reduced cooling water intake structure and waterbody application information at least **two years and six months** prior to the expiration of its NPDES permit. The request must identify each element in 40 CFR 122.21(r) that it determines has not substantially changed since the previous permit application and the basis for the determination. IDEM has the discretion to accept or reject any part of the request.

7. The permittee must maintain an intake daily flow rate of 39 MGD or less. Further, the permittee shall submit an annual summary of the actual intake flows measured at a minimum frequency of daily.

8. The permittee must monitor the velocity at the screen at a minimum frequency of daily. In lieu of velocity monitoring at the screen face, the permittee may calculate the through-screen velocity using water flow, water depth, and the screen open areas.

9. The permittee must monitor and report its cycles of concentration at a minimum frequency of daily.

10. The permittee shall either conduct visual inspections or employ remote monitoring devices during the period the cooling water intake structure is in operation as required by 40 CFR 125.96(e). The permittee shall conduct such inspections at least weekly to ensure that any technologies operated to comply with 40 CFR 125.94 are maintained and operated to function as designed including those installed to protect Federally-listed threatened or endangered species or designated critical habitat. Alternative procedures can be approved if this requirement is not feasible (e.g., an offshore intake, velocity cap, or during periods of inclement weather).

11. The permittee shall submit and maintain all the information required by the applicable provisions of 40 CFR 125.97.

12. All required reports shall be submitted to the IDEM, Office of Water Quality, NPDES Permits Branch, Industrial NPDES Permit Section at OWQWWPER@idem.in.gov and the Compliance Branch at wwReports@idem.in.gov

National Pollutant Discharge Elimination System
Fact Sheet for
Northern Indiana Public Service Company LLC (NIPSCO)
R.M. Schahfer Generating Station
Draft: July 2020
Final: September 2020

Indiana Department of Environmental Management
100 North Senate Avenue
Indianapolis, Indiana 46204
(317) 232-8603
Toll Free (800) 451-6027
www.idem.IN.gov

Permittee:	Northern Indiana Public Service Company LLC (NIPSCO) R.M. Schahfer Generating Station 2723 E. 1500 N. Wheatfield, IN 46392
Existing Permit Information:	Permit Number: IN0053201 Expiration Date: September 30, 2020
Facility Contact:	Nicholas Babbitt 219-956-5385 nbabbitt@nisource.com
Facility Location:	2723 East 1500 North Wheatfield, IN 46392 Jasper County
Receiving Stream(s):	Kankakee River (Outfall 001 and 002), Davis Ditch and Stalbaum Ditch (storm water Outfalls)
GLI/Non-GLI:	Non-GLI
Proposed Permit Action:	Renew
Date Application Received:	April 3, 2020
Source Category	NPDES Major– Industrial
Permit Writer:	Trisha Williams (317)234-8210, twilliam@idem.in.gov

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1.0 INTRODUCTION

The Indiana Department of Environmental Management (IDEM) received a National Pollutant Discharge Elimination System (NPDES) Permit application from the Northern Indiana Public Service Company LLC (NIPSCO) R.M. Schahfer Generating Station on April 3, 2020.

In accordance with 327 IAC 5-2-6(a), the current five-year permit was issued with an effective date of October 1, 2015. A five-year permit is proposed in accordance with 327 IAC 5-2-6(a).

The Federal Water Pollution Control Act (more commonly known as the Clean Water Act), as amended, (Title 33 of the United States Code (U.S.C.) Section 1251 *et seq.*), requires an NPDES permit for the discharge of pollutants into surface waters. Furthermore, Indiana law requires a permit to control or limit the discharge of any contaminants into state waters or into a publicly owned treatment works. This proposed permit action by IDEM complies with and implements these federal and state requirements.

In accordance with Title 40 of the Code of Federal Regulations (CFR) Sections 124.8 and 124.56, as well as Title 327 of the Indiana Administrative Code (IAC) Article 5-3-8, a Fact Sheet is required for certain NPDES permits. This document fulfills the requirements established in these regulations. This Fact Sheet was prepared in order to document the factors considered in the development of NPDES Permit effluent limitations. The technical basis for the Fact Sheet may consist of evaluations of promulgated effluent guidelines, existing effluent quality, receiving water conditions, Indiana water quality standards-based wasteload allocations, and other information available to IDEM. Decisions to award variances to Water Quality Standards or promulgated effluent guidelines are justified in the Fact Sheet where necessary.

2.0 FACILITY DESCRIPTION

2.1 General

Effective February 16, 2018, the Northern Indiana Public Service Company, a domestic corporation, converted to a limited liability company, with the new name Northern Indiana Public Service Company LLC.

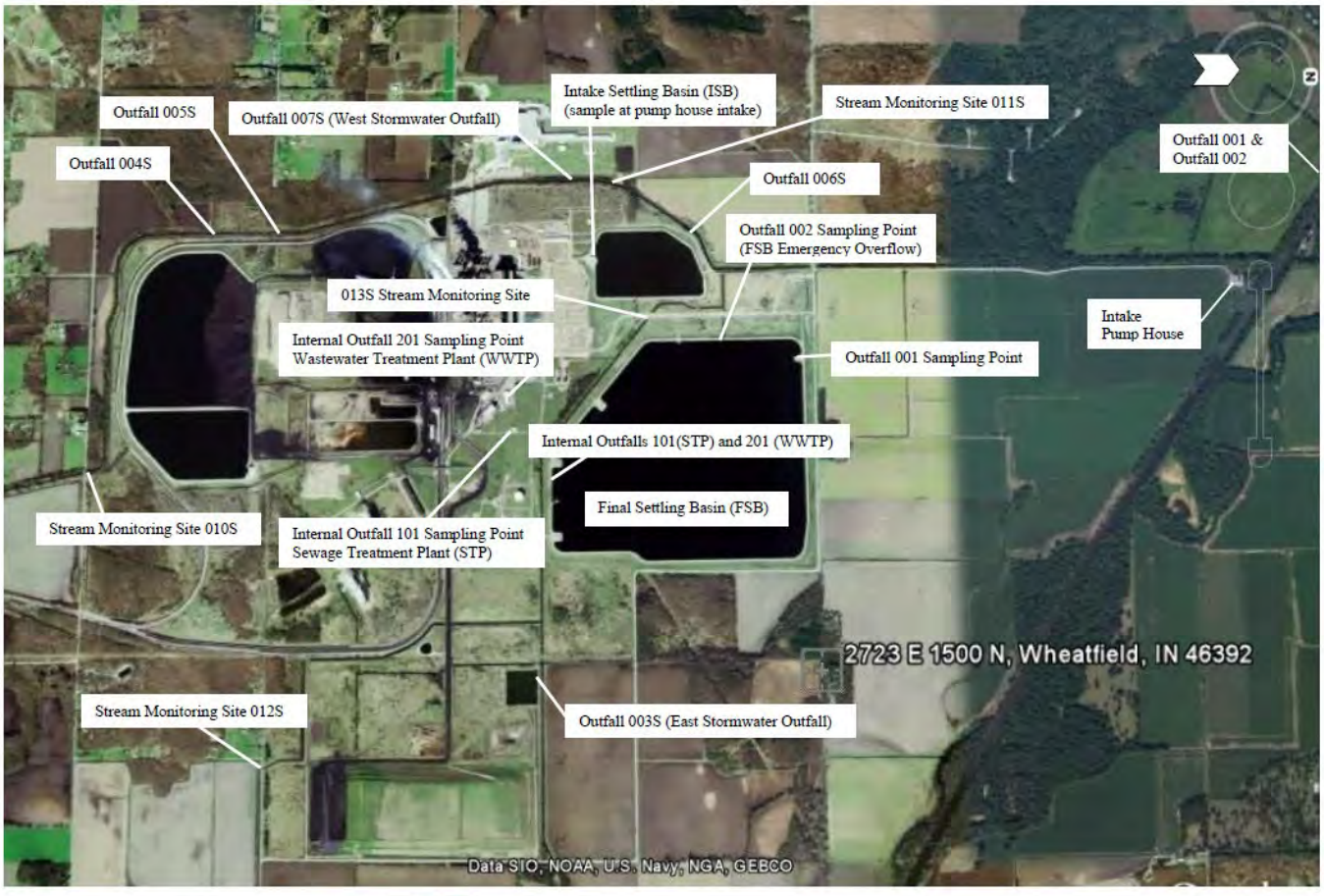
Northern Indiana Public Service Company LLC (NIPSCO) R.M. Schahfer Generating Station is classified under Standard Industrial Classification (SIC) Code 4911- Electric Power Services.

NIPSCO - R.M. Schahfer Generating Station is natural gas and coal fired power steam electric generation facility, in Wheatfield, Indiana, Jasper County. The coal-fired boilers convert water into high pressure steam which drives turbines that are connected to electrical generators. There are four (4) coal-fired steam generating units (14, 15, 17, and 18) and two natural gas-fired combustion turbine peaking units (16A & B) located at the facility. The total coal fired production capacity of the station is 1,625 megawatts (MW). Units 16A & B can produce approximately 155 megawatts (MW) total.

Intake water is withdrawn from the Kankakee River at a location approximately one (1) mile north of the facility and is then discharged into the Intake Basin (IB). The IB has supply and bypass lines to various unit service water systems. The largest portion of water used at the plant is condenser cooling water, which is recirculated through cooling towers and discharged to the Final Basin (FB). A number of waste streams discharge internally to the FB and can be reused/recycled to the cooling towers or other systems. The FB discharges to the Kankakee River via Outfall 001. The FB also has an emergency overflow, Outfall 002, which may discharge to the Kankakee River via Davis Ditch.

A map showing the location of the facility has been included as Figure 1.

Figure 1: Facility Location



NIPSCO NIPSCO R.M. Schahfer Generating Station
FIGURE 1. SITE LOCATION MAP - Outfall, Stormwater and Stream Monitoring Site Locations

2723 East 1500 N
Wheatfield, IN 46392
Jasper County

2.2 Outfall Locations

Table 1. Inventory of Process and Stormwater Outfalls

Location Identification	Description	Location Latitude/ Longitude	Receiving Water
Outfall 001	Cooling tower blowdown, treated sanitary wastewater (Outfall 101), treated FGD wastewater (Outfall 201), low volume wastes, bottom ash transport water, coal pipe run-off, construction dewatering water, and stormwater	N 41° 15' 2.34" W 87° 1' 40.55"	Kankakee River
Outfall 002	Outfall 001 Emergency Overflow	N 41° 13' 35.87" W 87° 1' 18.43"	Kankakee River
Outfall 101	Treated Sanitary Wastewater	N 41° 15' 2.34" W 87° 0' 40.55"	Kankakee River via Outfall 001
Outfall 201	Treated Landfill Leachate and FGD Wastewater from Units 14/15	N 41° 13' 3" W 87° 1' 14"	Kankakee River via Outfall 001
Outfall 003S	Stormwater associated with industrial activity; surface water runoff from a perimeter storm water network from the onsite restricted waste landfill	N 41° 13' 8.55" W 87° 0' 20"	Stalbaum Ditch
Outfall 004S	Stormwater associated with industrial activity; drainage from coal car tracks exiting the plant and the perimeter security road (representative of Outfalls 005S and 006S)	N 41° 12' 22" W 87° 1' 38"	Davis Ditch
Outfall 005S	Stormwater associated with industrial activity; drainage from coal car tracks exiting the plant and the perimeter security road	N 41° 12' 31" W 87° 1' 38"	Davis Ditch
Outfall 006S	Stormwater associated with industrial activity; drainage for the perimeter security road and emergency overflow from the Intake Basin	N 41° 13' 31" W 87° 1' 36"	Davis Ditch
Outfall 007S	Stormwater associated with industrial activity; roof drain runoff and storm water collected from the area surrounding the main buildings of the generating facility	N 41° 12' 17.46" W 87° 1' 47.3"	Davis Ditch

Internal Outfall 301 is proposed in this permit; therefore, the coordinates are not known at this time.

2.3 Wastewater Treatment

Outfall 001 (primary) and 002 (emergency overflow):

The sources of wastewater contributing to these outfalls are cooling tower blowdown, treated sanitary wastewater from internal Outfall 101, treated flue gas desulfurization (FGD) wastewater from internal Outfall 201, FGD blowdown wastewaters from proposed internal Outfall 301, low volume wastes, bottom ash transport water, coal pile runoff, construction dewatering water, and storm water. Treatment includes sedimentation and dechlorination.

The wastewater treatment system has an average discharge of approximately 20.3 MGD and a maximum monthly discharge of 21.6 MGD, based on the recent 2-year period from April 2018 to April 2020 data from DMR/MMR Reports.

Internal Outfall 101:

The discharge from internal Outfall 101 consists of treated sanitary wastewater only. Treatment includes pre-aeration, activated sludge, sedimentation and UV disinfection. No chemical treatment is currently provided for sanitary wastewaters. The average long-term effluent flow from internal Outfall 101 has been 0.009 MGD per Form 2C.

Internal Outfalls 201 (Existing) and 301 (Proposed):

Internal Outfall 201 discharges effluent from a refurbished and upgraded former wastewater treatment plant (WWTP) which is designed to treat the blowdown from the FGD scrubbers for Units 14 and 15 prior to discharge to the Final Basin via internal Outfall 201. The wastewater treatment process at this treatment plant consists of neutralization, chemical precipitation, coagulation, flocculation, sedimentation, and filtration. The treatment plant includes an equalization tank, reaction tank, clarifier, effluent sand filter, and an additional mercury polishing step. Sludge thickening and dewatering technologies are also utilized. Currently, the discharge from internal Outfall 201 consists of treated Unit 14 FGD blowdown only.

The maximum daily effluent value from internal Outfall 201 has been 0.4275 MGD and the long-term average value has been reported to be 0.05 MGD. The FGD WWTP treats the blowdown from Units 14 and 15, as well as FGD Landfill Leachate. A Flow Diagram for FGD WWTP is provided in Figure 3.

Electric Generating Units 17 and 18 FGD systems operate as limestone forced oxidation systems producing synthetic gypsum, a byproduct with beneficial re-use. Boiler slag from Unit 14 and bottom ash from Units 15, 17, and 18 is quenched and is sent to the Waste Disposal Area. Boiler slag is commercially marketed for re-use and bottom ash from Units 15, 17, and 18 is used as construction material in the on-site coal ash landfill. Bottom ash and conditioned (wetted) fly ash from Units 14, 17, and 18 are landfilled on-site, while the fly ash from Unit 15 is marketed for beneficial re-use. The FGD system blowdown from Units 17 and 18 is currently discharged to the Material Storage Runoff Basin (MSRB) and settled before discharging to the FB. As currently designed, the Unit 17/18 FGD system discharges may comingle with non-FGD

related wastewaters in the MSRB as shown in the flow diagram provided by the facility. A requirement for a new internal monitoring (internal Outfall 301) is proposed in this permit to be located prior to the FGD blowdown wastewaters from Units 17 and 18 commingling with non-FGD wastewater in the MSRB.

A Water Flow Diagram has been included as Figure 2. An FGD Treatment System Water Flow Diagram has been included as Figure 3.

Figure 2: Water Flow Diagram

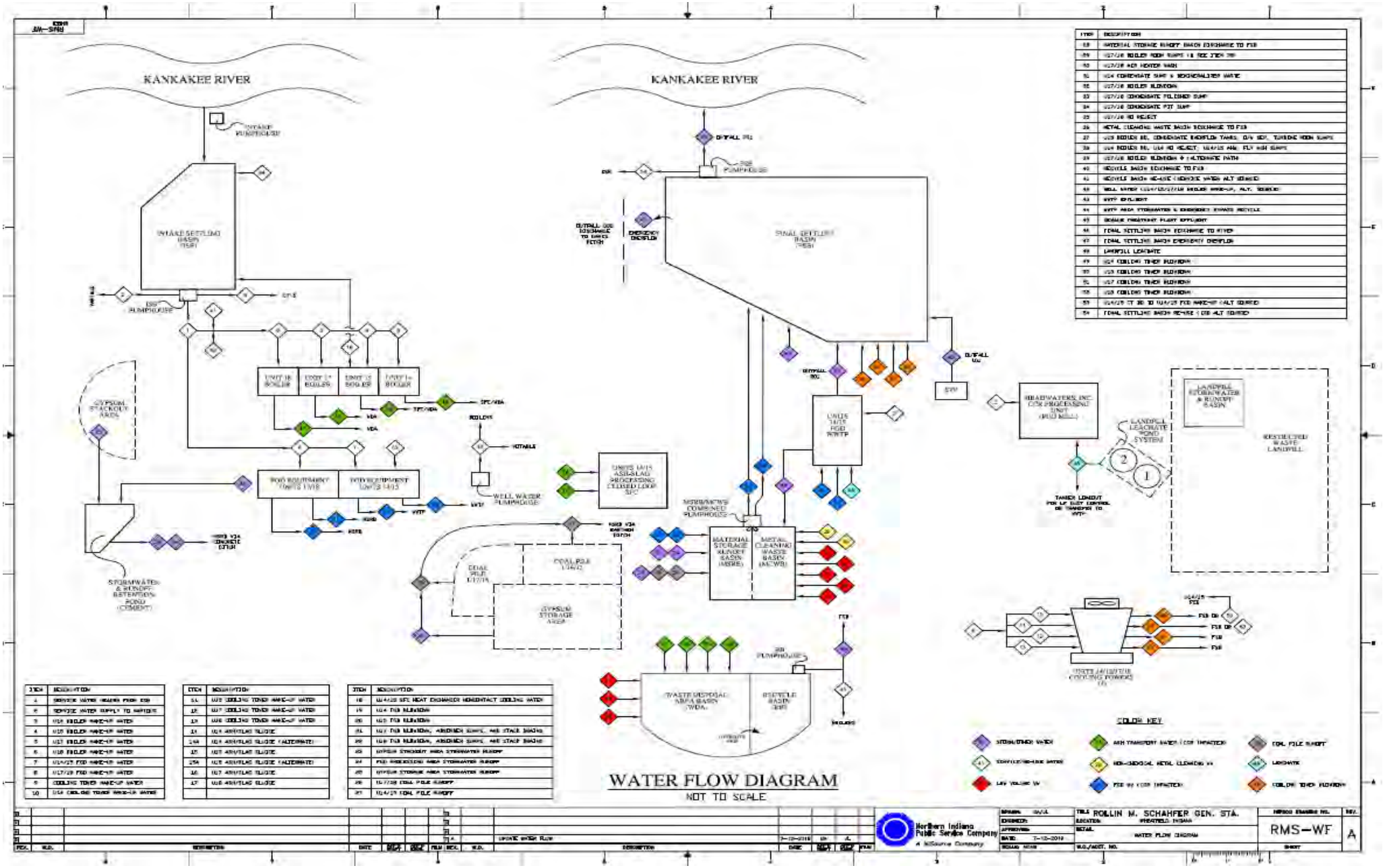
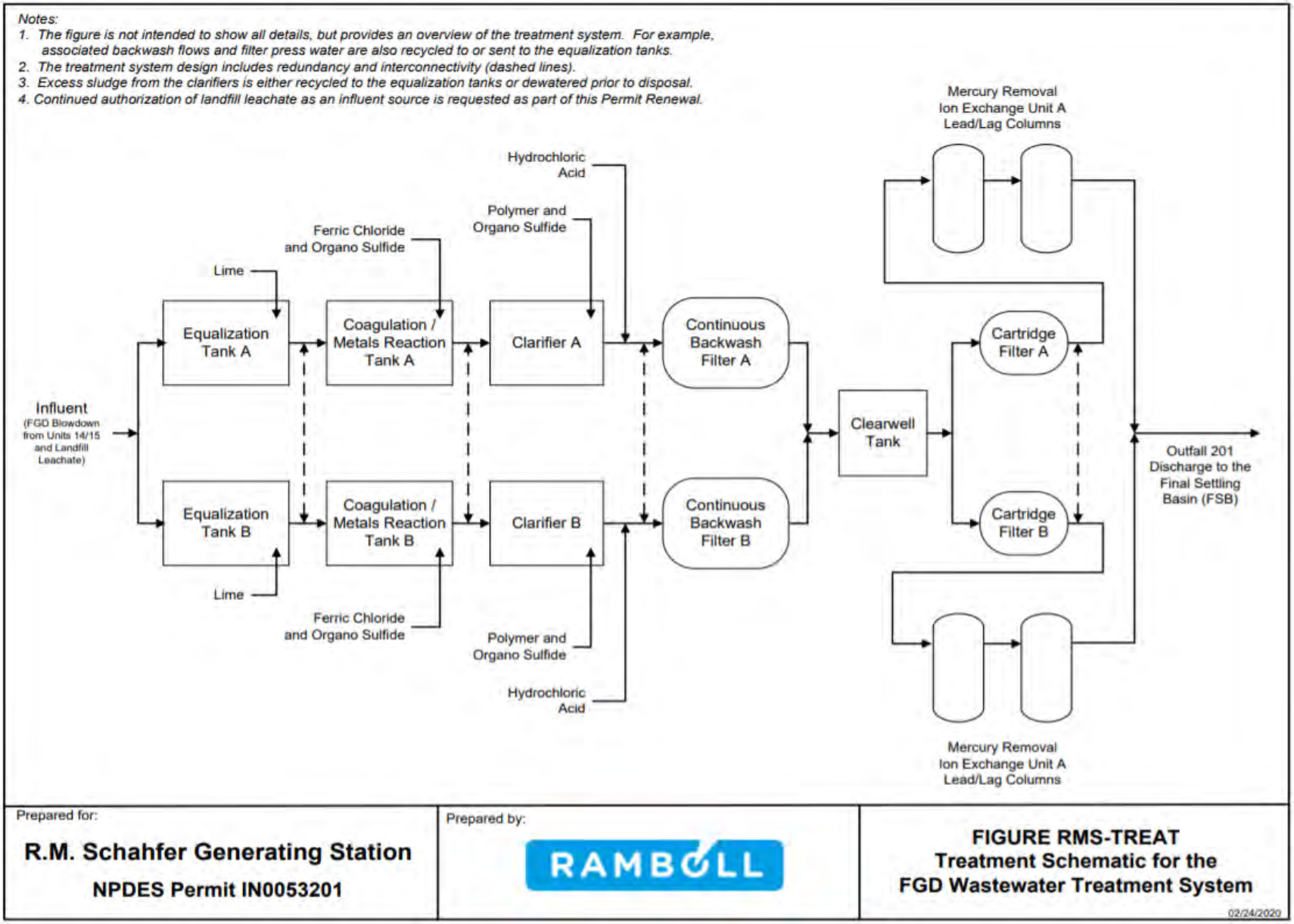


Figure 3. FGD Wastewater Treatment System Flow Diagram



The permittee shall have the wastewater treatment facilities under the responsible charge of an operator certified by the Commissioner in a classification corresponding to the classification of the wastewater treatment plant as required by IC 13-18-11-11 and 327 IAC 5-22-5. In order to operate a wastewater treatment plant, the operator shall have qualifications as established in 327 IAC 5-22-7. IDEM has given the permittee a Class D industrial wastewater treatment plant classification.

2.4 Changes in Operation

Announced through NIPSCO's 2018 Integrated Resource Plan released October 31, 2018, the Northern Indiana Public Service Company LLC has publicly announced the planned retirement of all coal-fired generation at the R.M. Schahfer Generating Station (RMSGS). Actions supporting this goal have already been initiated. The short-term action plan includes the initiation of activities in preparation for the retirement of RMSGS Units 14, 15, 17, and 18 by 2023, thereby aligning with NIPSCO's long term action plan to fully retire the RMSGS Units 14, 15, 17, and 18 by the end of 2023.

To implement the Coal Combustion Residual (CCR) rule compliance plan for NIPSCO-RMSGS, piping will be rerouted from the Metal Cleaning Waste Basin (MCWB) and MSRB, collectively referred to as the Multicell Unit (MCU), to the larger Waste Disposal Area (WDA) or Recycle Basin (RB). Engineering design is currently being finalized. The following information is PROPOSED / DRAFT and subject to change pursuant to final engineering specifications. CCR waste streams (FGD blowdown from Units 17 and 18 [i.e. U17/18 FGD WW]) currently going to the MCU will be routed to the WDA. Non-CCR waste streams currently going to the MCU will be routed to the RB. Pipe redirects will employ a combination of new and existing collection sumps, as well as new and existing pipelines. Work also includes the installation of an additional crosstie between the RB discharge lines and the MSRB/MCWB discharge line to the Final Settling Basin (FSB) to allow for greater blowdown capacity to the FSB. The following table presents the disposition of the waste streams to be redirected and the peak flow rates from their respective sources. The peak flows rates can occur simultaneously; although most are intermittent, except for the FGD Filter Building Sump Pumps which always have some level of flow in order to minimize solids deposition.

Table 3. Draft Waste Stream Pipe Redirect Summary

Contributing Streams	Re-Piped from WDA to Recycle Basin	Re-Piped To Recycle Basin via Coal Pile Runoff (CPR) Sump	Re-Piped To WDA via Existing Ash Piping[1]
	(gpm)	(gpm)	(gpm)
Non-CCR Streams to (WDA)			
Yard Drains	1,200		
U14 Boiler Room Sump	4,000		
U14 Boiler Room Sump	3,000		
Material Storage Runoff Basin (MSRB) Streams			
U17 & 18 FGD Filter Building North Sump			1,500
U17 & 18 FGD Filter Building South Sump			1,500
Coal Pile Run Off		6,000	
Unit 14/15 Chimney Drain[2]		0	
Run Off Retention Pond		500	
Metal Cleaning Waste Basin (MCWB) Streams			
U17 Fly Ash Truck Scale Sump		200	
U18 Fly Ash Truck Scale Sump		200	
U14 Fly Ash Silo Sump		200	
U17/18 Chimney Drain		125	
U14 Waste Neutralization		450	
U17 Make Up Demineralizer Sump		400	
U17/18 Metal Cleaning Waste Sumps		3,400	
U14/15 WWT Emergency Bypass			0
U14/15 Storm Water Run Off[3]		820	
Totals	8,200	12,295	3,000

[1] Deleted
[2] NIPSCO confirmed U14/15 Chimney Drain had no flow. This pipe will be capped.
[3] The U14/15 WWT Emergency Bypass and Storm Water Runoff currently discharge to the MCWB through a common line. The storm Water flow will be redirected to the Recycle Pond and the WWT Emergency Bypass will be disconnected.

2.5 Facility Storm Water

The facility is located within a mile of the Kankakee River with shallow groundwater and a potential for periodic flooding. It has been identified that the groundwater in the area of the Restricted Waste Site Type I Landfill (RWS I), that accepts FGD Sludge and Coal Ash, has been impacted by a showing of elevated levels of sodium, sulfate, and specific conductance.

The shallow groundwater has the potential to discharge to surface water by way of the two (2) primary drainage ditches (Stalbaum Ditch and Davis Ditch) that flow through the property. Therefore, Outfalls 004S and 007S, and Stream Monitoring Sites (SMS) 010S and 011S shall monitor for storm water in Davis Ditch. Outfall 004S discharge shall be representative of discharge from Outfalls 005S and 006S.

Outfalls 004S and 005S provide drainage from coal car tracks exiting the plant and the perimeter security road. Outfall 006S provides drainage for a different section of the perimeter security road and emergency overflow from the IB. Outfall 007S consists of roof drain runoff and storm water collected from the area surrounding the main buildings of the generating facility. Outfalls 003S and SMS 012S and 013S shall monitor for storm water in Stalbaum Ditch. Outfall 003S is surface water runoff from a perimeter storm

water network from the onsite restricted waste landfill. To date, no discharge from Outfall 003S has been reported.

Table 2. Stream Monitoring Sites

Location Identification	Description	Location Latitude/ Longitude
SMS 010S	Stormwater in Davis Ditch	N 41° 12' 5.22" W 87° 0' 56.4"
SMS 011S	Stormwater in Davis Ditch	N 41° 13' 19.21" W 87° 1' 47.3"
SMS 012S	Stormwater in Stalbaum Ditch	N 41° 12' 29.88" W 87° 0' 3.9"
SMS 013S	Stormwater in Stalbaum Ditch	N 41° 13' 24.52" W 87° 1' 21.3"

-+

3.0 PERMIT HISTORY

3.1 Compliance History

The purpose of this section is to summarize any violations and enforcement actions associated with the permit.

A review of this facility's discharge monitoring data was conducted for compliance verification and shows the following permit limitation violations at Outfall 001 and 101 between April 2015 and April 2020. There are no pending or current enforcement actions regarding this NPDES permit.

Outfall 001: Exceedances in TSS
Outfall 101: Exceedances in TSS, *E. coli*, and $CBOD_5$

4.0 LOCATION OF DISCHARGE/RECEIVING WATER USE DESIGNATION

The receiving stream for Outfalls 001 and 002 is the Kankakee River. The $Q_{7, 10}$ low flow value of the Kankakee River is 294 cfs and shall be capable of supporting a well-balanced warm water aquatic community and full body contact recreation in accordance with 327 IAC 2-1-3.

Shallow groundwater has the potential to discharge to surface water by way of the two (2) primary drainage ditches (Stalbaum Ditch and Davis Ditch) that flow through the property. The $Q_{7, 10}$ low flow values of the Stalbaum Ditch and Davis Ditch are 0.0 cfs.

The permittee discharges to a waterbody that has been identified as a water of the state that is not within the Great Lakes system. Therefore, it is subject to water-quality standards and the procedures to calculate and incorporate water quality-based effluent limitations specific to dischargers not discharging to waters within the Great Lakes system under 327 IAC 2-1 and 327 IAC 5-2-11.1.

4.1 Total Maximum Daily Loads (TMDLs)

Section 303(d) of the Clean Water Act requires states to identify waters, through their Section 305(b) water quality assessments, that do not or are not expected to meet applicable water quality standards with federal technology based standards alone. States are also required to develop a priority ranking for these waters taking into account the severity of the pollution and the designated uses of the waters. Once this listing and ranking of impaired waters is completed, the states are required to develop Total Maximum Daily Loads (TMDLs) for these waters in order to achieve compliance with the water quality standards. Indiana's 2018 303(d) List of Impaired Waters was developed in accordance with Indiana's Water Quality Assessment and 303(d) Listing Methodology for Waterbody Impairments and Total Maximum Daily Load Development for the 2018 Cycle.

A TMDL for the Kankakee/Iroquois River Watershed was completed by IDEM in 2009. The primary cause of impairment is *Escherichia coli* bacteria (*E. coli*), therefore, the Kankakee River (in the Kankakee/Iroquois River Watershed), (Assessment-Unit INK0189_M1008), 12 Digit HUC 71200010800) is on the 2018 303(d) list for *E. coli*, impaired biotic communities, and PCBs in fish tissue.

The receiving streams Stalbaum Ditch and Davis Ditch are not on the 2018 303(d) list for impairments. TMDLs for Stalbaum Ditch and Davis Ditch are not currently planned.

5.0 PERMIT LIMITATIONS

Under 327 IAC 5-2-10 (see also 40 CFR 122.44), NPDES permit limits are based on either TBELs (including TBELs developed on a case-by-case basis using BPJ, where applicable) or WQBELs, whichever is most stringent. The decision to limit or monitor the parameters contained in this permit is based on information contained in the permittee's NPDES application, and other available information relating to the facility and the receiving waterbody. In addition, when renewing a permit, the existing permit limits and the antibacksliding requirements under 327 IAC 5-2-10(a)(11) must be considered.

5.1 Technology-Based Effluent Limits (TBEL)

TBELs require every individual member of a discharge class or category to operate their water pollution control technologies according to industry-wide standards and accepted engineering practices. TBELs are developed by applying the National Effluent Limitation Guidelines (ELGs) established by EPA for specific industrial categories. Technology-based treatment requirements established pursuant to sections 301(b) and 306 of the Clean Water Act (CWA) represent the minimum level of control that must be imposed in an NPDES permit (327 IAC 5-5-2(a)).

In the absence of ELGs, TBELs can also be established on a case-by-case basis using best professional judgment (BPJ) in accordance with 327 IAC 5-2-10 and 327 IAC 5-5 (which implement 40 CFR 122.44, 125.3, and Section 402(a)(1) of the CWA).

The applicable technology-based standards for the facility are contained in 40 CFR 423 – Steam Electric Point Source Category. Since this facility is classified as an "existing point source", all discharges are subject to effluent guidelines identified in 40 CFR 423.12, Best Practicable Control Technology (BPT) and 40 CFR 423.13; Best Available Control Technology (BAT). The applicable effluent guidelines are as follows:
Applicable ELG Subparts:

Requirements applicable to all wastewater streams:

1. pH Control - 40 CFR 423.12(b)(1), the pH of all discharges, except once through cooling water, shall be within the range of 6.0-9.0 s.u. (BPT)

2. Polychlorinated biphenyl (PCB) - 40 CFR 423.12(b)(2), there shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid. (BPT)

Regulated wastewater streams and their applicable requirements

There are eight (8) separate wastewater streams that are regulated by 40 CFR Part 423. Not every wastewater stream may not be present at every facility. The wastewater streams are:

1. Once through non-contact cooling water for a plant with a total rated electric generating capacity of 25 or more megawatts – The BPT guidelines are contained in 40 CFR 423.12(b)(6) and (8), and the BAT guidelines are contained in 40 CFR 423.13(b).

2. Cooling tower blowdown - The BPT guidelines are contained in 40 CFR 423.12(b)(7) and (8), and the BAT guidelines are contained in 40 CFR 423.13(d).

3. Low volume wastewater - The BPT guidelines are contained in 40 CFR 423.12(b)(3), and there are no BAT guidelines.

4. Ash handling wastewater - The BPT guidelines are contained in 40 CFR 423.12(b)(4). The BAT guidelines are contained in 40 CFR 423.13(k)(1)(i) - Bottom Ash and 40 CFR 423.13(h)(1)(i) – Fly Ash

5. Metal cleaning wastewater - The BPT guidelines are contained in 40 CFR 423.12(b)(5) [non-chemical] and the BAT guidelines are contained in 40 CFR 423.13(e) [chemical].

6. Coal Pile Runoff - The BPT guidelines are contained in 40 CFR 423.12(b)(9) and (10), and there are no BAT guidelines.

7. FGD wastewater - The BPT guidelines are contained in 40 CFR 423.12(b)(11), and the BAT guidelines are contained in 40 CFR 423.13(g)(1)(i).

8. Combustion residual leachate - The BPT guidelines are contained in 40 CFR 423.12(b)(11), and the BAT guidelines are contained in 40 CFR 423.13(l).

For the cooling water discharges (cooling tower blowdown and once through noncontact cooling water) identified above, the BAT guidelines are more stringent and/or more comprehensive than the BPT guidelines. However, the BPT guidelines are more stringent and/or more comprehensive than the BAT guidelines for the metal cleaning wastewater discharges. The tables below identifies the most stringent guidelines for each wastewater sources.

Table 1a
Effluent Guidelines from 40 CFR 423

Wastewater Stream***	pH	Res. Chlorine	TSS		O & G		T. Copper		T. Iron	
			Daily Max	Mo. Avg.	Daily Max	Mo. Avg.	Daily Max	Mo. Avg.	Daily Max	Mo. Avg.
Once through non-contact	n/a	0.2 mg/l*	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cooling tower blowdown	≥ 6.0 s.u. and ≤ 9.0 s.u	0.2 mg/l*	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Low volume wastewater	≥ 6.0 s.u. and ≤ 9.0 s.u	n/a	100 mg/l	30 mg/l	20 mg/l	15 mg/l	n/a	n/a	n/a	n/a
+Ash handling wastewater	≥ 6.0 s.u. and ≤ 9.0 s.u	n/a	100 mg/l	30 mg/l	20 mg/l	15 mg/l	n/a	n/a	n/a	n/a
Metal cleaning wastewater	≥ 6.0 s.u. and ≤ 9.0 s.u	n/a	100 mg/l	30 mg/l	20 mg/l	15 mg/l	1 mg/l	1 mg/l	1 mg/l	1 mg/l
Coal Pile Runoff	≥ 6.0 s.u. and ≤ 9.0 s.u	n/a	50 mg/l**	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Combustion residual leachate	n/a	n/a	100.0 mg/l	30.0 mg/l	20.0 mg/l	15.0 mg/l	n/a	n/a	n/a	n/a

* The discharge of chlorine is limited to a maximum two hours per day for each electrical generating unit.

** This value is an instantaneous limitation (at any time), not a daily maximum.

*** When wastewater streams are combined for discharge and/or treatment 40 CFR 423 requires that the quantity of each pollutant or pollutant property controlled attributable to each controlled waste source shall not exceed the specified limitations for that waste source.

Table 1b
FGD Effluent Guidelines from 40 CFR 423

Wastewater Stream*	TSS		O & G		T. Arsenic		T. Mercury		T. Selenium		Nitrate/nitrite (as N)	
	Daily Max	Mo. Avg.	Daily Max	Mo. Avg.	Daily Max	Daily Max	Daily Max	Mo. Avg.	Daily Max	Mo. Avg.	Daily Max	Mo. Avg.
FGD wastewater	100.0 mg/l	30.0 mg/l	20.0 mg/l	15.0 mg/l	11 ug/l	8 ug/l	788 ng/l	356 ng/l	23 ug/l	12 ug/l	17.0 mg/l	4.4 mg/l

* When wastewater streams are combined for discharge and/or treatment 40 CFR 423 requires that the quantity of each pollutant or pollutant property controlled attributable to each controlled waste source shall not exceed the specified limitations for that waste source.

5.2 Water Quality-Based Effluent Limits (WQBELs)

WQBELs are designed to be protective of the beneficial uses of the receiving water and are independent of the available treatment technology. The WQBELs for this facility are based on water quality criteria in 327 IAC 2-1-6 or developed under the procedures described in 327 IAC 2-1-8.2 through 8.7 and 327 IAC 2-1-8.9, and implementation procedures in 327 IAC 5. Limitations are required for any parameter which has the reasonable potential to exceed a water quality criterion as determined using the procedures under 327 IAC 5-2-11.1(h).

5.3 Effluent Limitations and Monitoring Requirements by Outfall

Under 327 IAC 5-2-10(a) (see also 40 CFR 122.44), NPDES permit requirements are technology-based effluent limitations and standards (including TBELs based on federal effluent limitations guidelines or developed on a case-by-case basis using best professional judgment (BPJ), where applicable), water quality standards-based, or based on other more stringent requirements. The decision to limit or monitor the parameters contained in this permit is based on information contained in the permittee's NPDES application and other available information relating to the facility and the receiving waterbody as well as the applicable federal effluent limitations guidelines. In addition, when renewing a permit, the existing permit limits, the antibacksliding requirements under 327 IAC 5-2-10(a)(11), and the antidegradation requirements under 327 IAC 2-1.3 must be considered.

5.3.1 All External Outfalls

Narrative Water Quality Based Limits

The narrative water quality criteria contained under 327 IAC 2-1-6(a)(1) and (2) have been included in this permit to ensure that these minimum water quality conditions are met.

Flow
The effluent flow is to be monitored in accordance with 327 IAC 5-2-13(a)(2).

pH

Discharges to waters of the state are limited to the range of 6.0-9.0 s.u., in accordance with 327 IAC 2-1-6(b)(2) and 40 CFR 423.12(b)(1).

5.3.2 Outfalls 001 and 002

Intake Flow

The actual intake flows must be measured at a minimum frequency of daily in accordance with 40 CFR 125.94. The permittee must maintain an intake daily flow rate of 39 MGD or less.

Cycles of Concentration

The cycles of concentration must be measured at a minimum frequency of daily. The definition at 40 CFR 125.92 requires makeup flows be minimized. COC serve as an indicator of minimized makeup flows, and thus may be used by IDEM when assessing performance of a particular closed-cycle recirculating cooling system (CCRS) CCRS.

Temperature

Effluent limitations for temperature are based on the criteria established in 327 IAC 2-1-6(b).

Total Suspended Solids (TSS)

TSS limitations are based upon 327 IAC 5-5-2(h)(2) and are 30 mg/l daily maximum and 15 mg/l monthly average. These limits have been retained from the previous permit, and are considered sufficient to ensure compliance with narrative water quality criteria in 327 IAC 2-1-6(a)(1)(C) which prohibits oil or other substances in amounts sufficient to produce color, visible sheen, odor, or other conditions in such a degree to create a nuisance.

Oil and Grease (O & G)

The proposed O & G limitations are more stringent than the limitations based upon 327 IAC 5-5-2(h)(2) and are 15 mg/l daily maximum and 5 mg/l monthly average. These limits have been retained from the previous permit which are considered sufficient to ensure compliance with narrative water quality criteria in 327 IAC 2-1-6(a)(1)(C) which prohibits oil or other substances in amounts sufficient to produce color, visible sheen, odor, or other conditions in such a degree to create a nuisance.

Sulfate

In 2004, a reasonable potential to exceed (RPE) analysis showed that Sulfate was discharged at levels having an RPE water quality criteria (see Attachment A). These effluent limitations are included in the permit because sulfate is a significant component of the landfill waste material. The effluent limitations have been retained from the previous permit in accordance with antibacksliding regulations and are 1,501 mg/l Daily Maximum and 748 mg/l Monthly Average.

Total Residual Chlorine (TRC) - Continuous

The limits for continuous total residual chlorine are retained from the previous permit and are based on the water quality standards in 327 IAC 2-1-6. The limits are 0.02 mg/l monthly average and 0.04 mg/l daily maximum. The WQBELs for chlorine are less than the limit of quantitation (LOQ) of 0.06 mg/l. The permittee will be considered in compliance with the permit limits if the effluent concentrations measured are less than the LOQ of 0.06 mg/l.

Total Residual Chlorine (TRC) - Intermittent

The intermittent TRC limit of 0.2 mg/l daily maximum has been retained from the previous permit and is based on 327 IAC 2-1-6. To be considered an intermittent discharge, total residual chlorine shall not be detected in the discharge from any single generating unit for a period of more than forty (40) minutes in duration, and such periods shall be separated by at least five (5) hours. The permittee is limited to no more than four (4) chlorination cycles per day. The intermittent TRC limitations were developed for the control of zebra mussels.

Chlorination - Frequency

The monitoring of chlorination frequency applies only when the facility is chlorinating intermittently. The permit requires the permittee to provide a monthly report on the “times per day” the permittee is intermittently chlorinating. The permittee is limited to no more than four (4) chlorination cycles per day.

Chlorination - Duration

The monitoring for duration of chlorination dose applies only when the facility is chlorinating intermittently. The permit requires the permittee to provide a monthly report on the number of minutes per chlorination cycle the permittee is chlorinating intermittently. The permittee is limited to no more than forty (40) minutes per chlorination cycle.

Mercury

Flue gas desulfurization (FGD) wastestreams are common wastestreams at coal fired steam electric power generating facilities. It is generated when a wet scrubbing system is used to scrub pollutants, such as mercury, from power plant air emissions. FGD wastewater is often treated in a dedicated wastewater facility rather than through a plants existing wastewater treatment system.

In 2010, an RPE analysis showed that Mercury was discharged at levels having an RPE water quality criteria (see Attachment B). The effluent limitations have been retained from the previous permit in accordance with antibacksliding regulations. The limits are 12.0 ng/l monthly average and 20.0 ng/l daily maximum. The previous permit required that Mercury sampling be conducted 6 X annually in the months of February, April, June, August, October, and December of each year for the term of the permit.

Total Chromium

Monitoring requirements and effluent limitations have been retained from the previous permit for Total Chromium. These limits are technology-based from 40 CFR 423.13(d)(1) for discharges from cooling tower blowdown. The effluent limitations have been retained from the previous permit in accordance with antibacksliding regulations. The permittee is required to meet a daily maximum limit of 0.2 mg/l for Total Chromium.

Total Zinc

The 2004 RPE analysis showed that Zinc was discharged at levels having an RPE water quality criteria (see Attachment A). The WQBELs are more stringent that the TBELs from 40 CFR 423.13(d)(1) for discharges from cooling tower blowdown. The effluent limitations are 0.604 mg/l Daily Maximum and 0.301 mg/l Monthly Average.

Ammonia (as N), Arsenic, Boron, Chloride, Manganese, Selenium, Nitrate/Nitrite

IDEM identified the following as pollutants of concern for the facility's FGD wastewater: Ammonia, Arsenic, Boron, Chloride, Manganese, Selenium, and Nitrate/Nitrite. The monitoring requirements for these parameters have been retained in this permit in accordance with 40 CFR Part 423.

126 Priority Pollutants

To ensure that the 126 priority pollutants listed in 40 CFR 423, Appendix A, are not present in the discharge at Outfall 001 with the exception of chromium and zinc, the permittee shall provide engineering calculations which demonstrate that the regulated pollutants are not detectable in the final discharge by the analytical methods in 40 CFR 136. The permittee is required to submit engineering calculations to the IDEM, Office of Water Quality, Industrial NPDES Permit Section as part of the next permit renewal.

The discharge of cooling tower blowdown is regulated by the 40 CFR 423.13(d). 40 CFR 423.13(d)(1) prohibits the discharge of the 126 priority pollutants listed in Appendix A of this regulation in detectable amounts with the exception of total chromium and total zinc which have specific numeric limits. In accordance with 423.13(d)(3), instead of the monitoring specified in 40 CFR 122.48(b), compliance with the limitations for the 126 priority pollutants in paragraph (d)(1) of 40 CFR 423.13 may be determined by engineering calculations which demonstrate that the regulated pollutants are not detectable in the final discharge by the analytical methods in 40 CFR part 136. However, compliance with the above limitations for the 126 priority pollutants (with the exception of chromium and zinc) in paragraph (d)(1) of 40 CFR 423.13 must be reported each time there is a change in the chemicals added for cooling tower maintenance.

5.3.3 Outfall 101

E.coli

The *E. coli* limitations are set in accordance with regulations specified in 327 IAC 5-10-6.

$CBOD_5$ and TSS

Effluent limitations for $CBOD_5$ and TSS were established using BPJ and are based on 40 CFR 133 and 327 IAC 5-10-5; Small Sanitary Discharge.

5.3.4 Outfalls 201 (existing) and 301 (proposed)

Oil and Grease (O & G)

The proposed O & G limitations based upon 40 CFR 423.12(b)(11) and are 20.0 mg/l daily maximum and 15.0 mg/l monthly average.

Total Suspended Solids (TSS)

TSS limitations are based upon 40 CFR 423.12(b)(11) and are 100.0 mg/l daily maximum and 30.0 mg/l monthly average.

Arsenic

Arsenic limitations are based upon 40 CFR 423.13(g)(1)(i) and are 11 ug/l daily maximum and 8 ug/l monthly average. As allowed by the ELG, and based on the planned shutdown of the facility, the permittee must comply with the limits no later than December 31, 2023.

Mercury

Mercury limitations are based upon 40 CFR 423.13(g)(1)(i) and are 788 ng/l daily maximum and 356 ng/l monthly average. As allowed by the ELG, and based on the planned shutdown of the facility, the permittee must comply with the limits no later than December 31, 2023.

Selenium

Selenium limitations are based upon 40 CFR 423.13(g)(1)(i) and are 23 ug/l daily maximum and 12 ug/l monthly average. As allowed by the ELG, and based on the planned shutdown of the facility, the permittee must comply with the limits no later than December 31, 2023.

Nitrate/Nitrite, as N

Nitrate/Nitrite, as N, limitations are based upon 40 CFR 423.13(g)(1)(i) and are 17.0 mg/l daily maximum and 4.4 mg/l monthly average. As allowed by the ELG, and based on the planned shutdown of the facility, the permittee must comply with the limits no later than December 31, 2023.

Ammonia, Boron, Chloride, Manganese, and Zinc

These parameters are included because IDEM identified them as pollutants of concern for the facility's FGD wastewater. Monitoring for these parameters will be retained from the previous permit.

5.3.5 Storm Water Outfalls 003S, 004S, and 007S; Stream Monitoring Sites 010S, 011S, 012S, and 013S

TSS, Oil & Grease (O & G), Arsenic, Cadmium, Chromium, Copper, Lead, Nickel, Selenium, Zinc, Sulphate, and pH

The above identified parameters are associated with storm water discharges at this facility. The monitoring requirements for TSS, O & G, Arsenic, Cadmium, Chromium, Copper, Lead, Nickel, Selenium, Zinc, Sulphate, and pH have been retained from the previous permit.

5.4 Whole Effluent Toxicity (WET) TESTING

The permit does not contain a requirement to conduct whole effluent toxicity (WET) tests.

5.5 Antibacksliding

Pursuant to 327 IAC 5-2-10(a)(11), unless an exception applies, a permit may not be renewed, reissued or modified to contain effluent limitations that are less stringent than the comparable effluent limitations in the previous permit. None of the limits included in this permit are less stringent than the comparable effluent limitations in the previous permit, therefore, backsliding is not an issue in accordance with 327 IAC 5-2-10(a)(11).

5.6 Antidegradation

Indiana's Antidegradation Standards and Implementation procedures are outlined in 327 IAC 2-1.3. The antidegradation standards established by 327 IAC 2-1.3-3 apply to all surface waters of the state. The permittee is prohibited from undertaking any deliberate action that would result in a new or increased discharge of a bioaccumulative chemical of concern (BCC) or a new or increased permit limit for a regulated pollutant that is not a BCC unless information is submitted to the commissioner demonstrating that the proposed new or increased discharge will not cause a significant lowering of water quality, or an antidegradation demonstration submitted and approved in accordance 327 IAC 2-1.3-5 and 2-1.3-6.

The NPDES permit does not propose to establish a new or increased loading of a regulated pollutant; therefore, the Antidegradation Implementation Procedures in 327 IAC 2-1.3-5 and 2-1.3-6 do not apply to the permitted discharge.

5.7 Storm Water

Under 327 IAC 5-4-6(d), if an individual permit is required under 327 IAC 5-4-6(a) for discharges consisting entirely of storm water, or if an individual permit is required under 327 IAC 5-2-2 that includes discharge of commingled storm water associated with industrial activity, IDEM may consider the following in determining the requirements to be contained in the permit:

(1) The provisions in the following: (A) 327 IAC 15-5, 327 IAC 15-6, and 327 IAC 15-13, as appropriate to the type of storm water discharge, (B) NPDES Pesticide General Permit for Point Source Discharges to Waters of the State from the Application of Pesticides, Permit Number ING870000, effective October 31, 2011, available at:

http://www.in.gov/idem/cleanwater/2480.htm#pesticide or from the IDEM Office of Water Quality, Permits Branch, 100 North Senate Avenue, Indianapolis, IN 46204-2251, and (C) 327 IAC 5-2 [Basic NPDES Requirements], 327 IAC 5-5 [NPDES Criteria and Standards for Technology-based Treatment Requirements], and 327 IAC 5-9 [Best Management Practices; Establishment].

(2) "Interim Permitting Approach for Water Quality-Based Effluent Limitations in Storm Water Permits", EPA 833-D-96-001, September 1, 1996, available from U.S. EPA, National Service Center for Environmental Publications at https://www.epa.gov/nscep or from IDEM.

(3) The nature of the discharges and activities occurring at the site or facility.

(4) Other information relevant to the potential impact on water quality.

In accordance with 327 IAC 15-2-2(a), the commissioner may regulate storm water discharges associated with industrial activity, as defined in 40 CFR 122.26(b)(14), consistent with the EPA 2008 NPDES Multi-Sector General Permit for Storm water Discharges Associated with Industrial Activity, as modified, effective May 27, 2009, under an NPDES general permit. Therefore, using Best Professional Judgment to develop case-by-case technology-based limits as authorized by 327 IAC 5-2-10, 327 IAC 5-5, and 327 IAC 5-9 (see also 40 CFR 122.44, 125.3, and Section 402(a)(1) of the Clean Water Act (CWA)), IDEM has developed storm water requirements for individual permits that are consistent with the EPA 2008 NPDES Multi-Sector General Permit for Storm water Discharges Associated with Industrial Activity. The 2008 Multi-Sector General Permit and Fact Sheet is available from: https://www.epa.gov/npdes/previous-versions-epas-msgp-documents.

According to 40 CFR 122.26(b)(14) and 327 IAC 15-6-2 facilities classified under Standard Industrial Classification (SIC) Code 4911 – Electric Power Service, are considered to be engaging in “industrial activity” for purposes of 40 CFR 122.26(b). Therefore, the permittee is required to have all storm water discharges associated with industrial activity permitted. Treatment for storm water discharges associated with industrial activities is required to meet, at a minimum, best available technology economically achievable/best conventional pollutant control technology (BAT/BCT) requirements. EPA has determined that non-numeric technology-based effluent limits have been determined to be equal to the best practicable technology (BPT) or BAT/BCT for storm water associated with industrial activity.

Storm water associated with industrial activity must also be assessed to ensure compliance with all water quality standards. Effective implementation of the non-numeric technology-based requirements should, in most cases, control discharges as necessary to meet applicable water quality standards. Violation of any of these effluent limitations constitutes a violation of the permit.

Additionally, IDEM has determined that with the appropriate implementation of the required control measures and Best Management Practices (BMPs) found in Part I.D. of the permit, the discharge of storm water associated with industrial activity from this facility will meet applicable water quality standards and will not cause a significant lowering of water quality. Therefore, the storm water discharge is in compliance with the antidegradation standards found in 327 IAC 2-1.3-3, and pursuant to 327 IAC 2-1.3-4(a)(5), an antidegradation demonstration is not required.

The technology-based effluent limits (TBELs) require the permittee to minimize exposure of raw, final, or waste materials to rain, snow, snowmelt, and runoff. In doing so, the permittee is required, to the extent technologically available and economically achievable, to either locate industrial materials and activities inside or to protect them with storm resistant coverings. In addition, the permittee is required to: (1) use good housekeeping practices to keep exposed areas clean, (2) regularly inspect, test, maintain and repair all industrial equipment and systems to avoid situations that may result in leaks, spills, and other releases of pollutants in storm water discharges, (3) minimize the potential for leaks, spills and other releases that may be exposed to storm water and develop plans for effective response to such spills if or when they occur, (4) stabilize exposed area and contain runoff using structural and/or non-structural control measures to minimize onsite erosion and sedimentation, and the resulting discharge of pollutants, (5) divert, infiltrate, reuse, contain or otherwise reduce storm water runoff, to minimize pollutants in the permitted facility discharges, (6) enclose or cover storage piles of salt or piles containing salt used for deicing or other commercial or industrial purposes, including maintenance of paved surfaces, (7) train all employees who work in areas where industrial materials or activities are exposed to storm water, or who are responsible for implementing activities necessary to meet the conditions of this permit (e.g., inspectors, maintenance personnel), including all members of your Pollution Prevention Team, (8) ensure that waste, garbage and floatable debris are not discharged to receiving waters by keeping exposed areas free of such materials or by intercepting them before they are discharged, and (9) minimize generation of dust and off-site tracking of raw, final or waste materials.

To meet the non-numeric effluent limitations in Part I.D.4, the permit requires the facility to select control measures (including BMPs) to address the selection and design considerations in Part I.D.3.

The permittee must control its discharge as necessary to meet applicable water quality standards. It is expected that compliance with the non-numeric technology-based requirements should ensure compliance with applicable water quality standards. However, if at any time the permittee, or IDEM, determines that the discharge causes or contributes to an exceedance of applicable water quality standards, the permittee must take corrective actions, and conduct follow-up monitoring and IDEM may impose additional water quality-based limitations.

"Terms and Conditions" to Provide Information in a Storm Water Pollution Prevention Plan (SWPPP)

Distinct from the effluent limitation provisions in the permit, the permit requires the discharger to prepare a SWPPP for the permitted facility. The SWPPP is intended to document the selection, design, installation, and implementation (including inspection, maintenance, monitoring, and corrective action) of control measures being used to comply with the effluent limits set forth in Part I.D. of the permit. In general, the SWPPP must be kept up-to-date, and modified when necessary, to reflect any changes in control measures that were found to be necessary to meet the effluent limitations in the permit.

The requirement to prepare a SWPPP is not an effluent limitation. Rather, it documents what practices the discharger is implementing to meet the effluent limitations in Part I.D. of the permit. The SWPPP is not an effluent limitation because it does not restrict quantities, rates, and concentrations of constituents which are discharged. Instead, the requirement to develop a SWPPP is a permit "term or condition" authorized under sections 402(a)(2) and 308 of the Act. Section 402(a)(2) states, "[t]he Administrator shall prescribe conditions for [NPDES] permits to assure compliance with the requirements of paragraph (1) of this subsection, including conditions on data and information collection, reporting, and such other requirements as he deems appropriate." The SWPPP requirements set forth in this permit are terms or conditions under the CWA because the discharger is documenting information on how it intends to comply with the effluent limitations (and inspection and evaluation requirements) contained elsewhere in the permit. Thus, the requirement to develop a SWPPP and keep it up-to-date is no different than other information collection conditions, as authorized by 327 IAC 5-1-3 (see also CWA section 402(a)(2)).

It should be noted that EPA has developed a guidance document, "Developing your Storm Water Pollution Prevention Plan – A guide for Industrial Operators (EPA 833-B09-002), February 2009, to assist facilities in developing a SWPPP. The guidance contains worksheets, checklists, and model forms that should assist a facility in developing a SWPPP.

Public availability of documents

Part I.E.2.d(2) of the permit requires that the permittee retain a copy of the current SWPPP at the facility and make it immediately available, at the time of an onsite inspection or upon request, to IDEM. When submitting the SWPPP to IDEM, if any information in the SWPPP is considered to be confidential, that information shall be submitted in accordance with 327 IAC 12.1. Interested persons can request a copy of the SWPPP through IDEM. Any information that is confidential pursuant to Indiana law will not be released to the public.

5.8 Water Treatment Additives

In the event that changes are to be made in the use of water treatment additives that could significantly change the nature of or increase the discharge concentration of any of the additives contributing to an outfall governed under the permit, the permittee must apply for and obtain approval from IDEM prior to such discharge. Discharges of any such additives must meet Indiana water quality standards. The permittee must apply for permission to use water treatment additives by completing and submitting State Form 50000 (Application for Approval to Use Water Treatment Additives) available at: http://www.in.gov/idem/5157.htm and submitting any needed supplemental information. In the review and approval process, IDEM determines, based on the information submitted with the application, whether the use of any new or changed water treatment additives/chemicals or dosage rates could potentially cause the discharge from any permitted outfall to cause chronic or acute toxicity in the receiving water.

The authority for this requirement can be found under one or more of the following: 327 IAC 5-2-8(11)(B), which generally requires advance notice of any planned changes in the permitted facility, any activity, or other circumstances that the permittee has reason to believe may result in noncompliance with permit requirements; 327 IAC 5-2-8(11)(F)(ii), which generally requires notice as soon as possible of any planned physical alterations or additions to the permitted facility if the alteration or addition could significantly change the nature of, or increase the quantity of, pollutants discharged; and 327 IAC 5-2-9(2) which generally requires notice as soon as the discharger knows or has reason to know that the discharger has begun or expects to begin to use or manufacture, as an intermediate or final product or byproduct, any toxic pollutant that was not reported in the permit application.

The following is a list of water treatment additives currently approved for use at the facility:

Additive Name	Supplier	Injection Points	Purpose
Sodium Hypochlorite	Rowe	U17, U18 Cooling Tower Basin	Algaecide and biocide
Nalco 90005	Nalco	U14, U15, U17, U18 Cooling Tower	Algaecide and biocide
Sulfuric Acid	Wilson	U14, U15, U17, U18 Cooling Tower	pH control
3D Trasar 3DT198	Nalco	U14, U17, U18 Condenser	Cooling Tower treatment
Nalco 7385	Nalco	U14, U15, U17, U18 Cooling Tower	Scale inhibitor
AGS Plus DBA	Solutia	FGD specific	FGD process additive
Nalco 7408	Nalco	RO units, Feedw ater Ion Exchange Unit, Wastewater	Boiler chlorine scavenger
Perma Treat PC-191T	Nalco	Reverse Osmosis system	Boiler antiscalant
Nalco 8735	Nalco	RO systems	RO system pH stabilizer
Trasar Trac 109	Nalco	FGD, Boiler, RO, and cooling towers	Cooling Tower corrosion inhibitor
Nalco PermaClean PC-11	Nalco	RO systems	RO system biocide
Nalco 7468	Nalco	Cooling towers	Cooling tower Antifoam (used in conjunction with Nalco 73550)
Ammonium Hydroxide	Wilson	North of Unit 14, 17	Boiler pH control
Citric Acid (anhydrous)	Wilson	Unit 14, 15 basement	RO system maintenance
Sodium Hydroxide	Rowe	Unit 14 basement	pH control
Ferric Chloride	PVS Chemical	14 / 15 FGD WWTP	Wastewater treatment chemical
Hydrated Lime	Mississippi Lime	14 / 15 FGD WWTP	Wastewater treatment chemical
Hydrochloric Acid	PVS Chemical	14 / 15 FGD WWTP	Wastewater treatment pH control
Nalmet 1689	Nalco	14 / 15 FGD WWTP	Wastewater treatment chemical
Nalclear 7763	Nalco	14 / 15 FGD WWTP	Wastewater treatment chemical
CL5828	ChemTreat	Circ Water System	Cooling Water Treatment Dispersant
CL206	ChemTreat	Circ Water System	Cooling Water and Reserve Osmosis
CL4125	ChemTreat	Circ Water System	Cooling Water Treatment
CL4704	ChemTreat	Circ Water System	Cooling Water Treatment
CL1370	ChemTreat	Circ Water System	Cooling Water Treatment
RL9005	ChemTreat	U14/15/17/18 RO Systems	Reverse Osmosis Treatment
P8200L	ChemTreat	Circ Water System	Metal Precipitant
FCT42	ChemTreat	U14/15/17/18 Coal Feeders	Fuel Additive
CL2840	ChemTreat	Circ Water System	Closed System Treatment
PE2505	Suez	Circ Water System	Corrosion/scale inhibitor
3DT138	NALCO	Circ Water System	Water Chemistry control
CL5450	ChemTreat	Circ Water System	Cooling Water Treatment
2877	NALCO	Recycle Basin	Algaecide
3DT337	NALCO	U14/17/18 Condensers	Corrosion control
RL124	ChemTreat	U14/15/17/18 RO Systems	Dechlorination
AZ8100	Suez	U14/17/18 Condensers	Corrosion control
CT1300	Suez	U14/15/17/18 CTs	Algaecide
RL9007	ChemTreat	U14/15/17/18 CTs	Corrosion/scale inhibitor
BL1304	ChemTreat	U14/17 RO Systems	pH control

6.0 PERMIT DRAFT DISCUSSION

6.1 Discharge Limitations, Monitoring Conditions and Rationale

The proposed final effluent limitations are based on the more stringent of the Indiana water quality-based effluent limitations (WQBELs), technology-based effluent limitations (TBELs), or approved total maximum daily loads (TMDLs) and NPDES regulations as appropriate for each regulated outfall. Section 5.3 of this document explains the rationale for the effluent limitations at each Outfall.

Analytical and sampling methods used shall conform to the version of 40 CFR 136 as referenced in 327 IAC 5-2-13(d)(1) and 327 IAC 5-2-1.5.

Nothing has changed to warrant modifying the monitoring conditions.

Outfalls 001 and 002:

Parameter	Monthly Average	Daily Maximum	Units	Minimum Frequency	Sample Type
Intake Flow	Report	39	MGD	1 X Daily	Continuous
Flow	Report	Report	MGD	1 X Daily	Continuous
COC	Report	Report	number	1 X Daily	Report
Temperature	Report	Report	°F	1 X Weekly	Grab
TSS	15	30	mg/l	1 X Weekly	24-Hr. Comp.
Oil & Grease	5	15	mg/l	1 X Weekly	Grab
Chromium	----	0.2	mg/l	1 X Monthly	Grab
Zinc	0.301	0.604	mg/l	1 X Monthly	Grab
Mercury	12.0	20.0	ng/l	6 X Yearly	Grab
Sulfate	748	1,501	mg/l	1 X Weekly	Grab
TRC Continuous Intermittent	 0.02 ----	 0.04 0.2	 mg/l mg/l	 1 X Daily 1 X Daily	 Grab Grab
Chlorination Frequency Duration	 ---- ----	 4 40	 Times/Day Minutes/Dose	 1 X Daily 1 X Daily	 Report Report
Ammonia (as N)	Report	Report	mg/l	2 X Monthly	Grab
Arsenic	Report	Report	ug/l	1 X Weekly	Grab
Boron	Report	Report	ug/l	1 X Weekly	Grab
Chloride	Report	Report	mg/l	2 X Monthly	Grab
Manganese	Report	Report	mg/l	1 X Weekly	Grab
Selenium	Report	Report	ug/l	1 X Weekly	Grab
Nitrate/Nitrite	Report	Report	mg/l	1 X Weekly	Grab

Parameter	Daily Minimum	Daily Maximum	Units	Minimum Frequency	Sample Type
pH	6.0	9.0	Std Units	1 X Weekly	Grab

Internal Outfall 101:

Parameter	Monthly Average	Daily Maximum	Units	Minimum Frequency	Sample Type
Flow	Report	Report	MGD	2 X Monthly	24-Hr. Total
$CBOD_5$	25	40	mg/l	2 X Monthly	24-Hr. Comp.
TSS	30	45	mg/l	2 X Monthly	Grab
E. coli	125	235	cfu/100 ml	2 X Monthly	Grab

Internal Outfalls 201 (Existing) and 301 (Proposed):

Parameter	Monthly Average	Daily Maximum	Units	Minimum Frequency	Sample Type
Flow	Report	Report	MGD	2 X Monthly	24-Hr. Total
TSS	30.0	100.0	mg/l	2 X Monthly	24-Hr. Comp.
Oil & Grease	15.0	20.0	mg/l	2 X Monthly	Grab
Arsenic Interim Final	 Report 8	 Report 11	 ug/l ug/l	 2 X Monthly 2 X Monthly	 Grab Grab
Mercury Interim Final	 Report 356	 Report 788	 ng/l ng/l	 6 X Yearly 6 X Yearly	 Grab Grab
Selenium Interim Final	 Report 12	 Report 23	 ug/l ug/l	 2 X Monthly 2 X Monthly	 Grab Grab
Nitrate/Nitrite (as N) Interim Final	 Report 4.4	 Report 17.0	 mg/l mg/l	 2 X Monthly 2 X Monthly	 Grab Grab
Ammonia (as N)	Report	Report	mg/l	2 X Monthly	Grab
Boron	Report	Report	ug/l	2 X Monthly	Grab
Chloride	Report	Report	mg/l	2 X Monthly	Grab
Manganese	Report	Report	mg/l	2 X Monthly	Grab
Zinc	Report	Report	mg/l	2 X Monthly	Grab

Parameter	Daily Minimum	Daily Maximum	Units	Minimum Frequency	Sample Type
pH	6.0	9.0	Std Units	2 X Monthly	Grab

Storm Water Outfalls: 003S, 004S, 007S
Stream Monitoring Sites: 010S, 011S, 012S, 013S

Parameter	Daily Maximum	Units	Minimum Frequency	Sample Type
Flow	Report	MGD	Annually	Grab
TSS	Report	mg/l	Annually	Grab
O&G	Report	mg/l	Annually	Grab
Arsenic	Report	mg/l	Annually	Grab
Cadmium	Report	mg/l	Annually	Grab
Chromium	Report	mg/l	Annually	Grab
Copper	Report	mg/l	Annually	Grab
Lead	Report	mg/l	Annually	Grab
Nickel	Report	mg/l	Annually	Grab
Selenium	Report	mg/l	Annually	Grab
Zinc	Report	mg/l	Annually	Grab
Sulfate	Report	mg/l	Annually	Grab
pH	Report	s.u.	Annually	Grab

6.2 Schedule of Compliance

The circumstances in this NPDES permit do not qualify for a schedule of compliance.

6.3 Polychlorinated Biphenyl

There shall be no discharge of polychlorinated biphenyl (PCBs) compounds such as those commonly used for transformer fluid.

Many electrical transformers manufactured prior to 1978 contained PCBs. Therefore, in order to determine compliance with the PCB prohibition, the permittee shall provide the following PCB* data for Outfall 001 within twelve (12) months of the effective date of the permit. The permittee shall submit the data to the Industrial NPDES Permit Section at OWQWWPER@idem.in.gov and the Compliance Branch at wwReports@idem.in.gov.

Parameter	Test Method	LOD	LOQ
*Total PCBs	608	0.1 ug/l	0.3 ug/l

*Total PCBs is the sum of the following aroclors: PCB-1016, PCB-1221, PCB-1232, PCB-1242, PCB-1248, PCB-1254, and PCB-1260.

6.4 Clean Water Act Section 316(b) Cooling Water Intake Structure(s) (CWIS)

A. Introduction

In accordance with 40 CFR 401.14, the location, design, construction and capacity of cooling water intake structures of any point source for which a standard is established pursuant to section 301 or 306 of the Clean Water Act (CWA) shall reflect the best technology available for minimizing adverse environmental impact.

The EPA promulgated a CWA section 316(b) regulation on August 15, 2014, which became effective on October 14, 2014. 79 Fed. Reg. 48300-439 (August 15, 2014). This regulation established application requirements and standards for cooling water intake structures. The regulation is applicable to point sources with a cumulative design intake flow (DIF) greater than 2 MGD where 25% or more of the water withdrawn (using the actual intake flow (AIF)) is used exclusively for cooling purposes. The regulation establishes best technology available standards to reduce impingement and entrainment of aquatic organisms at existing power generation and manufacturing facilities.

Impingement is the process by which fish and other aquatic organisms are trapped and often killed or injured when they are pulled against the CWISs outer structure or screens as water is withdrawn from a water body. Entrainment is the process by which fish larvae and eggs and other aquatic organisms in the intake flow enter and pass through a CWIS and into a cooling water system, including the condenser or heat exchanger, which often results in the injury or the death of the organisms (see definitions at 40 CFR § 125.92(h) and (n)).

The R.M. Schahfer facility's DIF rate is 57.7 MGD, almost all of which is used for non-contact cooling water. The AIF, as defined under 40 CFR 125.92(a), is the average volume of water withdrawn on an annual basis by the cooling water intake structures over the previous five years. The annual actual intake flows from January 2015 through December 2019 are shown in the below table and the average actual intake flow over this entire five year period is 21.7 MGD.

Year	Actual Intake Flow (MGD)
2015	22.03
2016	18.79
2017	20.26
2018	24.56
2019	22.93

Therefore, since the facility has a DIF greater than 2 MGD, and because the percentage of flow used at the facility exclusively for cooling is greater than 25%, the facility is required to meet the BTA standards for impingement and entrainment mortality,

including any measures to protect Federally-listed threatened and endangered species and designated critical habitat established under 40 CFR 125.94(g).

Also, since the design intake flow at this facility is greater than 2 MGD and since the AIF is not greater than 125 MGD, the permittee was required to submit the application information required by 40 CFR § 122.21(r)(2) through (r)(8). This information was originally submitted to IDEM in April 2015 in the report titled "Schahfer Generating Station NPDES Permit Application Submittal Requirements §122.21(r)(2) – (r)(8)" authored by Golder Associates, Inc. (referred to herein as the April 2015 CWIS Report). The April 2015 CWIS Report is available in IDEM's Virtual File Cabinet (VFC) at:

https://ecm.idem.in.gov/cs/idcplg?IdcService=GET_FILE&dID=80458487&dDocName=80457843&Rendition=web&allowInterrupt=1&noSaveAs=1

As part of the April 2020 NPDES permit renewal application for the facility, the permittee included as Attachment 2 of that application, an update of the 316(b) Cooling Water Intake Structure requirements in §122.21(R)(2) – (R)(8). This update, herein referred to as the 2020 CWIS Requirements Update, stated that the required 316(b) application information was submitted to IDEM in the April 2015 CWIS Report and that the main elements of that report continue to be substantially unchanged. A copy of this 2020 CWIS Requirements Update is included as Attachment C of this Fact Sheet.

The 316(b) regulation also established requirements that build on existing Clean Water Act requirements to coordinate with the U.S. Fish and Wildlife Service prior to issuing NPDES permits. Pursuant to 40 CFR 125.98(h), upon receipt of an NPDES 316(b) application for an existing facility subject to the rule, the Director (IDEM) must forward a copy of the 316(b) application to the appropriate Field Office of the U.S. Fish and Wildlife Service for a 60-day review prior to public notice of the permit. A copy of this application was sent to the Bloomington Field Office of the U.S. Fish and Wildlife Service (USFWS) on April 3, 2020. Comments were received from Mr. Daniel W. Sparks of the U.S. Fish and Wildlife Service on April 15, 2020 that were also based on an earlier June 5, 2015 response from Mr. Sparks and which are discussed in the sections below.

Much of the factual information presented below was taken, sometimes directly, from the April 2015 CWIS Report (available from VFC) and the 2020 CWIS Requirements Update (Attachment C).

A. Facility and Cooling Water Intake Structure (CWIS) Description

The NIPSCO R.M. Schahfer Generating Station ("R.M. Schahfer") has four coal-fired boilers (Units 14, 15, 17, and 18) which began operating in 1976 when Unit 14 came online followed by Unit 15 (1979), Unit 17 (1983) and Unit 18 (1986). The R.M. Schahfer generating station is a base-load facility with all four units operating under normal conditions based on information in the April 2015 CWIS Report (available in VFC). The 2020 CWIS Requirements Update (see Attachment C) did not include any new information on unit operating rates.

All four units feature close-cycle cooling via a single multi-cell mechanical draft cooling tower per unit. Makeup water for the recirculating water system comes from the cooling water intake system (CWIS) located on Davis Ditch approximately two miles north of the plant. See Attachment D for an aerial view of the CWIS and Attachment E for a topographical map of the CWIS and R.M. Schahfer. The intake structure sits on the east bank of Davis Ditch, approximately 550 feet south of the confluence with the Kankakee River. Due to the close proximity of this intake structure to the Kankakee River, water from the Kankakee River is drawn upstream to the intake via Davis Ditch. Water depths in Davis Ditch immediately in front of the intake pump house are approximately eight feet.

Makeup water is drawn through the CWIS by a set of three circulating water pumps, each with a capacity of 20,000 gallons per minute (gpm); however, only two of the pumps can be operated together at any one time, thus the maximum DIF is approximately 40,100 gpm (57.7 MGD). Makeup water is pulled into the service water pump house through a pair of steel bar trash racks then into two separate bays, each containing one traveling screen with stainless steel mesh panels.

From the CWIS, makeup water travels via underground pipe to the Intake Basin. Water from the Intake Basin is pumped into the facility to be used as cooling tower makeup water, as well as makeup water to the recycle line, and to provide water to the boilers and the flue-gas desulfurization equipment.

After passing through the plant processes, all water is routed to the Final Setting Basin (FSB) located on the north side of the plant. The FSB contains a primary outfall (Outfall 001) to the Kankakee River and an emergency outfall (Outfall 002) to the Kankakee River via Davis Ditch.

The CWIS operates as needed to provide makeup water for the R.M. Schahfer water system. The CWIS service pumps are run to maintain a normal operational water depth of 2.0 to 5.5 ft. in the Intake Basin; makeup water also may bypass the Intake Basin and be drawn directly into the cooling recirculation systems, if needed. CWIS operations may be altered to address abnormal conditions in the Kankakee River or in the permittee’s operations.

Coarse environmental debris is removed from the intake flow at the CWIS prior to entry into the permittee’s water system. Debris is removed from the trash rack, as needed, by a mechanical rake system and emptied into a dumpster for disposal. Typically, the traveling screens do not operate continuously but rotate when sufficient head differential occurs across the screens from flow blockage by debris buildup. While rotating, debris is cleared from the traveling screens by spray wash nozzles, cleared debris is washed into a collection trough and flows out of the intake building to a receptacle for disposal.

Intake Flows, Through-Screen Velocity and Area of Influence

The maximum DIF at the facility is 57.7 MGD. For the period 2015 through 2019, the AIF was 21.7 MGD. The permittee in their 2020 CWIS Requirements Update (see Attachment C) reported a maximum observed daily intake flow of 39 MGD.

At the maximum DIF of 57.7 MGD, the through-screen velocity is 0.58 feet per second (fps), at maximum observed daily intake flow of 39 MGD, the through-screen velocity is 0.39 fps and at the AIF of 21.7 MGD, the through–screen velocity is 0.22 fps.

The hydraulic zone of influence (HZI) sometimes called the area of influence, is that portion of the source waterbody hydraulically affected by the CWIS withdrawal of water. In the context of Section 316(b), the HZI defines the source area or the near field capture zone for small, weakly motile or planktonic organisms that are easily entrained. A detailed discussion of the calculations and methodology to determine the HZI is included in the April 2015 CWIS Report (available in VFC).

The input values and the calculated dimensions of the HZI for the shoreline CWIS located on the Davis Ditch are shown in Table 1 of the April 2015 CWIS Report (available in VFC). This table provides results for two river flow conditions based on data from U.S. Geological Survey (USGS) Gaging Station No. 05517500, Kankakee River at Dunns Bridge, Indiana, for the period of record 2007 through 2015, and the maximum design intake flow condition. The flow conditions evaluated are:

1. Mean annual flow in the Kankakee River = 1,605 cubic feet per second (cfs)
2. Lowest mean annual flow in the Kankakee River = 943 cfs
3. The maximum design intake flow condition is the DIF (57.7 MGD or 89.28 cfs)

Under all river and intake flow conditions, it is assumed that the entire area of the Davis Ditch is within the HZI. The location of the HZI-line with the Kankakee River will change with stream flow and intake flow, and therefore with time. The location of the HZI-line at any time will depend on the ratio of the intake flow to the river flow. Under extreme low-flow hydrologic conditions (e.g., lowest mean annual flow conditions at the Dunns Bridge gaging station), the HZI-line will move away from the shoreline and downstream. The maximum values for this scenario are approximately 12.6 ft and 3.6 ft, respectively (Table 1 of the April 2015 CWIS Report (available in VFC). Consequently, outside a line defined by these dimensions, the probability of hydraulically influencing nonmotile organisms remains low most of the time. Under normal hydrologic conditions (e.g., mean annual flow conditions), the HZI-line will move toward the shoreline and toward the intake. The values for this scenario are approximately 7.9 ft and 2.1 ft, respectively (Table 1 of the April 2015 CWIS Report (available in VFC). Consequently, inside a line defined by these dimensions, the probability is high most of the time. Between these extremes, the probability of hydraulically influencing non-motile organisms is moderate and variable.

The DIF of 57.7 MGD (89 cfs) is less than 10% of the lowest mean annual flow of the Kankakee River for the period studied of 2007 through 2015 and less than 6% of the mean annual flow of 1605 cfs for the period of study. Although flow values were not provided for Davis Ditch, since it is such a small stream, it is expected that the DIF of 57.7 MGD would be 100% of the lowest mean annual flow and mean annual flow of Davis Ditch.

Cooling Towers Detailed Information

The following information about the cooling towers was obtained from supplemental information provided by the permittee in a June 17, 2020 e-mail.

1. Cycles of Concentration (COC)

The four cooling towers at R.M. Schahfer average 1.7 cycles of concentration (COC). The actual COC has varied at times throughout the history of the R.M. Schahfer but our current chemistry plan has been optimized around the design and operating parameters of this facility. The primary goal of the chemistry program is to prevent scaling within the condensers. The current chemistry plan is designed to target 2.0 - 2.2 COC while the average (as mentioned) is currently 1.7. Previous attempts to cycle as high as 3 have failed. This was largely due to the scaling issue experienced under such operating conditions. Water from the Kankakee River is brought into the Intake Settling Basin (ISB) as the source of service water used throughout the facility. The Kankakee has a fairly high concentration of calcium, which left untreated results in our scaling issue. There is no chemical pretreatment performed on the water in the ISB. Accordingly, controlling the FGD blowdown rate moderates the COC. The plant engineers routinely monitor the chloride levels within the scrubber to best maximize the system (i.e. to blowdown the scrubbers at little as possible; less blowdown results in increased COC). As an ancillary note to the chemistry control, a purposeful factor in the design of our program is to not increase the sulfate (and other ions) levels in the Final Settling Basin (FSB). All internal ponds and process water combine in the FSB prior to discharge at final outfall 001. The FSB has an engineered capability of providing water directly (if and as needed) into the ISB under low flow conditions in the Kankakee River. Adding unwanted salts into the ISB would only exacerbate the scaling potential and prove problematic in limiting blowdown (which results in lower cycles of concentration).

2. Percent Reduction

Using real world data and recent operating conditions (such as run times of the various Units), the permittee estimated a once-through system would require 1.044 billion gallons of water per day. The permittee calculated an estimated water use of 48.5 million gallons per day at 1.7 COC, and 40 million gpd at 2.0 COC. The 1.7 COC results in a 95.4% reduction when compared to a once-through system (and 96.2% at 2.0 COC).

The permittee is aware of the EPA 316(b) guidance document reference to reducing AIF by 97.5 percent with a closed cycle cooling tower system being operated at a minimum 3.0 cycles of concentration. As affected by the circumstances mentioned above, despite minimizing blow down (thus minimizing make up flow), employing an appropriate chemistry control program, and operating a closed cycle system the permittee is unable to replicate these COC levels or percent flow reductions.

3. Chemistry Control Program Guidance

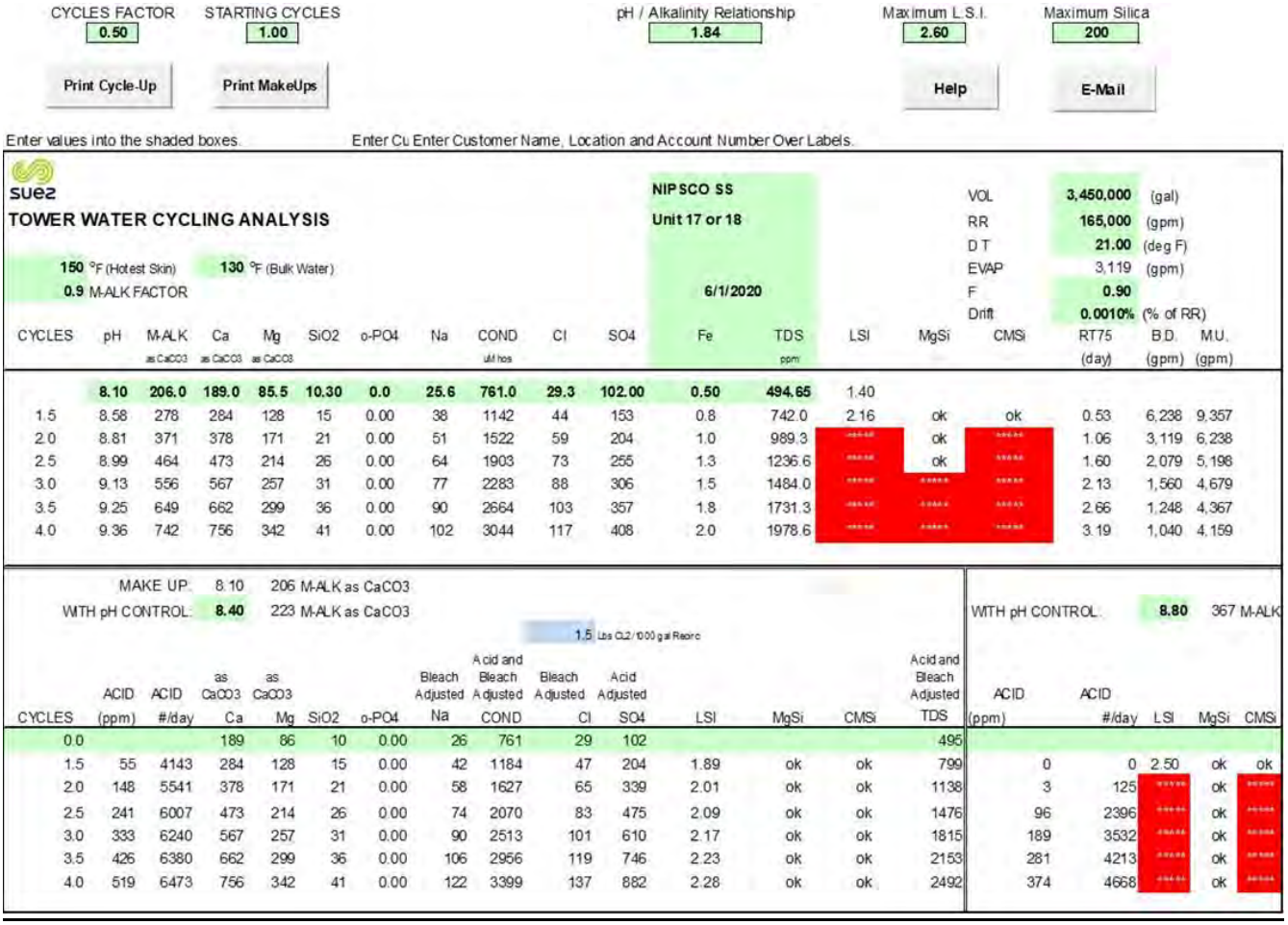
The following is feedback from the permittee's chemical provider (Suez) after discussing the design of our program with respect to potentially increasing cycles of concentration.

The current target cycles at R.M. Schahfer is 2 cycles with pH control to pH 8.4 (via acid feed). A gauge for the "treatability" of the water from a calcium carbonate scaling perspective is the Langelier Saturation index (LSI), with typical treatable LSIs < 2.6. It is critical to keep the condensers clean of deposit, with calcium carbonate being the main potential culprit at these conditions. Under the abovementioned operating parameters and typical water compositions, LSIs are generally < 2.6, and treatable.

With an increase in cycles and the strict maintenance at the appropriate pH, elevated cycles can be achieved. However, with an upset such as a loss of acid feed or pH measurement issue, calcium carbonate scale and silicate scales can be issues; please refer to Figure 1, below. Note that a modest deviation from the target pH would lead to elevated LSIs and exceedances of limits of select mineral salts. In addition, effluent turbidities will increase, which may pose a challenge with regard to TSS permit limit requirements.

In brief, operating at higher cycles poses more risk and potential negative consequences to the operation.

Figure 1. Water chemistry composition and the associated limits for NIPSCO Schahfer Station as a function of cycles; indicates “over limit”.



CYCLES FACTOR 0.50 | STARTING CYCLES 1.00 | pH / Alkalinity Relationship 1.84 | Maximum L.S.I. 2.60 | Maximum Silica 200

Print Cycle-Up | Print MakeUps | Help | E-Mail

Enter values into the shaded boxes. Enter Cu Enter Customer Name, Location and Account Number Over Labels.

SUEZ

TOWER WATER CYCLING ANALYSIS

NIPSCO SS
Unit 17 or 18
6/1/2020

150 °F (Hotest Skin) 130 °F (Bulk Water)
0.9 M-ALK FACTOR

VOL 3,450,000 (gal)
RR 165,000 (gpm)
D T 21.00 (deg F)
EVAP 3,119 (gpm)
F 0.90
Drift 0.0010% (% of RR)

CYCLES	pH	M-ALK as CaCO3	Ca as CaCO3	Mg as CaCO3	SiO2	o-PO4	Na	COND uM hos	Cl	SO4	Fe	TDS ppm	LSI	MgSi	CMSi	RT75 (day)	B.D. (gpm)	M.U. (gpm)
	8.10	206.0	189.0	85.5	10.30	0.0	25.6	761.0	29.3	102.00	0.50	494.65	1.40					
1.5	8.58	278	284	128	15	0.00	38	1142	44	153	0.8	742.0	2.16	ok	ok	0.53	6,238	9,357
2.0	8.81	371	378	171	21	0.00	51	1522	59	204	1.0	989.3	*****	ok	*****	1.06	3,119	6,238
2.5	8.99	464	473	214	26	0.00	64	1903	73	255	1.3	1236.6	*****	ok	*****	1.60	2,079	5,198
3.0	9.13	556	567	257	31	0.00	77	2283	88	306	1.5	1484.0	*****	*****	*****	2.13	1,560	4,679
3.5	9.25	649	662	299	36	0.00	90	2664	103	357	1.8	1731.3	*****	*****	*****	2.66	1,248	4,367
4.0	9.36	742	756	342	41	0.00	102	3044	117	408	2.0	1978.6	*****	*****	*****	3.19	1,040	4,159

MAKE UP 8.10 206 M-ALK as CaCO3
WITH pH CONTROL 8.40 223 M-ALK as CaCO3
1.5 Lbs Cl2/1000 gal Recirc

WITH pH CONTROL 8.80 367 M-ALK

CYCLES	ACID (ppm)	ACID #/day	as CaCO3 Ca	as CaCO3 Mg	SiO2	o-PO4	Bleach Adjusted Na	Acid and Bleach Adjusted COND	Bleach Adjusted Cl	Acid Adjusted SO4	LSI	MgSi	CMSi	Acid and Bleach Adjusted TDS	ACID (ppm)	ACID #/day	LSI	MgSi	CMSi
0.0			189	86	10	0.00	26	761	29	102				495					
1.5	55	4143	284	128	15	0.00	42	1184	47	204	1.89	ok	ok	799	0	0	2.50	ok	ok
2.0	148	5541	378	171	21	0.00	58	1627	65	339	2.01	ok	ok	1138	3	125	*****	ok	*****
2.5	241	6007	473	214	26	0.00	74	2070	83	475	2.09	ok	ok	1476	96	2396	*****	ok	*****
3.0	333	6240	567	257	31	0.00	90	2513	101	610	2.17	ok	ok	1815	189	3532	*****	ok	*****
3.5	426	6380	662	299	36	0.00	106	2956	119	746	2.23	ok	ok	2153	281	4213	*****	ok	*****
4.0	519	6473	756	342	41	0.00	122	3399	137	882	2.28	ok	ok	2492	374	4668	*****	ok	*****

Operational Status and Upcoming Unit Retirements

The 2018 Integrated Resource Plan (IRP) which NIPSCO submitted to the Indiana Utility Regulatory Commission (IURC) identified the preferred retirement path, which included the retirements of R.M. Schahfer Units 14, 15, 17, and 18. NIPSCO’s short term action plan covering the period 2019 to 2022 is focused mainly on initiating the planning process for the retirement of the R.M. Schahfer 14, 15, 17, and 18 units and beginning the procurement of replacement resources. In this period, NIPSCO will make the required notifications to Midcontinent Independent System Operator (MISO), North American Reliability Corporation (NERC) and other relevant organizations of its intention to retire the R.M. Schahfer coal units by the end of 2023. NIPSCO will also identify and implement reliability and transmission upgrades resulting from the retirements of the units.

B. Biological Condition of the Kankakee River

The Kankakee River is 140 miles long and is located in northwestern Indiana and northeastern Illinois (IDNR 1990 https://www.in.gov/dnr/water/4108.htm). The Kankakee River Basin (part of the Illinois River Basin) is 2,989 square miles (mi^2) and drains portions of Michigan, Indiana, and Illinois. The Kankakee River originates just southwest of South Bend, Indiana in St. Joseph County. It then travels 104 miles to the west and southwest to Illinois. The mainstem of the Kankakee River forms the southern boundaries of Lake, Porter, and LaPorte Counties and the northern borders of Newton, Jasper, and Starke Counties (IDNR 1990). The Kankakee River was channelized during the late 1800's and early 1900's during the draining of the Grand Kankakee Marsh, resulting in a river system prone to flooding.

According to the IDEM Integrated Report on the status of impairment of Indiana waters, the upper Illinois River Basin, including the upper Kankakee, Iroquois, and Yellow River basins, 42% of the stream miles are attaining their designated uses, while 58% are not (IDEM 2018). A complete listing of Kankakee River Section 303(d) impaired waters of the Kankakee River can be found at https://www.in.gov/idem/nps/2647.htm. Indiana's Integrated Monitoring and Assessment Report can be found at https://www.in.gov/idem/nps/2639.htm.

At the confluence with Davis Ditch, the Kankakee River flows from southeast to northwest. The river generally proceeds west where it joins with the Des Plaines River southwest of Joliet, Illinois, becoming the Illinois River, which flows southwest before emptying into the Mississippi River near Grafton, Illinois. The Illinois River is also connected to the Chicago River and, ultimately, Lake Michigan via the Illinois Waterway, which was constructed in 1933 to replace the Illinois and Michigan Canal (Lamb 1983).

The Kankakee River is a productive system, with a predominance of its drainage area in agricultural use. It is home to a warmwater fish community with species including Small and Largemouth Bass, Walleye, Northern Pike, and various panfish.

In a June 5, 2015 email to IDEM, US F&WS Dan Sparks raised concerns about high selenium levels (but not likely at acute levels) in barn swallows sampled on the Kankakee River approximately 25 miles downstream of the R.M. Schahfer facility. His exact comment is below:

> *One general biological comment I would like for you to consider. The level of selenium discharged to the Kankakee is significant from a wildlife standpoint. Source of this emanates from outfall 201 to outfall 001 which based on what I have learned in recent years from a similar facility, I assume comes from their fly ash management. First a related observation. During my bird studies of the Grand Calumet River in the mid-1990s, I sampled barn swallows on the Kankakee River approximately 25 miles downstream of this outfall to be my reference samples. Using sediment data collected by IDEM's biomonitoring program, estimated selenium bioconcentration factors (BCF) from sediment to barn swallow bird eggs and chicks of 6.9 and 9.7, respectively. These selenium*

BCFs are high, none of my other sites were this high even the Grand Calumet River so this is significant. Overall barn swallow egg and chick concentrations were high at the Hwy 41 bridge, but not likely to be at acute levels. Since sediment selenium concentrations were low, what this says to me is that there is a lot of bioavailable selenium in the water column of the Kankakee River persisting many miles downstream from this facility. Given this observation, I would hope that NIPSCO tries to minimize bird use in its final settling basin as it could be a significant attractive nuisance to birds.

A total of 99 fish species and 35 freshwater Unionid mussel species have been identified in the Kankakee River basin based on historical accounts and published reports between 1971 and 1991 (Kwak 1993). Several of these species are now considered extirpated from the basin, and others are state threatened or endangered (see below), while the Kankakee River has seen the introduction of approximately seven non-native fish species (Kwak 1993). Simon (1991) listed 82 fish species in the Kankakee River drainage of the Illinois River Basin.

A long-term study conducted between 1977 and 1990 at the Braidwood Station Aquatic Monitoring Area in Will County, Illinois identified 79 fish species (Kwak 1993, Larimore *et al.* 1988). Many of these studies look at downstream areas or the Kankakee River watershed as a whole and identify species that may not be expected in the main channel of the Kankakee in the vicinity of the plant.

In 2001, Price and Robertson (2005) performed extensive electrofishing surveys within Indiana portions of the main branch of the Kankakee, including a station at Dunns Bridge, approximately 3.5 miles upstream of the plant intake. During this study, a total of 46 fish species were identified; these species are considered to be the most likely species found in the vicinity of the CWIS due to their presence in the main stem of the Kankakee River. Relative abundance of each species in the Price and Robertson (2005) study is presented in Table 3, below (see April 2015 CWIS Report, available in VFC) to provide estimated relative abundances within the main channel of the Kankakee River in the vicinity of the R.M. Schahfer intake. Creel surveys were also conducted during the study to identify recreational catch. Species identified during the creel survey are noted in Table 3 (see April 2015 CWIS Report, available in VFC)

To assess substantially changed conditions from the information submitted in the April 2015 CWIS Report (available in VFC) Ramboll consultants conducted a review for the permittee of publicly-available information from published and online sources. Rule guidance documents, including the U.S. Fish and Wildlife Service (USFWS)/National Marine Fisheries Service (NMFS) Biological Opinion, as well as USEPA and USFWS online resources/databases, were utilized to guide this data search.

Based on the Ramboll review, the extensive electrofishing surveys within Indiana portions of the main branch of the Kankakee performed by Price and Robertson in 2001 were identified by the permittee as the most recent, representative reference of species and relative abundance in the vicinity of the cooling water intake structure. See Attachment C, 2020 CWIS Requirements Update.

The Ramboll review noted above did not, however, include an evaluation of any studies or data collected by IDEM.

Fish community studies in the Kankakee River Basin have been conducted by the IDEM Office of Water Quality in 1999 (5 sites on the mainstem Kankakee River), 2004 (6 sites on the mainstem), 2009 (4 sites on the mainstem) and 2017 (8 sites on the mainstem) as part of its Probabilistic Monitoring Program. This program entails a basin-wide sampling approach of sites selected by a stratified probabilistic design in order to provide a statistically valid assessment of the overall water quality of the basin based on fish community status and/or other metrics. Regular revisits to the basin with a new set of randomly chosen sites also gives an assessment of water quality trends in the basin. These basin assessments include the potential selection of sites from all stream reaches in the basin including headwaters, Strahler (Strahler 1957) first order, second order, third order, and fourth and greater, selected with equal weight probability. Sites close to R.M. Schahfer included at Dunn's Bridge (upstream) and downstream of R.M. Schahfer's Outfall 001. Sampling included sites in LaPorte, Porter, Jasper, Newton, and Lake counties. From these studies, 66 fish species were documented in the mainstem Kankakee River (Table 1, below).

Table 1. Fish Species documented by IDEM OWQ in the mainstem Kankakee River between 1999 and 2017.

Species Documented from OWQ Probabilistic Site Studies		
American Brook Lamprey	Golden Redhorse	River Redhorse
Banded Darter	Golden Shiner	Rock Bass
Banded Killifish	Goldeye	Rosyface Shiner
Bigmouth Buffalo	Greater Redhorse	Sand Shiner
Black Buffalo	Green Sunfish	Shorthead Redhorse
Black Crappie	Highfin Carpsucker	Silver Redhorse
Black Redhorse	Johnny Darter	Slenderhead Darter
Blackside Darter	Largemouth Bass	Smallmouth Bass
Bluegill	Logperch	Smallmouth Buffalo
Bluntnose Darter	Longear Sunfish	Spotfin Shiner
Bluntnose Minnow	Mottled Sculpin	Spotted Bass
Bowfin	Northern Hog Sucker	Spotted Sucker
Brook Silverside	Northern Pike	Steelcolor Shiner
Brook Stickleback	Northern Sunfish	Stonecat
Brown Bullhead	Orangespotted Sunfish	Striped Shiner
Bullhead Minnow	Pirate Perch	Walleye
Channel Catfish	Pumpkinseed	Weed Shiner
Common Carp	Quillback	White Crappie
Dusky Darter	Redear Sunfish	White Sucker
Emerald Shiner	Redfin Pickerel	Yellow Bullhead
Flathead Catfish	Redfin Shiner	Yellow Perch
Gizzard Shad	River Carpsucker	

The top 10 most abundant species in order of numbers of individuals from these studies, included Spotfin Shiner, Bluegill, Common Carp, Redhorse spp. Bluntnose Minnow, Green Sunfish, Rock Bass, Largemouth Bass, Buffalo spp. and Smallmouth Bass. Of note was all three buffalo species (Bigmouth, Black, and Smallmouth) and five redhorse species were documented from these studies. Other important sport fish documented included Largemouth Bass, Northern Pike, Smallmouth Bass, Walleye, and Yellow Perch. Data from these studies are managed in the Office of Water Quality Watershed Assessment and Planning Branch's Assessment Information Management System (AIMS) and can be provided upon request.

Index of Biotic Integrity (IBI) scores were tallied for these sites to assess aquatic life use attainment status. An IBI score is a multi-metric scoring based on aspect of the fish community structure. There are 12 metrics that make up the IBI score including compositional, functional, and health indicators about the fish community. The IBI

scoring ranges from 12 to 60 when fish are present. Calibration of the IBI scoring for a region is based on sampling of sites across a wide range of conditions and determining a gradient of expectation for each of the metrics chosen to make up that IBI. The calibration applicable for the Kankakee River Basin is based on Simon's (1991) IBI calibration for the Central Corn Belt Plains Ecoregion in Indiana. The IDEM OWQ has determined that an IBI total score of 36 or greater meets the definition for aquatic life use support for purposes of Section 303d listing of Impaired water in the State. Sites are sampled for a distance of 15 times the ambient wetted width of the stream. Sampling occurs along both the right and left descending banks.

The average total IBI score for the Kankakee River from these 24 samples was 38 with a median of 41. IBI scores ranged from 17 to 56. Nine of the 24 sites (37.5%) had IBI scores below the 36 threshold and would be considered not meeting their aquatic life use. The average species richness for these sites was 18 species with a median of 19. The species richness ranged from 3 to 27 species. The Dunn's Bridge site, upstream of R.M. Schahfer, had a total IBI score of 22 and species richness of 13. Much further downstream in the Kankakee River, the next three sites had IBI scores ranging from 40 to 46.

In 2017, a Travelling Zone (Emery and Thomas 2002) approach to fish community sampling was employed in the immediate reach downstream of the R.M. Schahfer thermal outfall. The purpose of this approach was to understand near and far-field community structure changes that might occur with distance from the thermal discharge outfall as thermal influence dissipates. For this, the reach immediately downstream of the R.M. Schahfer was divided into 60-meter segments starting near the Outfall 001 (10 segments including both left and right descending banks, and middle of river) for a total distance of 600 meters downstream of Outfall 001. Fish accounts were maintained separately for each 60-meter segments of the river reach (Table 2). For the analysis, data from each segment were combined into succeeding 300 meter zones (segments 1-5, 2-6,3-7,4-8, 5-9, and 6-10) (Table 3). Three hundred meters was based on 15X the average wetted width of the River to give the standard unit of effort used for IDEM fish community studies. Thirty-three fish species were documented in the 600 meters immediately downstream of the R.M. Schahfer Outfall 001. Included in this list were four species of Redhorse, Bigmouth Buffalo, and Northern Hog Sucker. Sport fish included Largemouth Bass, Northern Pike, Rock Bass, and Smallmouth Bass.

Twelve metric attributes about the community structure were assessed for determining if a gradient of community response was apparent with increasing distance from the R.M. Schahfer including species richness, number of darter species, number of sunfish species, number of round bodied suckers, number of sensitive species, percent round bodied suckers, percent tolerant species, percent omnivores, percent insectivores, percent carnivores, catch per unit of effort, and percent simple lithophilic spawners (Table 4).

Most of these metrics indicated fair to good conditions with only catch per unit effort lacking for the first 300 meter zone. Species richness in this case would be somewhat below an ideal expectation, mostly due to the loss of intolerant forms. Trophic levels show signs of stress having an under-representation of insectivores and a possible over-abundance of carnivores to the overall community.

There were no overtly obvious trends for any of the metrics other than a pattern of decreasing round bodied sucker (which includes the redhorse species) contribution in numbers to the community structure proceeding downstream even though the proportion of insectivores increased slightly going downstream (redhorse species are Considered insectivores). However, this, on the surface, did not appear to be significant. There was also a decrease in %omnivores proceeding downstream. Both the increase in %insectivores, and decrease in %omnivores could be indicative of an improvement in conditions proceeding downstream. The higher proportion of simple lithophilic spawners in the first zone was influenced by the higher number of simple lithophilic round bodied suckers. A simple lithophilic spawners are species which broadcast their eggs over the stream bottom where they can develop in the interstices of sand, gravel, and cobble substrates without parental care. This metric provides an assessment of the suitability of a site for reproduction.

Bigmouth Buffalo were consistently found throughout the reach (Table 2), while numbers of Bluegill were quite low in the first 300 meter zone and were completely absent in the first two segments (Table 2), but increased quickly in subsequent segments. Green Sunfish, Largemouth Bass, and Spotfin Shiner numbers displayed the same pattern at the zone level. However, Smallmouth Bass numbers were consistent throughout all zones.

In conclusion, this IDEM monitoring study did not show any significant community structure change patterns proceeding downstream from the R.M. Schahfer Outfall 001. The fish community structure in this portion of the Kankakee River would be considered fair to good and probably meeting its aquatic life use designation.

Table 2. Fish species observed in the reach just downstream of the R.M. Schahfer Outfall 001 in the Kankakee River for each succeeding 60-meter segment.

Species Observed in the immediate reach downstream of th R.M. Schahfer EGS Outfall 001	0-60 meters d/s	60-120 meters d/s	120-180 meters d/s	180-240 meters d/s	240-300 meters d/s	300-360 meters d/s	360-420 meters d/s	420-480 meters d/s	480-540 meters d/s	540-600 meters d/s	Total Ind. Of each sp.
American Brook Lamprey	1								1		2
Banded Killifish						1					1
Bigmouth Buffalo	1		2	1	10	9	1	5	3	6	38
Black Crappie			1	1	4	3	1	1			11
Blackside Darter		1		1						1	3
Bluegill			1	2	5	8	1	3	6	1	27
Bluntnose Minnow	1	2	1		1	1	1				7
Bowfin							1			1	2
Bullhead Minnow				1							1
Channel Catfish								1			1
Common Carp	1		2				1			3	7
Gizzard Shad					20	16	3	1		3	43
Golden Redhorse			3	1	1						5
Golden Shiner										1	1
Green Sunfish	1	4	9	8		28	2	2		6	60
Highfin Carpsucker									1		1
Johnny Darter							1		1	1	3
Largemouth Bass	1				3	4	5	2		2	17
Logperch				1							1
Longear Sunfish					1	2	2				5
Northern Hog Sucker	1										1
Northern Pike			1		1	1				1	4
Northern Sunfish						2		1	3	3	9
Pirate Perch		1				2					3
Redfin Pickerel	1		2		1	2	1	1		5	13
River Carpsucker										1	1
River Redhorse	1	1		1	1					1	5
Rock Bass	3	1	3	1		3	3		1	5	20
Shorthead Redhorse	1							1			2
Silver Redhorse	1	1	1	1					1		5
Smallmouth Bass	2	2	3	2	2	6	1	2	1	3	24
Spotfin Shiner	5	9	2	3	11	52	11	22	1	8	124
White Sucker										1	1
Total number of Species	14	9	13	13	13	16	15	12	10	19	33

Table 3. Fish Species observed in the reach just downstream of the R.M. Schahfer Outfall 001 In the Kankakee River. Each zone represents the compilation of succeeding 60 meter segments into a 300 meter long zone moving downstream of Outfall 001.

Species Observed in the immediate reach downstream of th R.M. Schahfer EGS Outfall 001	Zone 1 0 to 300 meters	Zone 2 60 to 360 meters	Zone 3 120 to 420 meters	Zone 4 180 to 480 meters	Zone 5 240 to 540 meters	Zone 6 540 to 600 meters
American Brook Lamprey	1				1	1
Banded Killifish		1	1	1	1	1
Bigmouth Buffalo	14	22	23	26	28	24
Black Crappie	6	9	10	10	9	5
Blackside Darter	2	2	1	1		1
Bluegill	8	16	17	19	23	19
Bluntnose Minnow	5	5	4	3	3	2
Bowfin			1	1	1	2
Bullhead Minnow	1	1	1	1		
Channel Catfish				1	1	1
Common Carp	3	2	3	1	1	4
Gizzard Shad	20	36	39	40	40	23
Golden Redhorse	5	5	5	2	1	
Golden Shiner						1
Green Sunfish	22	49	47	40	32	38
Highfin Carpsucker					1	1
Johnny Darter			1	1	2	3
Largemouth Bass	4	7	12	14	14	13
Logperch	1	1	1	1		
Longear Sunfish	1	3	5	5	5	4
Northern Hog Sucker	1					
Northern Pike	2	3	3	2	2	2
Northern Sunfish		2	2	3	6	9
Pirate Perch	1	3	2	2	2	2
Redfin Pickerel	4	5	6	5	5	9
River Carpsucker						1
River Redhorse	4	3	2	2	1	1
Rock Bass	8	8	10	7	7	12
Shorthead Redhorse	1			1	1	1
Silver Redhorse	4	3	2	1	1	1
Smallmouth Bass	11	15	14	13	12	13
Spotfin Shiner	30	77	79	99	97	94
White Sucker						1
Total number of Species	24	23	25	27	26	29
Total number of Individuals	159	278	291	302	297	289

Table 4. Fish community structure metric values.

Community Structure Metrics						
Species richness	24	23	25	27	26	29
Number Darter Species	2	2	3	3	1	2
Number Sunfish Species	3	4	4	4	4	4
Number Round Bodied Suckers	4	2	2	3	3	2
Number Sensitive Species	8	4	4	5	6	4
% Round Bodied Suckers	9.4	4.0	3.1	2.0	1.3	1.0
% Tolerant Species	1.9	1.1	1.4	0.7	0.7	2.4
% Omnivores	18.2	15.8	16.2	14.9	15.2	10.7
%Insectivores	33.7	38.8	37.8	43.0	43.4	41.9
% Carnivores	18.2	13.7	15.5	13.9	13.8	17.3
Catch Per Unit Effort	159.0	278.0	291.0	302.0	297.0	289.0

D. Impingement and Entrainment

No previous impingement or entrainment studies have been performed at the facility; therefore, historic plant impingement and entrainment data were not used by the permittee to assess species and life stages or numbers of organisms susceptible to impingement and entrainment.

The April 2015 CWIS Report (available in VFC), evaluated the primary gamefish species identified in the Price and Robertson (2005) study, as well as the most prevalent forage and rough fish species, to determine their susceptibility to impingement and entrainment at R.M. Schahfer during various life stages.

The following species were considered during this evaluation: Northern Pike (*Esox lucius*), Largemouth Bass (*Micropterus salmoides*), Smallmouth Bass (*Micropterus dolomieu*), Channel Catfish (*Ictalurus punctatus*), Walleye (*Sander vitreus*), Bluegill (*Lepomis macrochirus*), Gizzard Shad (*Dorosoma cepedianum*), Spotfin Shiner (*Cyprinella spiloptera*), Carp (*Cyprinus carpio*) and Silver Redhorse (*Moxostoma anisurum*).

All species were considered to be most susceptible during the egg and larval stages of development, as they may be unable to swim away from the induced current of the R.M. Schahfer intake.

Evaluating susceptibility of these early life stages requires knowledge of species life history characteristics including egg diameter, larval head capsule width, spawning habitats and substrates, and egg adhesiveness. R.M. Schahfer traveling screens currently have 5/16-inch openings, which would not restrict egg or larval individuals of the above-listed species from becoming entrained based upon size. However, several of these species may have limited susceptibility based upon other life history factors. A discussion of each species is found in the April 2015 CWIS Report (available in VFC).

Egg and larval abundance within the Kankakee River is expected to peak during the period of late April through July. Some species, such as northern pike, begin spawning in early March whereas others, such as bluegill, spawn from May into late August. However, most species' spawning periods overlap during the late spring and early summer months of May, June, and early July. Though some fish species, such as trout and salmon, spawn in the fall and hatch in the spring, species identified in the Kankakee River primarily hatch shortly after egg fertilization; spawning periods and periods of larval emergence completely or partially overlap. Hatching typically occurs between 3 days and 3-4 weeks following fertilization, depending upon the species, at the water temperatures expected within the Kankakee River in the late spring and early summer months (Becker 1983). By late August or early September, most young-of-the-year (YOY) fishes have grown and progressed through their larval stages and are sufficiently strong swimmers to be able to avoid being drawn into the CWIS.

Summary Discussion – Impingement and Entrainment

As discussed above, no previous impingement or entrainment studies have been performed at the facility. The permittee, in-lieu of such studies, has presented data based on surveys of aquatic life in the nearby waters of the CWIS as well the design/operation of the CWIS to assess species, life stages and relative numbers of organisms susceptible to impingement and entrainment at the CWIS.

The April 2015 CWIS Report (available in VFC), indicated susceptibility to egg entrainment is expected to be highest among walleye, while larval entrainment is expected to be highest amongst silver redhorse, walleye, spotfin shiner, and gizzard shad.

These results are consistent with results found in Boehler & Baker (2013), where larval drift samples in Honey Creek, Seneca County, Ohio were dominated by sucker species (80 percent), perch species (10 percent), and minnow species (8 percent). Silver redhorse is a sucker species, walleye is a perch species, and spotfin shiner is a minnow species.

Regarding susceptibility to impingement, for juvenile and adult fish, the USEPA has indicated that a water velocity of 1.0 fps is sufficient to protect 96 percent of fish species (FR 2001). In the Rule, the USEPA has provided a level of additional safety, indicating that a design intake flow or maximum actual through-screen velocity of 0.50 fps may be considered BTA for impingement.

Although, the through-screen velocity is 0.58 fps at the maximum DIF of 57.7 MGD, the maximum actual through screen velocity is 0.39 fps at the maximum observed daily intake flow of 39 MGD.

The use of closed cycle cooling means that the DIF of the R.M. Schahfer of 57.7 MGD (89 cfs) is significantly less than a similar sized facility that does not employ closed cycle cooling. The DIF of 57.7 MGD is less than 10% of the lowest mean annual flow of the Kankakee River for the period studied of 2007 through 2015 and less than 6% of the mean annual flow of 1605 cfs for that same period. As a result, the HZI is relatively limited in the Kankakee River reducing potential numbers of organisms impacted for entrainment and impingement. As noted above, the entire area of the Davis Ditch is expected to be within the HZI and the DIF is expected to be 100% of the flow of Davis Ditch.

As noted previously, the Kankakee supports a warmwater fish community with species including small and largemouth bass, walleye, northern pike, and various panfish.

Regarding federally listed species, USFWS concurs that the one federally listed species - Sheepnose mussel - has been extirpated from the Kankakee River in the area of the CWIS and did not raise any issues related to federally listed species. See discussion below.

E. Threatened, Endangered, and Other Protected Species Susceptible to Impingement and Entrainment

Federal- and state-listed species identified for Jasper and Porter Counties of Indiana that may be located in the Kankakee River or the Davis Ditch in the vicinity of the R.M. Schahfer intake are presented in Table 5 of the April 2015 CWIS Report (available in VFC).

This list includes species that are endangered, threatened, or of special concern to the applicable managing agencies. Additionally, the species listed in Table 5 of the April 2015 CWIS Report (available in VFC), have a current or historical range that includes the area of influence of R.M. Schahfer, utilize the source waterbody (up to ordinary high water marks) for any portion of their life cycle or rely on species for their survival that meet these criteria.

Table 5 of the April 2015 CWIS Report (available in VFC) includes one federally-listed species (Sheepnose, *Plethobasus cyphyus* – a freshwater mussel) included on the Indiana Department of Natural Resources (IDNR) Indiana County Endangered, Threatened, and Rare Species lists Jasper and Porter counties (IDNR 2013a,b); however, Sheepnose is not included on USFWS County Distribution of Federally-Listed Threatened, Endangered, and Candidate Species for Jasper or Porter counties (USFWS 2015). Correspondence with Elizabeth McCloskey (USFWS Northern Indiana Suboffice) revealed that Sheepnose were extirpated from the Kankakee River in Jasper and Porter counties when the river was dredged and ditched in the late 1800s to early 1900s. Ms. McCloskey clarified that the IDNR maintains historical occurrences in their database, but that USFWS does not have any extant records of Sheepnose in the Kankakee River in Indiana. The 2002 USFWS Sheepnose status assessment report confirms that Sheepnose was extirpated from the channelized portions of the Kankakee River in Indiana (USFWS 2002).

In addition to the one federally-listed species, Table 5 of the April 2015 CWIS Report (available in VFC), includes 16 state endangered (one being the Sheepnose), four state threatened, three state rare, five state special concern, and one watchlist species that could be directly impacted. It also includes five state endangered and two state special concern species that could be indirectly impacted. Table 3 of the April 2015 CWIS Report (available in VFC) indicates threatened and endangered status for the 46 fish species identified in the main channel of the Kankakee River by Price and Robertson (2005). None of these 46 species were listed as threatened or endangered.

In addition to the federal and state listed Sheepnose, the Ellipse ((*Venustaconcha ellipsiformis*)) is the only other listed freshwater mussel species identified from USFWS and IDNR county lists. The Ellipse is state species of concern listed by IDNR in Porter County but not in Jasper County. The exclusion of the Ellipse from the Jasper County IDNR Indiana County Endangered, Threatened, and Rare Species List may indicate that the Ellipse is not found in the portion of the Kankakee River that forms the border of Jasper and Porter counties in the vicinity of R.M. Schahfer. No other federal or state listed mussel species are identified in Jasper or Porter counties on USFWS or IDNR species lists.

Like all unionid mussels, the Ellipse develops from a parasitic glochidial larval stage that requires a fish host to complete its life cycle. Although possibly not listed as threatened, endangered, or species of special concern; some common fish species within the Kankakee River are important to these threatened and endangered mussels as host species.

Sauger (*Stizostedion canadense*) and sunfish (*Lepomis* species) are the only known naturally occurring host fish species for the Ellipse (Allen et al. 2007). Sauger is not one of the 46 species listed by Price and Robertson (2005) for the Kankakee River; however, four species of *Lepomis* are present in the Kankakee River: green sunfish (*Lepomis cyanellus*), Pumpkinseed (*Lepomis gibbosus*), Warmouth (*Lepomis gulosus*), and Orangespotted sunfish (*Lepomis humilis*).

Since the April 2015 CWIS Report (available in VFC), the IDNR has updated the available Endangered, Threatened and Rare Species list. This list has been expanded to include Jasper and neighboring counties, La Porte and Porter. See Table 1 of the 2020 CWIS Requirements Update included as Attachment C of this Fact Sheet.

Consultation with Federal and State Agencies [40 CFR § 122.21(r)(4)(vii)]

Publicly available data sources were used by the permittee to identify federal and state listed species with the potential to be impacted by activities at R.M. Schahfer. Publicly available information from USFWS and IDNR was inconsistent regarding the potential presence of federal and state listed Sheepnose mussel in the Kankakee River in Indiana. The permittee indicated that correspondence with Elizabeth McCloskey (USFWS Northern Indiana Suboffice) clarified that USFWS does not have any extant records of Sheepnose in the Kankakee River in Indiana and IDNR records in the county database are historical.

In the June 5, 2015 email to IDEM regarding impacts from the CWIS, Mr. Dan Sparks, USFWS, wrote that he ….“essentially concur with their (the permittee) CWIS information and approach.” He also writes that the permittee should correct the heading of their Tables 3 and 4 in their April 2015 CWIS Report (available in VFC), “It's not Lake Michigan, its [sic] the Kankakee River they are presenting data on.” He also stated that “Their approach regarding the endangered sheepnose mussel is accurate. Someday it would be great to get some mussel surveys done in the Kankakee watershed but everything we currently know about mussels would suggest that they were extirpated when the river was straightened.”

In his April 15, 2020 email to IDEM with respect to the permittee’s updated 316(b) application (2020 CWIS Requirements Update included as Attachment C of this Fact Sheet), Mr. Sparks of USFWS indicated that his 2015 comments were still germane.

F. Best Technology Available (BTA) Determinations

Impingement BTA:

Under 40 CFR 125.94(c) existing facilities subject to the rule must comply with one of the following seven BTA Standards for Impingement Mortality:

1. Operate a closed-cycle recirculating system as defined at 40 CFR §125.92;
2. Operate a CWIS that has a maximum design through-screen design intake velocity of 0.5 fps;
3. Operate a CWIS that has a maximum actual through-screen intake velocity of 0.5 fps;
4. Operate an offshore velocity cap that is a minimum of 800 feet offshore;
5. Operate a modified traveling screen that the Director (IDEM) determines meets the definition of the rule (at §125.92(s)) and that the Director (IDEM) determines is BTA for impingement reduction;
6. Operate any other combination of technologies, management practices, and operational measures that the Director (IDEM) determines is BTA for impingement reduction; or
7. Achieve the specified impingement mortality performance standard of less than 24 percent.

The permittee has chosen Option 3, operate a CWIS that has a maximum through screen intake velocity of 0.5 fps, as their impingement mortality compliance option. Under this option, the permittee must submit information that demonstrates that the maximum intake velocity as water passes through the structural components of a screen measured perpendicular to the screen mesh does not exceed 0.5 feet per second. The maximum velocity must be achieved under all conditions, including during minimum ambient source water surface elevations (based on best professional judgment using hydrological data) and during periods of maximum head loss across the screens or other devices during normal operation of the intake structure. IDEM may authorize the owner or operator of the facility to exceed the 0.5 fps velocity at an intake for brief periods for the purpose of maintaining the cooling water intake system, such as backwashing the screen face. In addition, the permittee must monitor the velocity at the screen at a minimum frequency of daily. In lieu of velocity monitoring at the screen face, the permittee may calculate the through-screen velocity using water flow, water depth, and the screen open areas.

As discussed previously, at the maximum observed daily intake flow of 39 MGD, the through-screen velocity is 0.39 fps (maximum actual through screen velocity).

In order to ensure that the facility will comply with impingement Option 3 above, a permit condition and limit has been added that requires the facility to operate at a daily intake flow rate of 39 MGD or less.

In addition, the permittee has indicated it intends to close the facility no later than December 31, 2023.

With these conditions, IDEM concurs with the permittee that Option 3, operate a CWIS that has a maximum actual through screen intake velocity of 0.5 fps, is the best technology available (BTA) for impingement mortality.

Entrainment BTA:

For existing facilities, EPA did not identify any single technology or group of technology controls as available and feasible for establishing national performance standards for entrainment. Instead, EPA's regulations require the permitting agency to make a site-specific determination of the best technology available standard for entrainment for each individual facility. See 40 CFR § 125.94(d).

EPA's regulations put in place a framework for establishing entrainment requirements on a site-specific basis, including the factors that must be considered in the determination of the appropriate entrainment controls. These factors include the number or organisms entrained, emissions changes, land availability, and remaining useful plant life as well as social benefits and costs of available technologies when such information is of sufficient rigor to make a decision. These required factors are listed under 40 CFR § 125.98(f)(2).

EPA's regulations also establish factors that may be considered when establishing site-specific entrainment BTA requirements, including: entrainment impacts on the waterbody, thermal discharge impacts, credit for flow reductions associated with unit retirements, impacts on reliability of energy delivery, impacts on water consumption, and availability of alternative sources of water. (Id. § 125.98(f)(3))

In these regulations EPA identified closed-cycle recirculating cooling systems (CCRS) as the best performing technology for entrainment (See EPA Technical Development Document for the Final Section 316(b) Existing Facilities Rule, May 2014 at page 7-6). However, despite numerous retrofits of existing units to closed cycle cooling, EPA rejected this technology as the basis for a uniform national entrainment standard because, among other things, it is not nationally available. Also, in some instances, it has unacceptable non-water quality impacts.

All four units at this facility feature closed-cycle cooling via a single multi-cell mechanical draft cooling tower per unit.

Under the 316(b) rules, a closed-cycle recirculating system (CCRS) means a system designed and properly operated using minimized make-up and blowdown flows withdrawn from a water of the United States to support contact or non-contact cooling uses within a facility. A closed-cycle recirculating system passes cooling water through the condenser and other components of the cooling system and reuses the water for cooling multiple times. properly operated and maintained closed-cycle recirculating system withdraws new source water (make-up water) only to replenish losses that have occurred due to blowdown, drift, and evaporation.
If waters of the United States are withdrawn for purposes of replenishing losses to a closed-cycle recirculating system other than those due to blowdown, drift, and evaporation from the cooling system, the Director (IDEM) may determine a cooling system is a closed-cycle recirculating system if the facility demonstrates to the satisfaction of the Director that make-up water withdrawals attributed specifically to the cooling portion of the cooling system have been minimized.

The EPA Technical Development Document (TDD) and Essay 17A: Closed-Cycle Recirculating Cooling (EPA Response to Public Comment: National Pollutant Discharge Elimination System Final Regulations to Establish Requirements for Cooling Water Intake Structures at Existing

Facilities and Amend Requirements at Phase I Facilities (40 CFR Parts 122 and 125) Docket # EPA-HQ-OW-2008-0667) provide additional discussion on what constitutes a closed cycle recirculating system (CCRS) under the rule. The TDD developed by USEPA provides record support for the rule and describes the methods used by EPA to analyze various options in the rule. Essay 17A was developed by USEPA to address public comments about the definition of a CCRS under the rule.

Generally, two operating parameters are used to evaluate proper operation of a closed cycle cooling system, Cycles of Concentration (COC) and Reduction in Flow (RIF). The RIF is the percent reduction in water use versus water use at a facility with once through cooling. COCs can be measured as the ratio of chloride levels in the recirculated water or blowdown relative to the chloride levels in the source water, or makeup water. Cycles of concentration represents the accumulation of dissolved minerals in the recirculated cooling water.

While EPA has determined that a COC of 3.0 for freshwater facilities and a RIF approximately equivalent to a percent reduction in flow of 97.5 is indicative of a well-operated cooling system (i.e., one that truly minimizes makeup withdrawals), EPA decided not to include a minimum COC (or RIF) requirement as part of the definition for closed-cycle systems. Instead, the definition at 40 CFR 125.92 requires makeup flows be minimized. These flow reductions and COC serve as indicators of minimized makeup flows, and thus may be used by IDEM when assessing performance of a particular CCRS.

Regardless of whether facilities achieve either these levels of COC or reductions in flow, IDEM is responsible for determining whether such facilities in fact are operating as a close-cycle recirculating cooling system. IDEM would review the information provided by the facility and determine if the facility's configuration and operation are otherwise consistent with the definition of a closed-cycle cooling system in the final rule.

The permittee, via emails of May 20 and June 17, 2020 (see the detailed information provided in the June 17, 2020 e-mail under Section 6.4.B., above), has indicated to IDEM that all four units combined typically operate at a COC of 1.7. Previous attempts by the facility to cycle at a COC of 3.0 failed due to issues with scaling. The permittee has indicated to IDEM that operating at higher cycles (above 1.7) poses more risk and potential negative consequences to the operation of the facility.

Using recent operating conditions (such as run times of the various units), the permittee estimates that a once-through system would require 1.044 billion gallons of water per day. The permittee calculates an estimated water use of 48.5 MGD day at 1.7 COC, and 40 MGD at 2.0 COC. The 1.7 COC results in a 95.4% reduction when compared to a once-through system (and 96.2% at 2.0 COC).

IDEM has not determined whether the design and operation of the closed cycle cooling system at R.M. Schahfer meets the federal rule definition of a CCRS. However, after considering all the factors that must and may be considered by the federal rules (see discussion below), IDEM finds that the existing facility meets BTA for entrainment. This is primarily based on the following factors:

1. The permittee will cease operations at this facility by no later than December 31, 2023.
2. The permittee does have closed-cycle cooling via a single multi-cell mechanical draft cooling tower on each unit which has allowed the permittee to achieve substantial reductions in water usage.

Must and May Factor Discussion (40 CFR 125.98(f)(2) and (3))

In regard to the factors that must be considered (40 CFR § 125.98(f)(2)), IDEM evaluated the following:

Number and type of organisms affected, including the numbers of federally-listed species and designated critical habitat to the lowest taxonomic classification possible:

The permittee operates a closed cycle cooling system. While IDEM has not determined that the facility meets the federal definition of a CCRS, the facility has reduced the AIF to 21.7 MGD which significantly reduces the need for intake water and therefore the number of organisms entrained by the facility compared to a facility of similar size without closed cycle cooling.

Regarding federally-listed species, there are no known federal listed species expected to be impacted by the CWIS. See above Section E. Threatened, Endangered, and Other Protected Species Susceptible to Impingement and Entrainment

In addition to the current use of closed cycle cooling, the permittee has chosen to close the facility no later than December 31, 2023.

Changes in air emissions:

Air emissions will be significantly reduced due to the proposed closure of the facility in 2023.

Land availability:

The operating units at the Schahfer Generating Station will be shut down on or before December 31, 2023. Therefore, land availability is not an issue.

Remaining useful plant life:

The operating units will be shut down on or before December 31, 2023.

Social benefits and costs:

The permittee is not required to provide Cost Evaluation Study (40 CFR 122.21(r)(10)) or Benefits Evaluation (40 CFR 122.21(r)(11)) because the AIF is less than 125 MGD. Also, the R.M. Schahfer Generating Station will be shut down on or before December 31, 2023.

Water consumption:

The facility will be shut down on or before December 31, 2023. Therefore, water consumption is not an issue.

In regard to the factors that may be considered (40 CFR § 125.98(f)(3)), IDEM evaluated the following:

- Entrainment impacts on the waterbody are not expected to impact the existing warmwater fish community. All four units use close-cycle cooling via a single multi-cell mechanical draft cooling tower per unit which significantly reduces the volume of water that would otherwise be used by the facility. Also, the facility will be closing prior to 2023.

- Water consumption will be reduced in that the facility will shut down during the permit cycle.

- Credit for flow reductions associated with unit retirements, impacts on reliability of energy delivery and impacts on water consumption are either not applicable or were not considered due to lack of information.

G. Conclusion

For the NIPSCO R.M. Schahfer Generating Station, IDEM has determined that the selection of impingement BTA option for the operation of a CWIS with a maximum actual through screen intake velocity of 0.5 fps will result in compliance with the BTA to minimize adverse environmental impact from impingement. Further, IDEM has determined that the existing facility meets BTA for entrainment. Primary in this entrainment BTA determination is that the facility will cease operations no later than December 31, 2022 and the permittee does have closed-cycle cooling via a single multi-cell mechanical draft cooling tower on each unit which has allowed the permittee to achieve substantial reductions in water usage.

H. Permit Conditions

The permittee must comply with requirements below:

1. In accordance with 40 CFR 125.98(b)(1), nothing in this permit authorizes take for the purposes of a facility's compliance with the Endangered Species Act.

2. The permittee must at all times properly operate and maintain the cooling water intake structure and associated intake equipment.

3. The permittee must inform IDEM of any proposed changes to the CWIS or proposed changes to operations at the facility that affect the information taken into account in the current BTA evaluation.

4. There shall be no discharge of intake screen backwash.

5. In accordance with 40 CFR 125.97(c), by January 31 of each year, the permittee must submit to Industrial NPDES Permit Section IDEM-OWQ an annual certification statement for the preceding calendar year signed by the responsible corporate officer as defined in §122.22 (see 327 IAC 5-2-22) subject to the following:

    a. If the information contained in the previous year's annual certification is still pertinent, you may simply state as such in a letter to IDEM and the letter, along with any applicable data submission requirements specified in this section shall constitute the annual certification.

    b. If you have substantially modified operation of any unit at your facility that impacts cooling water withdrawals or operation of your cooling water intake structures, you must provide a summary of those changes in the report. In addition, you must submit revisions to the information required at §122.21(r) of this chapter in your next permit application.

6. Best technology available (BTA) determinations for entrainment mortality and impingement mortality at cooling water intake structures will be made in each permit reissuance, in accordance with 40 CFR 125.90-98. The permittee shall submit all the information required by the applicable provisions of 40 CFR 122.21(r)(2) through (r)(8) with the next renewal application. Since the permittee has submitted the studies required by 40 CFR 122.21(r), the permittee may, in subsequent renewal applications pursuant to 40 CFR 125.95(c), request to reduce the information required, if conditions at the facility and in the waterbody remain substantially unchanged since the previous application so long as the relevant previously submitted information remains representative of current source water, intake structure, cooling water system, and operating conditions. Any habitat designated as critical or species listed as threatened or endangered after issuance of the current permit whose range of habitat or designated critical habitat includes waters where a facility intake is located constitutes potential for a substantial change that must be addressed by the owner/operator in subsequent permit applications, unless the facility received an exemption pursuant to 16 U.S.C. 1536(o) or a permit pursuant to 16 U.S.C. 1539(a) or there is no reasonable expectation of take. The permittee must submit a request for reduced cooling water intake structure and waterbody application information at least **two years and six months** prior to the expiration of its NPDES permit. The request must identify each element in 40 CFR 122.21(r) that it determines has not substantially changed since the previous permit application and the basis for the determination. IDEM has the discretion to accept or reject any part of the request.

7. The permittee must maintain an intake daily flow rate of 39 MGD or less. Further, the permittee shall submit an annual summary of the actual intake flows measured at a minimum frequency of daily.

8. The permittee must monitor the velocity at the screen at a minimum frequency of daily. In lieu of velocity monitoring at the screen face, the permittee may calculate the through-screen velocity using water flow, water depth, and the screen open areas.

9. The permittee must monitor and report its cycles of concentration at a minimum frequency of daily.

10. The permittee shall either conduct visual inspections or employ remote monitoring devices during the period the cooling water intake structure is in operation as required by 40 CFR 125.96(e). The permittee shall conduct such inspections at least weekly to ensure that any technologies operated to comply with 40 CFR 125.94 are maintained and operated to function as designed including those installed to protect Federally-listed threatened or endangered species or designated critical habitat. Alternative procedures can be approved if this requirement is not feasible (e.g., an offshore intake, velocity cap, or during periods of inclement weather).

11. The permittee shall submit and maintain all the information required by the applicable provisions of 40 CFR 125.97.

12. All required reports shall be submitted to the IDEM, Office of Water Quality, NPDES Permits Branch, Industrial NPDES Permit Section at OWQWWPER@idem.in.gov and the Compliance Branch at wwReports@idem.in.gov

6.5 Spill Response and Reporting Requirement

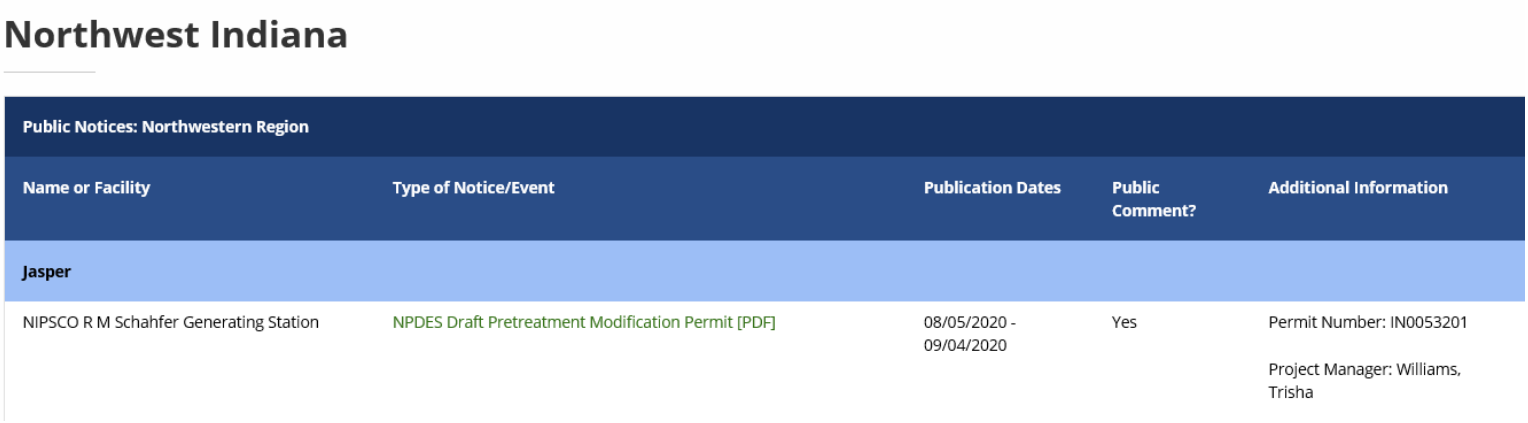
Reporting requirements associated with the Spill Reporting, Containment, and Response requirements of 327 IAC 2-6.1 are included in Part II.B.2.(d), Part II.B.3.(c), and Part II.C.3. of the NPDES permit. Spills from the permitted facility meeting the definition of a spill under 327 IAC 2-6.1-4(15), the applicability requirements of 327 IAC 2-6.1-1, and the Reportable Spills requirements of 327 IAC 2-6.1-5 (other than those meeting an exclusion under 327 IAC 2-6.1-3 or the criteria outlined below) are subject to the Reporting Responsibilities of 327 IAC 2-6.1-7.

It should be noted that the reporting requirements of 327 IAC 2-6.1 do not apply to those discharges or exceedances that are under the jurisdiction of an applicable permit when the substance in question is covered by the permit and death or acute injury or illness to animals or humans does not occur. In order for a discharge or exceedance to be under the jurisdiction of this NPDES permit, the substance in question (a) must have been discharged in the normal course of operation from an outfall listed in this permit, and (b) must have been discharged from an outfall for which the permittee has authorization to discharge that substance.

6.6 Permit Processing/Public Comment

Pursuant to IC 13-15-5-1, IDEM will publish the draft permit document online at https://www.in.gov/idem/6408.htm; additional information on options to receive notification of permit actions occurring can be found at https://www.in.gov/idem/6777.htm. A 30-day comment period is available in order to solicit input from interested parties, including the general public.

6.7 Post Public Notice Addendum



Northwest Indiana

Public Notices: Northwestern Region				
Name or Facility	**Type of Notice/Event**	**Publication Dates**	**Public Comment?**	**Additional Information**
Jasper				
NIPSCO R M Schahfer Generating Station	NPDES Draft Pretreatment Modification Permit [PDF]	08/05/2020 - 09/04/2020	Yes	Permit Number: IN0053201 Project Manager: Williams, Trisha

The draft NPDES permit for NIPSCO R.M. Schahfer Generating Station was made available for public comment from August 5, 2020 through September 4, 2020 as part of Public Notice No. 20200805–IN0053201–D on IDEM's website at https://www.in.gov/idem/6408.htm. During this comment period, a comment letter dated September 4, 2020, from Jeffrey Loewe of NIPSCO, was received. The comments submitted by Jeffrey Loewe, and this Office's corresponding responses are summarized below. Any changes to the permit and/or Fact Sheet are also noted below.

Comment 1: **Part I.A.1, Table 1, Intake Flow** – NIPSCO requests removal of the daily maximum limit of 39 MGD for Intake Flow. While our 2015 316(b) report as well as our current NPDES permit renewal application identify 39 MGD as the maximum observed intake flow, NIPSCO believes it is inappropriate to limit the intake flow to a daily volume which corresponds to a calculated through screen velocity (TSV) of less than the maximum allowable (i.e. 0.39 fps versus <0.5 fps). Intake values up to 50 MGD correlate to a TSV less than 0.5 fps (i.e. 0.4988 fps) and remain compliant with the impingement BTA standard. As an alternative to a numerical limit, the daily maximum Intake Flow can be designated as "Report". In addition to this requested change for Part I.A.1 Table 1, the same request applies to Part IV.B.7 as well and should also be revised to allow a maximum of 50 MGD intake volume.

Response 1: No changes were made. In the 2020 316(b) supplement, it states that the maximum intake flow registered by RMS is 39 MGD. The report later states that this is the maximum observed intake flow. Additional data is necessary to show that the maximum intake flow may be higher than 39 MGD.

Comment 2: **Parts I.A.1 and I.A.3** – In light of the August 31, 2020 pre-publication notice of the final Steam Electric Reconsideration Rule ("final Rule") applicable to the Federal Effluent Limits Guidelines (ELGs) at 40 CFR 423 for flue gas desulfurization (FGD) and bottom ash (BA) transport discharges, NIPSCO acknowledges that IDEM may choose to revise certain sections of the draft permit. Under the final Rule, the facility meets the definition of a facility that will cease combustion of coal no later than December 31, 2028 (40 CFR 423.11(w)). As such, once the rule is published and officially effective, the only applicable best available technology economically

achievable (BAT) ELGs for both FGD wastewater and bottom ash transport wastewater (40 CFR 432.13(g)(2)(i)) and 40 CFR 432.13(g)(2)(i)), respectively) are those for Total Suspended Solids (TSS) and Oil & Grease (O&G).

Note: the applicable best practicable control technology currently available (BPT) ELGs under 40 CFR 423.12 for TSS and Oil & Grease and these wastewaters remain unchanged.

Provided the timing of the final Rule aligns with IDEM's schedule of permit reissuance, NIPSCO requests the following three draft permit revisions be considered:

1. Part I.A.1., Footnote 19 – should be modified to also address bottom ash transport wastewater. NIPSCO offers the following suggested revised verbiage:

   In the event that wastestreams from various sources are combined for treatment or discharge, the quantity of each pollutant or pollutant property attributable to each controlled waste source shall not exceed the specified limitation for that waste source.

   In lieu of establishing new internal outfalls for low volume waste and bottom ash wastewater, should the permittee require a permit to continue operations beyond December 31, 2023, the permittee must submit an evaluation of alternate limitations for TSS and Oil & Grease developed using the combine wastestream formula (CWF), modified CWF, or building block approach and provide supporting documentation.

2. Part I.A.1., Footnote 20 – "The permittee shall comply with the requirements of the effluent limitation guidelines for Steam Electric Generating Stations, 40 CFR 423.13(k)(1)(i), for bottom ash transport water by December 31, 2023." should be removed, as it is no longer valid in the final Rule.

3. Part I.A.3. – The interim and final requirements/limits for arsenic, mercury, selenium, and nitrate/nitrite (as well as Footnotes [2], [4], and [5]) should be removed for both current Outfall 201 and proposed new Outfall 301.

Response 2: Footnote [19] has been updated.

No changes to Footnote [20] for Outfall 001 were made. The current regulations require compliance by this deadline, December 31, 2023. Once the regulatory revisions are effective, the permit can be modified.

No changes were made to the interim and final requirements/limits for arsenic, mercury, selenium, and nitrate/nitrite (as well as Footnotes [2], [4], and [5]) for both Outfall 201 and proposed new Outfall 301. The current regulations require compliance by this deadline. Once the regulatory revisions are effective, the permit can be modified.

Comment 3: **Part I.A.3, Outfall 301** – If IDEM decides not to address the final Rule at this time (as requested above) then NIPSCO requests the following permit revisions for Part I.A.3 be implemented into the renewed permit. Moreover, to provide clarity NIPSCO requests the suggested verbiage provided below in comment to Part 1.F.6, IDEM decides not to address the final Rule at this time.

> The limits and monitoring requirements in this table apply to both Outfall 201 and Outfall 301. However, Outfall 301 is a new outfall and there is currently no flow metering or sample collection infrastructure in place to assess parameter concentrations or effluent discharge flowrate. Additionally, the Unit 17/18 FGD wastewater currently comingles with other wastewaters and, therefore, an isolated, representative sampling port for Outfall 301 compliance assessment is necessary and may require significant re-piping to isolate this discharge. As such, NIPSCO requests a 3-year compliance schedule to design, procure, install, and debug the necessary power supply and equipment to properly monitor the required parameters at Outfall 301 as well as to properly segregate Unit 17/18 FGD wastewater from other sources at the new outfall location. Further, for the new Outfall 301 (only), monitoring for all parameters should not be required during the three year compliance schedule. After the compliance schedule expires, the numerical limitations for TSS and O&G would become effective when the Outfall 301 sampling equipment is properly configured and operational. Monitoring for all other parameters (i.e., “Report”) would also resume at this time. Ultimately, the limits for arsenic, mercury, selenium, and NO2+NO3 established under 40 CFR 423.13(g)(1)(i) shall apply no later than December 31, 2023 for both Outfalls 201 and 301.

Response 3: No changes were made. All applicable technology-based requirements (i.e., ELGs and BPJ) must be applied in NPDES permits without the benefit of a compliance schedule. The limits and monitoring requirements applied to Outfall 301 are not effective until that outfall starts discharging. The permit states that this outfall is proposed.

Comment 4: **Part I.A.3, Mercury** – NIPSCO requests that the monitoring frequency for Mercury be reduced from 2 X Monthly to 6 X Yearly. The 6 X Yearly frequency is consistent with the existing permit for Outfall 201, as well as this draft permit for Outfall 001. IDEM has presented no specific rationale in the Fact Sheet for increasing the monitoring frequency of Mercury. NIPSCO respectfully requests the rationale should the frequency remain as proposed.

Response 4: The changes have been made.

Comment 5: **Part I.A.4** – In the Draft Permit, NIPSCO believes IDEM has erroneously removed the reference to stormwater Outfall 005S and Outfall 006S in the introductory description as well as removed Footnote [5] in its entirety. Both references to outfalls 005S and 006S were in the July 6, 2020 Pre-public notice draft permit as well as the existing permit. These two outfalls still exist and continue to discharge. Accordingly, NIPSCO requests they be reinserted into this section with the acknowledgment that they are representatively sampled at Outfall 004. This request does not change any of the compliance requirements of the existing permit.

Response 5: References to Outfalls 005S and 006S were removed from Part 1.A.4. of the Permit because these outfalls are not sampled. However, the references to the outfalls have been returned to the Permit, along with GPS coordinates. Also, Footnote [5] has been added to the final Permit to clarify that the discharge of Outfall 004S shall be representative of discharge from Outfalls 005S and 006S.

Comment 6: **Part I.B.1** – NIPSCO requests the renewed permit retain the verbiage in the current permit. While the proposed verbiage is largely a simple restructuring from the current permit, the rewording for this section does change the meaning. The current permit verbiage addresses “the discharge not causing receiving waters to contain.” whereas the proposed verbiage focuses on the discharge itself as being free from substances, materials, floating debris, etc.

Response 6: No changes have been made. The narrative water quality standards language of the permit template was updated prior to this renewal. The narrative water quality standards are a discharge requirement. The Permit is regulating the discharge to ensure compliance with the water quality standards.

Comment 7: **Part I.C.2** – Page 15 of 58 (beginning of page through section f) is redundant with the verbiage on page 14 of 58 and should be deleted. NIPSCO believes to be an editorial oversight and removing the verbiage will result in zero effect to the requirements within the permit.

Response 7: The changes have been made.

Comment 8: **Part I.C.2.b** – NIPSCO requests this section be revised to state that an “approved statistical method” includes replacing values reported as <LOQ with 0 (zero) when calculating monthly averages for concentration. This technique is consistent with the provisions given in the current permit.

Response 8: No changes were made. The Permit issued in 2015 used the incorrect template for dischargers within the Great Lakes system. The portion of the rule that is applicable to dischargers not within the Great Lakes system is properly included in the Permit and does not include the language requested above.

Comment 9: **Part I.C.4** – NIPSCO requests “or the most recently approved version of 40 CFR 136.” Be added to the end of the first sentence in this section. The 327 IAC 5 reference (327 IAC 5-2-1.5 Incorporation by reference) does not specify a version of 40 CFR 136. However, 327 IAC 1 (specifically 1-1-2 References to the CFR) indicates that the CFR is the July 1, 2016 edition. NIPSCO believes not including the requested revision could potentially be problematic if there is a situation to use more recently approved methods.

Response 9: No changes were made. The Permit must comply with the current rules that reference the 2016 version of 40 CFR 136. Please note, Part I.C.4 of the Permit also states, “Different but equivalent methods are allowable if they receive the prior written approval of the Commissioner and the U.S. Environmental Protection Agency.” You may get prior approval if there is a situation that would require the use of more recently approved methods.

Comment 10: **Part I.F.6** – NIPSCO requests this section be revised to include the following or similar verbiage “This provision also allows the permittee to request appropriate permit modifications applicable from any newly promulgated Federal Effluent Limitation Guidelines for Steam Electric Generating Stations under 40 CFR 423.”

Response 10: Reopening Clause 6 now states, “to incorporate applicable limits and/or requirements based on newly promulgated and effective Federal Effluent Limitation Guidelines for Steam Electric Generating Stations under 40 CFR 423.”

Attachment A:

7State Form 4336

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
INDIANAPOLIS

OFFICE MEMORANDUM **Attachment V**

To: George Oliver
Industrial Permits Section

Date: May 26, 2004

From: Gurdeo Sondhe
Modeling Section

Subject: Reply to NIPSCO Schahfer Generating Station Public Notice No. 2004-3H-RD

Staff has reviewed a memo dated April 20, 2004, submitted by Mr. Arthur Smith, Environmental Counsel of NiSource Inc, regarding NIPSCO Schahfer Generating Station NPDES Permit Public Notice No. 2004-3H-RD. Following is the response to the questions raised by the counsel:

Receiving Water Flow:

A. Schematic Flow Diagram - NPDES water balance diagram suggests that the facility withdraw approximately 45 mgd flow from the receiving stream: Kankakee River, 42.5 mgd passes through cooling tower, including cooling tower makeup flow (2.5 mgd). Approximately 50 % of the total flow is evaporated in the cooling towers; rest passes through final settling basin via Outfall 001. Staff has conducted RPE analyses of MRO data (covers period from January 1998 through December 2003) including flow adjusted for outliers. The OWQ Tech Release requires 2-year maximum monthly average flow as a design flow. The design flow used in the analysis is based on BPJ of MRO Data. Adjusted PEQ flow from Outfall 001 is 22.4 mgd, by back tracking, facility would withdraw approximately 47.3 mgd, including flow required for screen backwash and cooling towers makeup flow.

B. The receiving stream of the facility discharge is Kankakee River, which has a Q7, 10 flow of 372 cfs upstream of the intake structure. The facility withdraws approximately 47.3 mgd, and discharges approximately 22.4-mgd flow from Outfall 001 back to the receiving water. Therefore, Q7, 10 flow upstream of the Outfall 001 is 301 cfs, which provides effluent limitations wrt water-balance flow diagram. Kankakee River (non-GLI Basin) is covered under Rule 320 IAC 2-1 and designated for warmwater species, and classified for general use, including protection of fish and aquatic life.

The background concentration profile of metal/toxic pollutants of concern used in the WLA analyses, were derived from the Kankakee River WQ Monitoring Stations at KR-68 and KR-118, respectively. Background concentrations reported by the facility were also incorporated in the background profile, and appropriate/modified profile was used in the analysis.

C. The Consultant has identified and collected samples of various pollutants of concern, both at Outfall 001 and intake structure, for determining LOD and respective background concentrations. These pollutants of concern are shown in the attached documents. The following methods were used to modify LOD values for RPE analysis and PEQ value determination.

1. In mixed data set (LOD and detectable data), a value less than the LOD (non detect) shall be assigned the value (V) as determined by the formula given below.

$$V = (LOD)*(1-(\text{Number of nondetects/Total number of values})$$

Above approach was used in mixed data set

2. Higher LOD values were replaced by the lowest value in a given data set,

C. **Effluent Concentration:** Method described above is used in determination of PEQ values (Table 4), and respective values used in the analysis. PEQ values are comparable with the NIPSCO findings.

E. **Water Quality Criteria**: In the Spreadsheet, the Antinomy acute value enters as FAV = 2* Acute Criteria (non-exponential relationship)

GSS/gss
Attachments:

Table 1	**Parameters - Selected by the Permit Writer**
Table 1a	**Parameters - Monitoring or Not required**
Table 1aa	**Parameters - Monitoring with WQBELs**
Table 1aaa	**Parameters – Report Only Grab Samples [Attached with NPDES Permit]**
Table 1A	Parameters – Selected by the Permit [PEQ]
Tables 1B	Detailed Calculation of Projected Effluent Quality [PEQ]
Table 1C	Parameters - Monitoring with WQBELs [PEQ]
Table 1D	Parameters - Monitoring or Parameters not required
Tables 2&2A	Master PROG Printout
Table 3	Compact Master PROG Printout
Tables 4&4A	RPE Analysis – Data Submitted by the Facility
Tables 5	RPE Analysis – MRO Data reported by the Facility

File Name : PPNG_adrpe3_FINAL_SCHAFFER POWER PLANT_HOGE COMMENTS.xls

EFFLUENT LIMITATIONS OBTAINED FROM MASTER PROGRAM FOR RPE Analysis (Metals) for the NIPSCO, ROLLIN M. SCHAHFER STATION , JASPER County

POLLUTANTS OF CONCERN As MENTIONED in WLA-CDA REQUEST/TRACKING SHEET By The PERMITS SECTION (RPE ANALYSIS)

TABLE 1

May 26, 2004

1:25:05 PM

	PARAMETERS Selected by the PERMIT WRITER				Data Collected by the Consultant is used					
OWQ Tech Release Criteria Flow (mgd) is used	22.38									OWQ Tech Release Criteria Flow (mgd) is used
Parameters	WQBELs		PEQ Plant Performance Actual MRO/MMR Data		PEQ Analyses - Samples Collected by Consultant		1995 NPDES Permit Effluent Limitations		Recommended Permit Effluent Limitations		Data Collected by the Consultant is used
	Monthly AVE mg/l	Daily MAX mg/l	Monthly AVE mg/l	Daily MAX mg/l	Monthly AVE mg/l	Daily MAX mg/l	Monthly AVE mg/l	Daily MAX mg/l	Monthly AVE mg/l	Daily MAX mg/l	RESULTS
Antimony, Acid Soluble	0.088	0.176			0.012		Report	Report	0.012	0.176	Monitoring or Parameter Not Required
Beryllium, Acid Soluble	0.004	0.008			0.001		Report	Report	0.001	0.008	Monitoring or Parameter Not Required
Cadmium, Acid Soluble	0.006	0.013	0.009		0.002		Report	Report	0.002	0.013	Monitoring or Parameter Not Required
Lead, Acid Soluble	0.052	0.105	0.037		0.005		Report	Report	0.005	0.105	Monitoring or Parameter Not Required
Mercury, Acid Soluble	0.00005	0.00011			0.00002		Report	Report	0.00002	0.00011	Report ONLY Grab Samples
Selenium, Acid Soluble	0.130	0.260			0.072		Report	Report	0.072	0.260	Monitoring or Parameter Not Required
Silver, Acid Soluble	0.014	0.028			0.049	0.049	Report	Report	0.014	0.028	Monitoring With WQBELs Recommendations
Zinc, Acid Soluble	0.301	0.604	0.340		0.347				0.301	0.604	Monitoring With WQBELs Recommendations
Cyanide, Total	0.022	0.044			0.039				0.022	0.044	Monitoring With WQBELs Recommendations
Sulfate as SO4	748.26	1501.15			1610.879		Report	Report	748.2570	1501.1451	Report ONLY Grab Samples

File Name : PPNG_adrpe3_FINAL_SCHAFFER POWER PLANT_HOGE COMMENTS.xls

EFFLUENT LIMITATIONS OBTAINED FROM MASTER PROGRAM FOR RPE Analysis (Metals) for the NIPSCO, ROLLIN M. SCHAHFER STATION , JASPER County

POLLUTANTS OF CONCERN As MENTIONED in WLA-CDA REQUEST/TRACKING SHEET By The PERMITS SECTION (RPE ANALYSIS)

TABLE 1_aaa

May 26, 2004

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	Monthly AVE mg/l	Daily MAX mg/l	Monthly AVE mg/l	Daily MAX mg/l	Monthly AVE mg/l	Daily MAX mg/l	Monthly AVE mg/l	Daily MAX mg/l	Monthly AVE mg/l	Daily MAX mg/l	RESULTS
Mercury, Acid Soluble	0.00005	0.00011			0.00002		Report	Report	0.00002	0.00011	Report ONLY Grab Samples
Sulfate as SO4	748.26	1501.15			1610.879		Report	Report	748.2570	1501.1451	Report ONLY Grab Samples

TABLE 2A RPE Analysis (Metals) for the NIPSCO, ROLLIN M. SCHAHFER STATION, JASPER County

Upstream Source I	Upstream Source II	Upstream Source III	Upstream Conc. ug/l	Pollutants of concern N	C V	Instream Concentration D/S mg/l	Instream Concentration D/S ug/l	CAS Number	Parameters	I Human Health Organisms ug/l	II Human Health Water ug/l	III AQUATIC CHRONIC ug/l	III TOXICITY ACUTE (FAV) ug/l	Water Quality-based Effluent Limits Average ug/l	Water Quality-based Effluent Limits Maximum ug/l		LIMITS OF DETECTION ug/l	Limit of Quantitation ug/l	Limits of COMPLIANCE Average ug/l	Limits of COMPLIANCE Maximum ug/l
									VOLATILE COMPOUNDS											
		5		4	0.6			67641	Acetone											
1	1			4	0.6			107028	Acrolein			9585	127796	41900.44	84060.22	IIa	10 S	32.00		
1	1			4	0.6			107131	Acrylonitrile	780 T	320 T			3409.74	6840.58	I	0.7 C	2.24		
1	3	2		4	0.6			71432	Benzene	6.5 C	0.58 C			22.64	45.42	I	0.5 C	1.60		
1	1			4	0.6			542881	Bis (Chloromethyl) Ether	400 C	5 DC	1064	2204	1098.60	2204.00	IIb	0.2 B	0.64		
				4	0.6			74964	Bromoethane	0.018 C	0.000038 C			0.06	0.13	I				
				4	0.6			78933	2-Butanone (Methyl Ethyl Ketone)											
				4	0.6			75150	Carbon Disulfide								4.2 Y	13.44		
1	1	2		4	0.6			56235	Carbon Tetrachloride											
	1	2		4	0.6			108907	Chlorobenzene	69.4 C	4 C	278	3520	241.74	484.98	I	0.12 A	0.38		
				4	0.6			75003	Chloroethane		488 T	250	11277	1092.86	2192.49	IIa	0.2 B	0.64		
				4	0.6			110758	2-Chloroethyl vinyl ether								0.52 A	1.66		
1	3	2		4	0.6			75343	1,1-Dichloroethane								0.13 A	0.42		
1	3			4	0.6			107062	1,2-Dichloroethane	2430 C	5 DC	2000	11800	5881.80	11800.00	IIb	0.07 A	0.22		
				4	0.6			75354	1,1-Dichloroethene	18.5 C	7 DT			64.44	129.28	I	0.03 A	0.10		
				4	0.6			540590	1,2-Dichloroethene								0.13 A	0.42		
		2		4	0.6			156605	1,2-Dichloroethene, Trans											
1	1			4	0.6			78875	1,2-Dichloropropane								0.1 A	0.32		
				4	0.6			542756	Dichloropropenes			840	5250	2616.90	5250.00	IIb	0.04 A	0.13		
				4	0.6			10061015	1,3-Dichloropropene, Cis	14100 T	87 T			61637.59	123656.65	I				
1	1	2		4	0.6			10061026	1,3-Dichloropropene, Trans								0.34 A	1.09		
				4	0.6			100414	Ethylbenzene	3280 T	1400 T	622.2	28000	2719.92	5456.65	IIa	0.2 A	0.64		
				4	0.6			591786	2-Hexanone (Methyl Butyl Ketone)								0.2 B	0.64		
				4	0.6			108101	4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)											
				4	0.6			100425	Styrene								3.00 Y	9.60		
1	1	2		4	0.6			79345	1,1,2,2-Tetrachloroethane								10.00 T	32.00		
1	1	2		4	0.6			127184	Tetrachloroethene	107 C	1.7 C	109.7	932	372.71	747.73	I	0.03 A	0.10		
1	1	2		4	0.6			108883	Toluene	88.5 C	5 C	124	1990	305.27	618.45	I	0.03 A	0.10		
1	3	2		4	0.6			71556	1,1,1-Trichloroethane	424000 T	14300 T	291	13109	1272.09	2552.06	IIa	0.2 B	0.64		
1	1	2		4	0.6			79005	1,1,2-Trichloroethane	1030000 T	200 DT	155	6970	677.58	1359.35	IIa	0.03 A	0.10		
1	3	2		4	0.6			79016	Trichloroethene	418 C	5 C	415	3610	1456.02	2921.05	I	0.02 A	0.06		
1	3			4	0.6			75014	Vinyl Chloride	807 C	5 DC	99.3	4470	434.09	870.86	IIa	0.12 A	0.38		
		5		4	0.6			1330207	Total Xylenes	5246 C	20 DC			18273.37	36659.83	I	0.18 A	0.58		
				4	0.6							675	9000	2950.74	5919.73	IIa	3 Y	9.60		
1	1			4	0.6				Halomethanes					1.00	1.00	IIa				
				4	0.6			75274	Bromodichloromethane	157 C	1.9 C			546.88	1097.14	I				
				4	0.6			75252	Bromoform								0.1 A	0.32		
				4	0.6			124481	Chlorodibromomethane								0.2 A	0.64		
				4	0.6			74873	Chloromethane (Methyl Chloride)								0.09 A	0.29		
				4	0.6			75718	Dichlorodifluoromethane								0.08 A	0.26		
		2		4	0.6			74839	Methyl Bromide								1.81 A	5.79		
				4	0.6			75092	Methylene Chloride								1.18 A	3.78		
				4	0.6			75694	Trichlorofluoromethane								0.25 A	0.80		
1	1	2		4	0.6			67663	Chloroform	157 C	[illegible] C	133	5780	546.88	1097.14	I	1.00 Y	3.20		
												495	22400	2176.99	4367.45	IIa	0.05 A	0.16		

TABLE 2A — RPE Analysis (Metals) for the NIPSCO, ROLLIN M. SCHAHFER STATION, JASPER County

Upstream Source I	Upstream Source II	Upstream Source III	Upstream Conc. ug/l	Pollutants of concern N	C V	Instream Concentration D/S mg/l	Instream Concentration D/S ug/l	CAS Number	Parameters	I Human Health Organisms ug/l	II Human Health Water ug/l	III AQUATIC CHRONIC ug/l	III TOXICITY ACUTE (FAV) ug/l	Water Quality-based Effluent Limits Average ug/l	Water Quality-based Effluent Limits Maximum ug/l	LIMITS OF DETECTION	ug/l	Limit of Quantification ug/l	Limits of COMPLIANCE Average ug/l	Limits of COMPLIANCE Maximum ug/l
				4	0.6			65850	Benzoic Acid											
1	1			4	0.6				Dichlorobenzenes	2600 T	400 T			11365.80	22801.94	I				
				4	0.6			95501	1,2-Dichlorobenzene								0.15 A	0.48		
				4	0.6			541731	1,3-Dichlorobenzene								0.32 A	1.02		
				4	0.6			106467	1,4-Dichlorobenzene								0.24 A	0.77		
1	1	9		4	0.6			118741	Hexachlorobenzene	0.0074 C	0.0072 C	3.68	12	0.03	0.05	I	0.05 M	0.16	0.0128882	0.16
	1	2		4	0.6			98953	Nitrobenzene		19600 T	60	2700	262.29	526.20	IIa	1.9 Q	6.05		
1	1			4	0.6			608935	Pentachlorobenzene	85 T	74 T			371.57	745.45	I	50 Y	160.00		
1	1			4	0.6			95943	1,2,4,5-Tetrachlorobenzene	48 T	38 T			209.83	420.96	I	10 Y	32.00		
7	7	7		4	0.6			120821	1,2,4-Trichlorobenzene	22 T	12 T	281	675	96.17	192.94	I	0.05 M	0.16		
	1			4	0.6									1.00	1.00	IIIa				
		2		4	0.6			120832	2,4-Dichlorophenol		3090 T									
1	1			4	0.6			105679	2,4-Dimethylphenol			31.3	212	105.67	212.00	IIb	0.39 D	1.25		
		2		4	0.6				Dinitrophenol	14300 T	70 T			62511.88	125410.65	I	0.32 D	1.02		
		7		4	0.6			51285	2,4-Dinitrophenol			1.38	62	6.03	12.10	IIIa	13 Q	41.60		13
		5		4	0.6			80057	4,4'-(1-methylethylidene) Bisphenol (Bisphenol A)			10.4	466.2	45.46	91.21	IIIa				
		8		4	0.6			95487	2-Methylphenol (o-cresol)			420	5600	1836.01	3683.39	IIIa	3.6 Y	11.52		
1	1			4	0.6			106445	4-Methylphenol (p-cresol)			395	5266	1726.73	3464.14	IIIa	2.4 Y	7.68		
		2		4	0.6			534521	2-Methyl-4,6-Dinitrophenol(46DinitroCres)	765 T	13.4 T			3344.17	6709.03	I	16 D	51.20		
	1	1		4	0.6			88755	2-Nitrophenol								0.45 D	1.44		
	1	2		4	0.6			100027	4-Nitrophenol			18.4	828	80.43	161.37	IIa	0.7 E	2.24		
	1	9		4	0.6			87865	Pentachlorophenol		1000 T	1.0000	2.0000	1.00	2.00	IIb	0.59 E	1.89	0.295	
1	1			4	0.6			108952	Phenol		3500 T	669	9361	2924.51	5867.11	IIa	0.14 D	0.45		
1	1			4	0.6			95954	2,4,5-Trichlorophenol		2600 T	63	200	99.69	200.00	IIb	10 T	32.00		
				4	0.6			88062	2,4,6-Trichlorophenol	36 C	12 C			126.40	251.57	I	0.58 E	1.86		
				4	0.6				Polynuclear Aromatic Hydrocarbons	0.31 C	0.028 C			1.08	2.17	I				
		2		4	0.6				*BASE / NEUTRAL COMPOUNDS*					1.00	1.00	IIIa				
				4	0.6			83329	Acenaphthene			2.76	170	16.52	33.15	IIIa	1.8 K	5.76		
				4	0.6			208968	Acenaphthylene								2.3 K	7.36		
				4	0.6			120127	Anthracene								0.66 K	2.11		
6	6			4	0.6			56553	Benzo(a)Anthracene								0.013 K	0.04		
				4	0.6			50328	Benzo(a)Pyrene	0.31 C	0.028 C			1.08	2.17	I	0.023 K	0.07		
				4	0.6			205992	Benzo(b)Fluoranthene								0.018 K	0.06		
				4	0.6			191242	Benzo(g,h,i)Perylene								0.076 K	0.24		
				4	0.6			207089	Benzo(k)Fluoranthene								0.017 K	0.05		
				4	0.6			91587	2-Chloronaphthalene								0.94 M	3.01		
				4	0.6			218019	Chrysene								0.15 K	0.48		
				4	0.6			53703	Dibenzo(a,h)Anthracene								0.03 K	0.10		
				4	0.6			86737	Fluorene								0.21 K	0.67		
				4	0.6			193395	Indeno(1,2,3-cd)Pyrene								0.043 K	0.14		
				4	0.6			91576	2-Methylnaphthalene								2.2 Y	7.04		
		2		4	0.6			91203	Naphthalene								1.6 Q	5.12		
		9		4	0.6			85018	Phenanthrene			42	460	183.60	368.34	IIa	0.64 K	2.05		
				4	0.6			129000	Pyrene			6.3	60	27.54	55.25	IIIa	0.27 K	0.86		
1	1			4	0.6			206440	Fluoranthene	54 T	42 T			236.06	473.68	I	0.21 K	0.67		

TABLE 2A — RPE Analysis (Metals) for the NIPSCO, ROLLIN M. SCHAHFER ...TION, JASPER County

Upstream Source I	Upstream Source II	Upstream Source III	Upstream Conc ug/l	Pollutants of concern N	C V	Instream Concentrasion D/S mg/l	D/S ug/l	CAS Number	Parameters	I Human Health Organisms ug/l	II Human Health Water ug/l	III AQUATIC TOXICITY CHRONIC ug/l	AQUATIC TOXICITY ACUTE (FAV.) ug/l	Water Quality-based Effluent Limits Average ug/l	Maximum ug/l		LIMITS OF DETECTION ug/l	Limit of Quantification ug/l	Limits of COMPLIANCE Average ug/l	Maximum ug/l
1	1			4	0.6			92875	Benzidine	0.0053 C	0.0012 C			0.02	0.04	I	0.1 F	0.32		0.1
				4	0.6			111911	Bis (2-Chloroethoxy) Methane								0.5 L	1.60		
1	1			4	0.6			111444	Bis (2-Chloroethyl) Ether	13.6 C	0.3 C			47.37	95.04	I	0.3 L	0.95		
1	1			4	0.6			108601	Bis (2-Chloroisopropyl) Ether	4360 T	34.7 T			19059.57	38237.09	I	0.8 L	2.56		
				4	0.6			101553	4-Bromophenyl phenyl ether								1.9 Q	6.08		
				4	0.6			7005723	4-Chlorophenyl phenyl ether								3.9 L	12.48		
				4	0.6			132649	Dibenzofuran								2.8 Y	8.96		
1	1			4	0.6			91941	3,3'-Dichlorobenzidine(Dichlorobenzidine)	0.2 C	0.1 C			0.70	1.40	I	0.13 F	0.42		
1	1			4	0.6			121142	2,4-Dinitrotoluene	91 C	1.1 C			316.98	635.92	I	0.02 J	0.06		
				4	0.6			606202	2,6-Dinitrotoluene								0.01 J	0.03		
1	1			4	0.6			122667	1,2-Diphenylhydrazine	5.6 C	0.422 C			19.51	39.13	I	2.6 Y	8.32		
		7		4	0.6			50000	Formaldehyde											
1	1			4	0.6			87683	Hexachlorobutadiene	500 C	4.47 C	11837	19399	9669.58	19399.00	IIIb				
	1			4	0.6			77474	Hexachlorocyclopentadiene		206 T			1741.85	3494.07	I	0.34 M	1.09		
1	1	2		4	0.6			67721	Hexachloroethane	87.4 C	19 C	350	980				0.4 M	1.28		
1	1	2		4	0.6			78591	Isophorone	520000 T	5200 T	4333	11700	304.44	610.76	I	0.03 M	0.10		
1	1	9		4	0.6			117817	Bis (2-Ethylhexyl) Phthalate	50000 T	15000 T	360	800	5831.95	11700.00	IIb	2.2 Q	7.04		
		2		4	0.6			85687	Butyl Benzyl Phthalate			26	660	396.77	800.00	IIb	2 G	6.40		
1	1			4	0.6			84662	Diethyl Phthalate	1600000 T	350000 T			113.66	228.02	IIIa	0.34 G	1.09		
1	1			4	0.6			131113	Dimethyl Phthalate	2900000 T	313000 T			7866828	15785958	I	0.49 G	1.57		
1	1	2		4	0.6			84742	Di-N-Butyl Phthalate	154000 T	34000 T	12.7	573	12677234	25432929	I	0.29 G	0.93		
				4	0.6			117840	Di-N-Octyl Phthalate					55.52	111.38	IIIa	0.36 G	1.15		
1	1			4	0.6			924163	N-Nitrosodibutylamine	6.9 C	0.064 C						2.5 Q	8.00		
1	1			4	0.6			55185	N-Nitrosodiethylamine	12.4 C	0.008 C			20.55	41.23	I	10 Y	32.00	5	
1	1			4	0.6			62759	N-Nitrosodimethylamine	160 C	0.014 C			43.19	86.65	I	1 Y	3.20		
				4	0.6			86306	N-Nitrosodiphenylamine	161 C	49 C			557.33	1118.10	I	0.15 H	0.48		
				4	0.6			621647	N-Nitrosodi-N-Propylamine					560.81	1125.09	I	0.81 H	2.59		
1	1			4	0.6			930552	N-Nitrosopyrrolidine								0.46 H	1.47		
1	1			4	0.6			1746016	Dioxin (2,3,7,8-TCDD)	919 C	0.16 C			3201.15	6422.11	I	1 Y	3.20		
				4	0.6					0.0000001 C	0.0000001 C			0.00	0.00	I	0.00001 R	0.00		
				4	0.6				*PESTICIDES and PCBs*											
1	1	1		4	0.6			309002	Aldrin					1.00	1.00					0.00001
1	1			4	0.6			319846	Alpha-BHC (Alpha-HCH)	0.00079 C	0.00074 C		3	0.00	0.01	I	0.004 I	0.01	0.0013759	0.0126
1	1			4	0.6			319857	Beta-BHC (Beta-HCH)	0.31 C	0.09 C			1.08	2.17	I	0.003 I	0.01		
				4	0.6			319868	Delta-BHC (Delta-HCH)	0.55 C	0.16 C			1.92	3.84	I	0.006 I	0.02		
1	1	1		4	0.6			58899	Gamma-BHC (Gamma-HCH,Lindane)								0.009 I	0.03		
1	1	1		4	0.6			57749	Chlordane	0.63 C	0.19 C	0.08	2	0.35	0.70	IIIa	0.004 I	0.01		
		1		4	0.6			2921882	Chlorpyrifos	0.0046 C	0.0046 C	0.0043	2.4	0.02	0.03	I	0.014 I	0.04	0.007	0.0448
				4	0.6			72548	4,4-DDD			0.041	0.166	0.08	0.17	IIb	0.3 O	0.96		0.3
				4	0.6			72559	4,4-DDE								0.011 I	0.04		
1	1	1		4	0.6			50293	4,4-DDT								0.004 I	0.01		
1	1	1		4	0.6			60571	Dieldrin	0.00024 C	0.00024 C	0.001	1.1	0.00	0.00	I	0.012 I	0.04		0.012
1	1	1		4	0.6			115297	Endosulfan	0.00076 C	0.00071 C	0.0019	2.6	0.00	0.01	I	0.002 I	0.01	0.001	0.0064
				4	0.6			959988	Alpha-Endosulfan	159 T	74 T	0.056	0.22	0.11	0.22	IIIb				
				4	0.6			33213659	Beta-Endosulfan								0.014 I	0.04		
				4	0.6			1031078	Endosulfan Sulfate								0.004 I	0.01		
	1	1		4	0.6			72208	Endrin		1 DT	0.0023	0.18	0.01	0.02	IIIa	0.066 I	0.21		
				4	0.6			7421934	Endrin Aldehyde								0.006 I	0.02	0.003	
																	0.023 I	0.07		

TABLE 2A — RPE Analysis (Metals) for the NIPSCO, ROLLIN M. SCHAHFER ...ATION, JASPER County

Upstream Source I	Upstream Source II	Upstream Source III	Upstream Conc. ug/l	Pollutants of concern N	C V	Instream Concentration DIS mg/l	DIS ug/l	CAS Number	Parameters	I Human Health Organisms ug/l	II Human Health Water ug/l	III AQUATIC TOXICITY CHRONIC ug/l	ACUTE (FAV) ug/l	Water Quality-based Effluent Limits Average ug/l	Maximum ug/l		LIMITS OF DETECTION ug/l	Limit of Quantification ug/l	Max. Limits of COMPLIANCE Average ug/l	Maximum ug/l
1	1	1		4	0.6			76448	Heptachlor	0.0026 C	0.0026 C	0.0038	0.52	0.01	0.02	I	0.003 I	0.27		
				4	0.6			1024573	Heptachlor Epoxide								0.063 I			
		1		4	0.6				Parathion			0.013	0.13	0.06	0.11	IIa				
1	1	1		4	0.6			8001352	Toxaphene	0.0073 C	0.0071 C	0.0002	1.46	0.0009	0.0018	IIa	0.24 I	0.77		0.24
1	1	1							PCB's	0.00079 C	0.00079 C	0.014	2	0.0028	0.0055	I				
				4	0.6			12674112	PCB-1016								0.1 I	0.32		
				4	0.6			11104282	PCB-1221								0.1 I	0.32		
				4	0.6			11141165	PCB-1232								0.1 I	0.32		
				4	0.6			53469219	PCB-1242								0.1 I	0.32		
				4	0.6			12672296	PCB-1248								0.1 I	0.32		
				4	0.6			1109769	PCB-1254								0.1 I	0.32		
				4	0.6			11096825	PCB-1260					1.00	1.00	IIa	0.1 I	0.32		

T = derived from threshold toxicity
C = derived from non-threshold cancer risk
DC = derived from drinking water standards, based on carcinogenic effects
DT = derived from drinking water standards, based on toxic effects

1) Indiana Water Quality Standards
2) IWQS Equations (327 IAC 2-1-6.2 & 6.3) with testing data from EPA
3) National Drinking Water Regulations
4) EPA Gold Book
5) Aquatic acute/chronic criteria from CH2M Hill report for Fort Wayne Reduction
6) EPA Criteria
7) IWQS Equations (327 IAC 2-1-6.2 & 6.3) with testing data from literature
8) Site-specific calculation using procedures from 327 IAC 2-1-6.2 & 6.3
9) Draft EPA Criteria

A) EPA Method 601-GC/Hal
B) EPA Method 602-GC/PID
C) EPA Method 603-GC/FID
D) EPA Method 604-GC/FID (Table 1)
E) EPA Method 604-GC/ECD (Table 2)
F) EPA Method 605-HPLC
G) EPA Method 606-GC/ECD
H) EPA Method 607-GC/N-PD
I) EPA Method 608-GC/ECD
J) EPA Method 609-GC/FID
K) EPA Method 610-HPLC
L) EPA Method 611-GC/Hal
M) EPA Method 612-GC/ECD
N) EPA Method 613-GC/MS
O) EPA Method 622-GC/Flame Photometric
P) EPA Method 624-GC/MS
Q) EPA Method 625-GC/MS
R) EPA Method 1613-HRGC/HRMS
S) EPA Method 1624-GC/MS (Isotope)
T) EPA Method 1625-GC/MS (Isotope)
U) EPA Method 200.7 (ICP)
V) EPA Methods Manual - Atomic Absorption, Furnace Technique
W) EPA Methods (- Atomic Absorption, Direct Aspiration
X) EPA Methods Manual
Y) IDEM Detection Limit

8.47 in

Attachment B:

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

INDIANAPOLIS

OFFICE MEMORANDUM

Date: June 18, 2009
Thru: John Elliott
Permits Branch

To: George Oliver
Industrial Permits Section

From: Gurdeo Sondhe
Permits Branch

Subject: Wasteload Allocation Report for the NIPSCO Rollin M. Schahfer Generating Station in Jasper County (IN0053201, WLA001668)

A reasonable potential analysis for parameters included in the current permit (chromium, total cyanide, mercury, silver, zinc and sulfate) was done for the renewal of the NPDES permit for the NIPSCO Rollin M. Schahfer Generating Station (Wheatfield Plant). A reasonable potential analysis was also done for parameters mentioned as part of the permit renewal application. NIPSCO - RMSGS (Wheatfield Plant) is a Class D industrial wastewater treatment plant, classified in accordance with 327 IAC 5-22-5, Classification Wastewater Treatment Plants. The receiving stream of the facility is the Kankakee River, which has a Q7, 10 flow of 294 cfs. The Kankakee River is covered under Rule 327 IAC 2-1, and designated for full-body contact recreation and shall be capable of supporting a well-balanced warm water aquatic community. The Kankakee River (Assessment Unit INK0189_M1103) is on the 2008 303(d) list for *E. Coli*, and PCBs in Fish Tissue. TMDL for the Kankakee River in 14 Digit HUC {(07120001080090) [Kankakee River]} is not done and no other TMDL is currently in progress. The design flow used in the WLA analysis is 21.6 mgd.

The reasonable potential analysis for the listed pollutants of concern is included in Tables 1 and 2. The results of the analysis show that the discharge does have the reasonable potential to exceed a water quality criterion for mercury, but not for any of the other pollutants. Water quality-based effluent limitations for mercury and many of the other pollutants of concern are included in Table 3.

Based on present available information/data, the RPE/WLA analysis results are shown in the attached tables. The documentation of the wasteload allocation analysis is included as an attachment.

GSS/gss
Attachments

TABLE 1

Calculation of Projected Effluent Quality
For NIPSCO Rollin M. Schahfer Generating Station in Jasper County
Outfall 001 to Kankakee River
(IN0053201, WLA001668)

Parameter	Monthly Average PEQ					Daily Maximum PEQ				
	Maximum Monthly Average (mg/l)	Number of Monthly Averages	CV	Multiplying Factor	Monthly Average PEQ (mg/l)	Maximum Daily Sample (mg/l)	Number of Daily Samples	CV	Multiplying Factor	Daily Maximum PEQ (mg/l)
Aluminum					0.15	0.074	7	0.6	2.0	0.15
Antimony					0.012	0.0079	10	0.4	1.5	0.012
Arsenic III					0.015	0.01	15	0.6	1.5	0.015
Barium					0.18	0.16	10	0.1	1.1	0.18
Beryllium					0.00018	0.00014	10	0.3	1.3	0.00018
Cadmium					0.007	0.0026	10	1.3	2.7	0.007
Total Chromium	0.0039	45	0.2	1.0	0.0039	0.0056	77	0.3	1.0	0.0056
Cobalt					0.0029	0.0018	10	0.5	1.6	0.0029
Copper					0.036	0.028	14	0.3	1.3	0.036
Iron					0.86	0.57	15	0.6	1.5	0.86
Lead					0.048	0.02	10	1.1	2.4	0.048
Manganese					1.4	1.1	10	0.3	1.3	1.4
Mercury					0.000025	0.0000165	19	0.7	1.5	0.000025
Molybdenum					0.05	0.031	10	0.5	1.6	0.05
Nickel					0.035	0.027	10	0.3	1.3	0.035
Selenium					0.027	0.019	15	0.5	1.4	0.027
Silver	0.01	46	0.3	1.0	0.01	0.01	130	0.4	0.9	0.009
Thallium					0.033	0.015	10	0.9	2.2	0.033
Tin					0.0072	0.0045	10	0.5	1.6	0.0072
Titanium					0.0074	0.0057	10	0.3	1.3	0.0074
Zinc	0.3	46	1.0	1.1	0.33	0.3	130	1.1	0.8	0.24
Boron					17	14	15	0.2	1.2	17
Cyanide, Free	0.014	43	0.3	1.0	0.014	0.019	116	0.4	0.9	0.017
Cyanide, Total	0.014	43	0.3	1.0	0.014	0.019	116	0.4	0.9	0.017
Sulfate	872	44	0.3	1.0	872	872	118	0.3	0.9	785

6/18/2009

TABLE 2
Results of Reasonable Potential Statistical Procedure
For NIPSCO Rollin M. Schahfer Generating Station in Jasper County
Outfall 001 to Kankakee River
(IN0053201, WLA001668)

Parameter	Monthly Average Comparison			Daily Maximum Comparison			Reasonable Potential to Exceed?
	Monthly Average PEQ (mg/l)	Monthly Average PEL* (mg/l)	PEQ > PEL?	Daily Maximum PEQ (mg/l)	Daily Maximum PEL* (mg/l)	PEQ > PEL?	
Aluminum	0.15	0.17	No	0.15	0.29	No	No
Antimony	0.012	0.43	No	0.012	0.71	No	No
Arsenic III	0.015	0.49	No	0.015	0.72	No	No
Barium	0.18	6.2	No	0.18	9.1	No	No
Beryllium	0.00018	0.011	No	0.00018	0.026	No	No
Cadmium	0.007	0.014	No	0.007	0.022	No	No
Total Chromium	0.0039	3.0	No	0.0056	5.0	No	No
Cobalt	0.0029	0.1	No	0.0029	0.16	No	No
Copper	0.036	0.076	No	0.036	0.11	No	No
Iron	0.86	3.8	No	0.86	5.5	No	No
Lead	0.048	0.078	No	0.048	0.13	No	No
Manganese	1.4	4.5	No	1.4	6.6	No	No
Mercury	0.000025	0.000012	Yes	0.000025	0.00002	Yes	Yes
Molybdenum	0.05	20	No	0.05	34	No	No
Nickel	0.035	0.53	No	0.035	1.3	No	No
Selenium	0.027	0.18	No	0.027	0.26	No	No
Silver	0.01	0.016	No	0.009	0.033	No	No
Thallium	0.033	0.12	No	0.033	0.17	No	No
Tin	0.0072	0.94	No	0.0072	1.5	No	No
Titanium	0.0074	13	No	0.0074	22	No	No
Zinc	0.33	0.33	No	0.24	0.65	No	No
Boron	17	41	No	17	60	No	No
Cyanide, Free	0.014	0.022	No	0.017	0.044	No	No
Cyanide, Total	0.014	259	No	0.017	630	No	No
Sulfate	872	8600	No	785	17000	No	No

* Based on an effluent flow of 21.6 mgd.

6/18/2009

TABLE 3
Water Quality-based Effluent Limitations
For NIPSCO Rollin M. Schahfer Generating Station in Jasper County
Outfall 001 to Kankakee River
(IN0053201, WLA001668)

Parameter	Quality or Concentration* Monthly Average	Daily Maximum	Units	Quantity or Loading* Monthly Average	Daily Maximum	Units	Monthly Sampling Frequency
Aluminum	0.17	0.29	mg/l	31	52	lbs/day	1
Arsenic III	0.49	0.72	mg/l	88	130	lbs/day	1
Beryllium	0.011	0.026	mg/l	2.0	4.7	lbs/day	1
Cadmium	0.014	0.022	mg/l	2.5	4.0	lbs/day	1
Total Chromium	3.0	5.0	mg/l	541	901	lbs/day	1
Copper	0.076	0.11	mg/l	14	20	lbs/day	1
Iron	3.8	5.5	mg/l	685	991	lbs/day	1
Lead	0.078	0.13	mg/l	14	23	lbs/day	1
Mercury	0.000012	0.00002	mg/l	0.0022	0.0036	lbs/day	1
Molybdenum	20	34	mg/l	3605	6129	lbs/day	1
Nickel	0.53	1.3	mg/l	96	234	lbs/day	1
Selenium	0.18	0.26	mg/l	32	47	lbs/day	1
Silver	0.016	0.033	mg/l	2.9	5.9	lbs/day	4
Thallium	0.12	0.17	mg/l	22	31	lbs/day	1
Zinc	0.33	0.65	mg/l	59	117	lbs/day	4
Boron	41	60	mg/l	7390	10815	lbs/day	1
Cyanide, Free	0.022	0.044	mg/l	4.0	7.9	lbs/day	4
Sulfate	8600	17000	mg/l	1550167	3064284	lbs/day	4

* Based on an effluent flow of 21.6 mgd.

6/18/2009

Documentation of Wasteload Allocation Analysis
For Discharges in the Non-Great Lakes System

Analysis By:	Gurdeo Sondhe
Date:	June 18, 2009
Reviewed By:	John Elliott
Permit Writer:	George Oliver
WLA Number:	WLA001668
Previous WLA Reports:	May 2004 WLA Report

Facility Information

Name: NIPSCO Rolfin M. Schahfer Generating Station (Wheatfield Plant) (Attachment 1)

The NIPSCO operates a coal fired, steam electric generation facility in Jasper County. Coal-fired boilers convert water into high pressure steam which drives turbines that are connected to electric generators. There are four (4) steam generated units (14, 15, 17 and 18) and two natural gas-fired peaking units (16A and B). The total coal fired production capacity of station is about 1440 MW, whereas, units 16A and B produce around 104 MW.

- **NPDES Permit Number:** IN0053201
- **Permit Expiration Date:** June 30, 2009
- **County:** Jasper
- **Purpose of Analysis:** RPE/WLA Analysis for pollutants of concern
- **Type of Treatment:** NIPSCO - RMSGS (Wheatfield Plant) is a Class D industrial wastewater treatment plant, classified in accordance with 327 IAC 5-22-5, Classification Wastewater Treatment Plant.
- **Outfall Number:**
  - 001 Effluent flow is limited to low volume waste, bottom ash transport water, cooling tower blowdown, coal pile runoff, treated sanitary wastewater and stormwater. Chemical metal cleaning wastewater is excluded from the discharge.
  - 002 Emergency overflow from Final Settling Basin.
- **Effluent Flow For WLA Analysis:** 21.6 mgd
  The 2-year maximum monthly average flow was used.

Current Effluent Limits: Listed Effluent limitations for toxic/conventional parameters are based on the reported effluent limitations in the NPDES Permit.

Parameter	Pollutants of Concern - Effluent Limitations	
	Monthly Average (mg/l)	Daily Maximum (mg/l)
Chromium (1 sample/month)		0.2
Cyanide (1 sample/week)	0.022	0.044
Silver (1 sample/week)	0.014	0.028
Mercury (bi-monthly) (ng/l)	Report	Report
Zinc (1 sample/week)	0.301	0.604
Sulfate (1 sample/week)	748	1501
TRC (daily)	0. 2	

Pollutants of Concern

Pollutants of Concern Outfall 001	
Parameters	**Reason for Inclusion on Pollutants of Concern List**
Chromium	Included in current permit
Cyanide	Included in current permit
Silver	Included in current permit
Mercury	Included in current permit
Zinc	Included in current permit
Sulfate	Included in current permit

Aluminum	Data available from permit application
Antimony	Data available from permit application
Arsenic	Data available from permit application
Boron	Data available from permit application
Barium	Data available from permit application
Beryllium	Data available from permit application
Cadmium	Data available from permit application
Cobalt	Data available from permit application

Copper	Data available from permit application
Iron	Data available from permit application
Lead	Data available from permit application
Manganese	Data available from permit application
Molybdenum	Data available from permit application
Nickel	Data available from permit application
Selenium	Data available from permit application
Thallium	Data available from permit application
Tin	Data available from permit application
Titanium	Data available from permit application

Receiving Stream Information

- **Receiving Stream:** Kankakee River
- **Public Water System Intakes Downstream:** None
- **Designated Stream Use:** The Kankakee River is covered under Rule 327 IAC 2-1 and is designated for full-body contact recreation and shall be capable of supporting a well-balanced, warm water aquatic community.
- **14 Digit HUC:** (07120001080090) (Kankakee River)
- **2008 Assessment Unit:** INK0189_M1103
- **2008 303(d) List:** The Kankakee River (Assessment unit INK0189_M1103) is on the 2008 303(d) list for *E. coli and* PCBs in Fish Tissue.
- **TMDL Status:** TMDL for the Kankakee River in 14 Digit HUC (07120001080090) is not done and no other TMDL is currently in progress.
- **Q7,10 (Outfall):** 294 cfs
  1375 sq.miles (Drainage Area u/s of Outfall)

  USGS Gaging Station 05517500 Kankakee River (Q7,10 = 348 cfs, Q30,10 = 385 cfs, Q50 = 1140 cfs and Drainage Area = 1352 sq.miles) near Dunn Bridge, 3.6 mi upstream of Davis Ditch in Jasper County) is used for the Q7,10 flow calculation.

  NIPSCO-RMSGS Plant withdraws water (39 mgd – maximum 7-day consecutive pumping operating days) from the Kankakee River upstream of outfall 001 for plant operation. This flow value is based on the intake flow data (covering period from November 2006 through October 2008) submitted by the facility.

The information for the gaging station for calculating Q7, 10 of the receiving stream was obtained from the book entitled Low-Flow Characteristics of Indiana Streams by Kathleen Fowler and John T. Wilson published in 1996 by the USGS.

The drainage area upstream of the outfall was obtained from the book entitled Drainage Areas of Indiana Streams by Richard E. Hoggatt, published in 1975 by the USGS in cooperation with the IDNR.

The Q7,10, Q30,10 and Q50 were calculated from the USGS gaging station values using the ratio of drainage areas and then subtracting the intake flow.

- **Q30,10 (Outfall):** 331 cfs
- **Q50 (Outfall):** 1100 cfs

- **Nearby Discharges:** None

Calculation of Preliminary Effluent Limitations

Upstream water quality data were obtained from fixed monitoring station KR-91, Kankakee River, Dunns Bridge, Porter County. For some pollutants water quality data were obtained from trace metals sampling downstream of the outfall at fixed station KR-68. The ambient upstream concentration of a given pollutant was determined by calculating the geometric mean of the instream data for the pollutant. The survey data include values reported as less than the limit of quantitation (LOQ). If less than one-half the values in the data set were below the LOQ, the values below the LOQ were assigned the value (V) and then the geometric mean of the data set was calculated. The value (V) was determined as follows

$$V = (LOQ) \times [1 - (\text{Number below LOQ})/(\text{Total number of values})]$$

If one-half or more of the values in the data set were below the LOQ, the values below the LOQ were set equal to one-half the LOQ. The determination of ambient upstream concentrations of pollutants of concern is included in Attachments 2 and 3. Mercury is a BCC and mixing zones for all discharges of BCCs to waters in the non-Great Lakes system are prohibited after January 1, 2004. Therefore, the criteria for mercury were applied to the undiluted discharge in accordance with 327 IAC 5-2-11.1(b)(6). The time periods chosen for the different data sets are based on the availability of data, improvement in the limit of detection for some pollutants and the desire to have data for whole years.

The data sets for fixed station KR-91 were limited to total last five years (November 2002 through December 2007 including missing data) of available data. The trace metals water quality data were limited to the available data covering period from April 2002 thru March 2006. For cobalt, molybdenum, tin, titanium and boron IDEM water quality data were not available so the long term average intake concentration from the permit application was used as the ambient upstream concentration.

The 50th percentile hardness and chloride values were obtained from downstream fixed monitoring station : KR-68, Kankakee River, SR 55 Bridge 1 Mile South of Shelby, Newton County. A hardness value of 336 mg/l (actual d/s value) was obtained to determine the criteria for those metals whose criteria are dependent on hardness (Attachment 4). Considering the downstream hardness (336 mg/l) and chloride (29 mg/l) at Fixed Station : KR-68 Kankakee River, the Indiana Sulfate criterion is 2005 mg/l.

The coefficient of variation used to calculate monthly average and daily maximum PELs was set equal to the default value of 0.6. The number of samples per month used to calculate monthly average PELs of the requested parameters was set equal to the expected monitoring frequency mentioned in the permit. The number of samples per month for mercury was set equal to 1. The spreadsheet used to calculate PELs is included in Attachment 5.

Reasonable Potential Analysis for Toxics

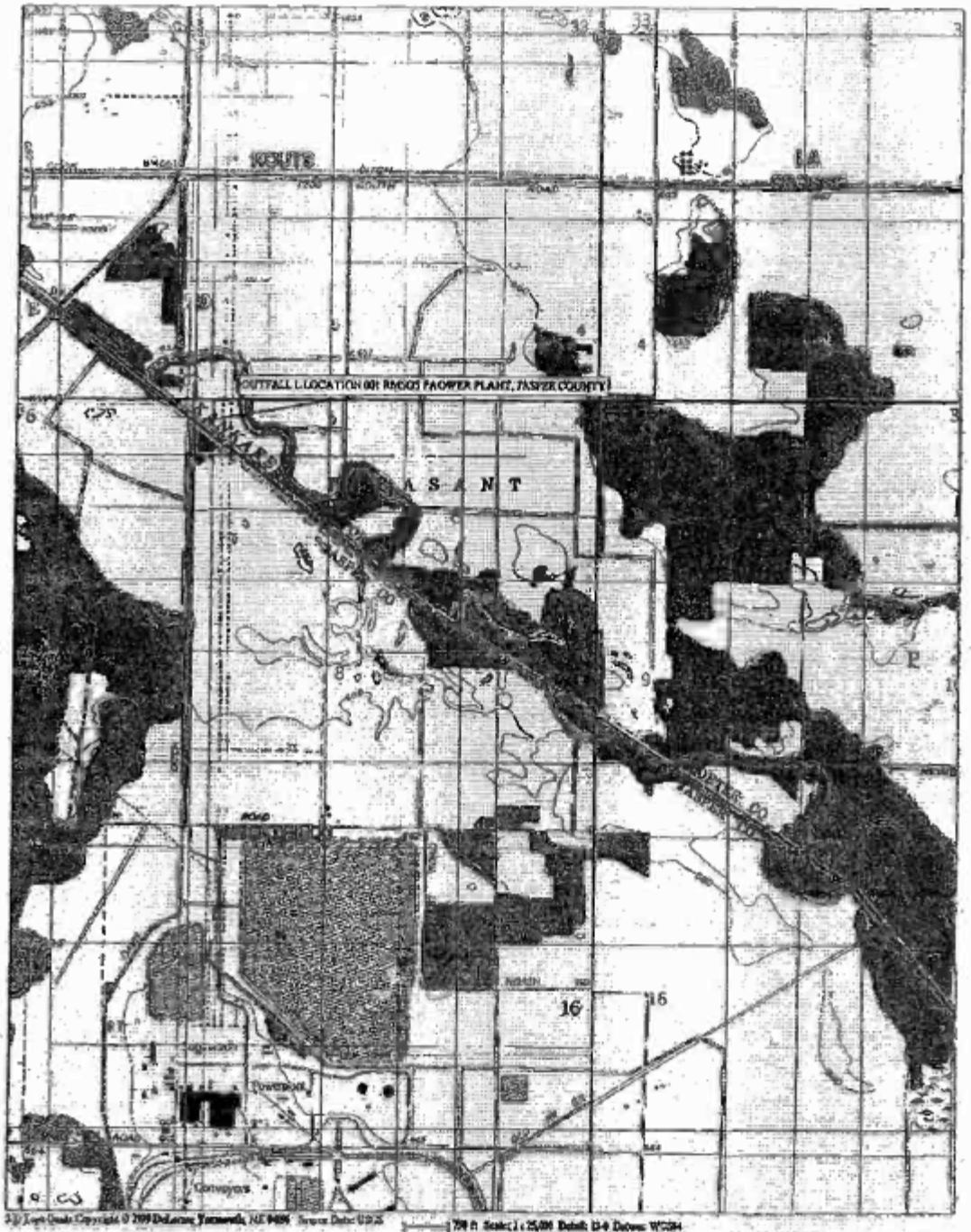
Calculation of Projected Effluent Quality

Effluent data collected from January 2005 through October 2008 as part of the current permit and effluent data reported on Form 2C of the permit renewal application were obtained from the facility in Excel Spreadsheet format. Effluent data for total cyanide were used to calculate PEQs for free cyanide. The RPE procedures under 327 IAC 5-2-11.5 were utilized. The PEQ for mercury is compared with a PEL based on an assumed monitoring frequency of once per month or less. Available mercury data were used in the analysis. The data used in the analysis are included in Attachments 6 and 7.

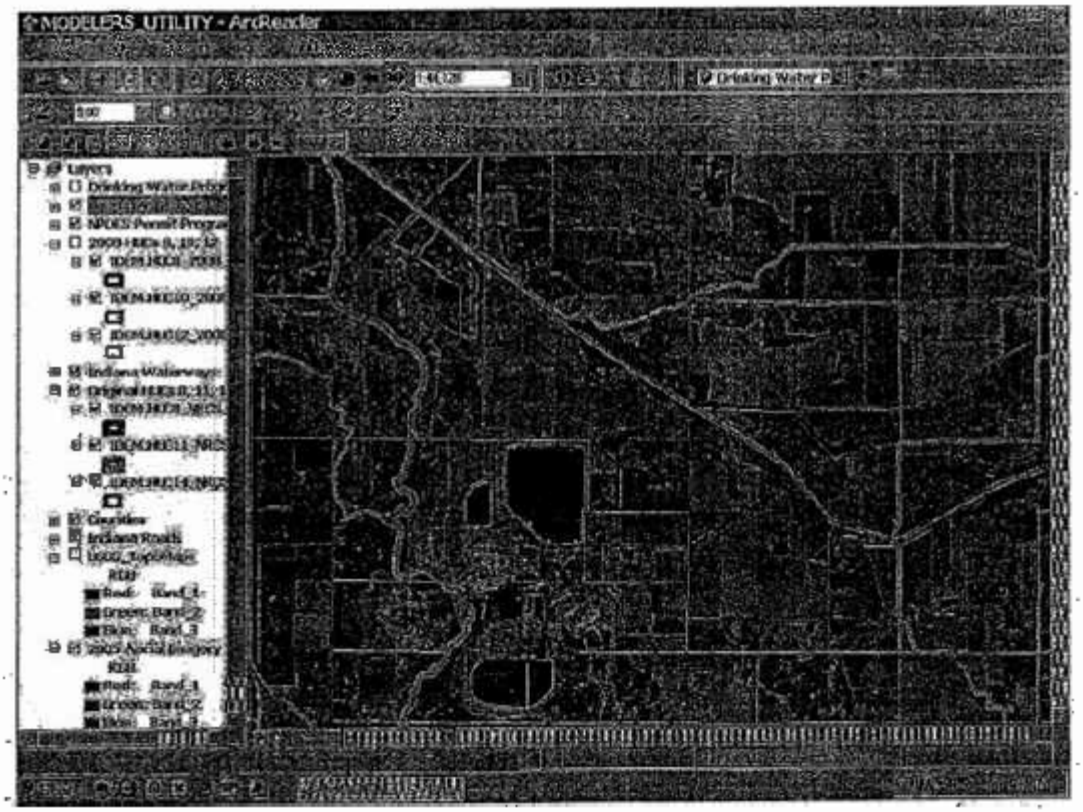
Comparison of PEQs to PELs

The reasonable potential analysis for the listed pollutants of concern is included in Attachment 8. The results of the analysis show that the discharge does not have the reasonable potential to exceed a water quality criterion for the pollutants of concern in the permit except mercury.

ATTACHMENT 1 Outfall Location for NIPSCO Rollin M. Schafer Generating Station



ATTACHMENT 1 Outfall Location for NIPSCO Rollin M. Schahfer Generating Station



ATTACHMENT 2 (UPSTREAM STATION)

STATION SITE SELECTED : KR-91 , Kankakee River , Dunns Bridge , Porter County

Chromium (Total) (ug/L)				Corrected					Corrected	Zinc (Total) (ug/L)				Corrected	Sulfate (mg/L)				Corrected
Sample Date	Season	<	Lab Test	Lab Result	Sample Date	Season	<	Lab Test	Lab Result	Sample Date	Season	<	Lab Test	Lab Result	Sample Date	Season	<	Lab Test	Lab Result
12/12/2002	W	L	1.2	0.6						12/12/2002	W	L	6.0	5.4	12/12/2002	W		94	
2/20/2003	W	L	1.2	0.6						2/20/2003	W	L	6.0	5.4	2/20/2003	W		93	
3/5/2003	W	L	1.2	0.6						3/5/2003	W		56.9	56.9	3/5/2003	W		89	
4/16/2003	W		1.28	1.28						4/16/2003	W		9.9	9.9	4/16/2003	W		95	
5/1/2003	S		1.39	1.39						5/1/2003	S		730.0	730.0	5/1/2003	S		84	
6/18/2003	S	L	1.2	0.6						6/18/2003	S		105.0	105.0	6/18/2003	S		194	
7/9/2003	S		1.57	1.57						7/9/2003	S		474.0	474.0	7/9/2003	S		80	
8/6/2003	S		1.48	1.48						8/6/2003	S		127.0	127.0	8/6/2003	S		70	
9/15/2003	S	L	1.2	0.6						9/15/2003	S		50.9	50.9	9/15/2003	S		90	
10/1/2003	S	L	1.2	0.6						10/1/2003	S		268.0	268.0	10/1/2003	S		81	
11/3/2003	S	L	1.2	0.6						11/3/2003	S		22.5	22.5	11/3/2003	S		92	
12/17/2003	W	L	1.2	0.6						12/17/2003	W		24.9	24.9	12/17/2003	W		94	
1/7/2004	W	L	1.2	0.6						1/7/2004	W		55.4	55.4	1/7/2004	W		92	
2/23/2004	W	L	1.2	0.6						2/23/2004	W		17.4	17.4	2/23/2004	W		77	
3/4/2004	W		2.03	2.03						3/4/2004	W		11.2	11.2	3/4/2004	W		82	
4/1/2004	W	L	1.2	0.6						4/1/2004	W		6.6	6.6	4/1/2004	W		94	
5/26/2004	S		3.43	3.43						5/26/2004	S		34.8	34.8	5/26/2004	S		78	
6/28/2004	S	L	1.2	0.6						6/28/2004	S		7.0	7.0	6/28/2004	S		88	
7/26/2004	S		1.57	1.57						7/26/2004	S		13.6	13.6	7/26/2004	S		74	
8/10/2004	S	L	1.2	0.6						8/10/2004	S	L	6.0	5.4	8/10/2004	S		81	
9/2/2004	S	L	1.2	0.6						9/2/2004	S		8.9	8.9	9/2/2004	S		80	
10/14/2004	S	L	1.2	0.6						10/14/2004	S	L	6.0	5.4	10/14/2004	S		96	
11/10/2004	S	L	1.2	0.6						11/10/2004	S	L	6.0	5.4	11/10/2004	S		99	
12/7/2004	W	L	1.2	0.6						12/7/2004	W		18.6	18.6	12/7/2004	W		91	
1/18/2005	W		2.6	2.6						1/18/2005	W		14.8	14.8	1/18/2005	W		55	
2/1/2005	W	L	1.2	0.6						2/1/2005	W	L	6.0	5.4	2/1/2005	W		101	
3/8/2005	W	L	1.2	0.8						3/8/2005	W		19.8	19.8	3/8/2005	W		78	
4/18/2005	W	L	1.2	0.6						4/18/2005	W		8.2	8.2	4/18/2005	W		97	
5/4/2005	S	L	1.2	0.6						5/4/2005	S		12.0	12.0	5/4/2005	S		96	
6/7/2005	S	L	1.2	0.6						6/7/2005	S		17.9	17.9	6/7/2005	S		95	
6/30/2005	S	L	1.2	0.6						6/30/2005	S		25.1	25.1	6/30/2005	S		98	
8/8/2005	S	L	1.2	0.6						8/8/2005	S		7.9	7.9	8/8/2005	S		75	
9/19/2005	S	L	1.2	0.6						9/19/2005	S		14.3	14.3	9/19/2005	S		82	
10/11/2005	S	L	1.2	0.6						10/11/2005	S		29.4	29.4	10/11/2005	S		88	
11/2/2005	S	L	1.2	0.6						11/2/2005	S		7.6	7.6	11/2/2005	S		95	
12/6/2005	W	L	1.2	0.60						12/6/2005	W		9.5	9.5	12/6/2005	W		94	
1/3/2006	W	L	1.2	0.6						1/3/2006	W		12.6	12.8	1/3/2006	W		100	
2/15/2006	W	L	1.2	0.6						2/15/2006	W		14.5	14.5	2/15/2006	W		107	
3/8/2006	W	L	1.2	0.6						3/8/2006	W		11.7	11.7	3/8/2006	W		107	
4/6/2006	W	L	1.2	0.6						4/6/2006	W		27.9	27.9	4/6/2006	W		88	
5/1/2006	S	L	1.2	0.6						5/1/2006	S		9.2	9.2	5/1/2006	S		98	
6/1/2006	S	L	1.2	0.6						6/1/2006	S		226.0	226.0	6/1/2006	S		95	
7/11/2006	S	L	1.2	0.6						7/11/2006	S		21.5	21.5	7/11/2006	S		76	
8/3/2006	S	L	1.2	0.6						8/3/2006	S		102.0	102.0	8/3/2006	S		78	
9/28/2006	S	L	1.2	0.6						9/28/2006	S		9.5	9.5	9/28/2006	S		80	
10/12/2006	S	L	1.2	0.6						10/12/2006	S		22.6	22.8	10/12/2006	S		80	
11/8/2006	S	L	1.2	0.6						11/8/2006	S		7.4	7.4	11/8/2006	S		85	
12/28/2006	W	L	1.2	0.6						12/28/2006	W		23.6	23.6	12/28/2006	W		78	

ATTACHMENT 2 (UPSTREAM STATION)

STATION SITE SELECTED : KR-91 , Kankakee River , Dunns Bridge , Porter County

Chromium (Total) (ug/L)				Corrected					Corrected	Zinc (Total) (ug/L)				Corrected	Sulfate (mg/L)				Corrected
Sample Date	Season	<	Lab Test	Lab Result	Sample Date	Season	<	Lab Test	Lab Result	Sample Date	Season	<	Lab Test	Lab Result	Sample Date	Season	<	Lab Test	Lab Result
1/11/2007	W	L	1.2	0.6						1/11/2007	W		68.5	68.5	1/11/2007	W		56	
2/1/2007	W	L	1.2	0.6						2/1/2007	W		121.0	121.0	2/1/2007	W		49	
3/1/2007	W	L	1.2	0.6						3/1/2007	W		72.8	72.8	3/1/2007	W		45	
4/23/2007	W	L	1.2	0.6						4/23/2007	W		21.7	21.7	4/23/2007	W		43	
5/7/2007	S	L	1.2	0.6						5/7/2007	S		49.8	49.8	5/7/2007	S		45	
6/18/2007	S	L	1.2	0.6						6/18/2007	S		67.2	67.2	6/18/2007	S		61	
7/19/2007	S	L	1.2	0.6						7/19/2007	S		12.8	12.8	7/19/2007	S		39	
8/6/2007	S	L	1.2	0.6						8/6/2007	S		41.2	41.2	8/6/2007	S		32.4	
9/27/2007	S	L	1.2	0.6						9/27/2007	S		27.6	27.6	9/27/2007	S		73	
10/2/2007	S	L	1.2	0.6						10/2/2007	S		59.3	59.3	10/2/2007	S		33.6	
11/1/2007	S	L	1.2	0.6						11/1/2007	S		40.8	40.8	11/1/2007	S		38	
12/6/2007	W	L	1.2	0.6						12/6/2007	W		16.70	16.7	12/6/2007	W		42	
Chromium (Total) (ug/L)										Zinc (Total) (ug/L)					Sulfate (mg/L)				
MF For Lab Data		0.13	Lab Test	Lab Result	MF For Lab Data			Lab Test	Lab Result	MF For Lab Data		0.93	Lab Test	Lab Result	MF For Lab Data			Lab Test	Lab Result
Samples		52	60	60	Samples					Samples		6	60	60	Samples			60	
Minimum			1.2	0.6	Minimum					Minimum			6.0	5.4	Minimum			32.4	
Average			1.3	0.8	Average					Average			56.5	56.4	Average			82.6	
Maximum			3.4	3.4	Maximum					Maximum			730.0	730.0	Maximum			194.0	
STD_Deviation			0.4	0.5	STD_Deviation					STD_Deviation			117.7	117.8	STD_Deviation			23.7	
CV			0.3	0.7	CV					CV			2.1	2.1	CV			0.3	
Geometric Mean			1.3	0.7	Geometric Mean					Geometric Mean			24	23	Geometric Mean			77	

ATTACHMENT 2 (UPSTREAM STATION)

STATION SITE SELECTED : KR-91 , Kankakee River , Dunns Bridge , Porter County

Iron (Total) (ug/L)				Corrected	Arsenic (Total) (ug/L)				Corrected	Cadmium (Total) (ug/L)				Corrected	Copper (Total) (ug/L)				Correct
Sample Date	Season	<	Lab Test	Lab Result	Sample Date	Season	<	Lab Test	Lab Result	Sample Date	Season	<	Lab Test	Lab Result	Sample Date	Season	<	Lab Test	Lab Res
12/12/2002	W		554		12/12/2002	W		2.0		12/12/2002	W	L	1	0.5	12/12/2002	W	L	1	0.91
2/20/2003	W		669		2/20/2003	W		2.4		2/20/2003	W	L	1	0.5	2/20/2003	W	L	1	0.91
3/5/2003	W		557		3/5/2003	W		2.1		3/5/2003	W	L	1	0.5	3/5/2003	W		1.08	1.08
4/16/2003	W		2680		4/16/2003	W		4.5		4/16/2003	W	L	1	0.5	4/16/2003	W		2.3	2.30
5/1/2003	S		2760		5/1/2003	S		4.7		5/1/2003	S	L	1	0.5	5/1/2003	S		2.88	2.88
6/18/2003	S		1940		6/18/2003	S		2.0		6/18/2003	S	L	1	0.5	6/18/2003	S		1.61	1.61
7/9/2003	S		1840		7/9/2003	S		3.7		7/9/2003	S	L	1	0.5	7/9/2003	S		2.72	2.72
8/6/2003	S		1780		8/6/2003	S		3.7		8/6/2003	S	L	1	0.5	8/6/2003	S		2.5	2.50
9/15/2003	S		997		9/15/2003	S		3.3		9/15/2003	S	L	1	0.5	9/15/2003	S		1.45	1.45
10/1/2003	S		694		10/1/2003	S		2.6		10/1/2003	S	L	1	0.5	10/1/2003	S		1.64	1.64
11/3/2003	S		756		11/3/2003	S		2.6		11/3/2003	S	L	1	0.5	11/3/2003	S		1.4	1.40
12/17/2003	W		651		12/17/2003	W		2.1		12/17/2003	W	L	1	0.5	12/17/2003	W		1.47	1.47
1/7/2004	W		710		1/7/2004	W		2.1		1/7/2004	W	L	1	0.5	1/7/2004	W		1.43	1.43
2/23/2004	W		977		2/23/2004	W		3.2		2/23/2004	W	L	1	0.5	2/23/2004	W		2.29	2.29
3/4/2004	W		2240		3/4/2004	W		3.0		3/4/2004	W	L	1	0.5	3/4/2004	W		3.49	3.49
4/1/2004	W		1340		4/1/2004	W		2.7		4/1/2004	W	L	1	0.5	4/1/2004	W		1.97	1.97
5/26/2004	S		3720		5/26/2004	S		4.0		5/26/2004	S	L	1	0.5	5/26/2004	S		4.85	4.85
6/28/2004	S		1810		6/28/2004	S		3.5		6/28/2004	S	L	1	0.5	6/28/2004	S		1.96	1.96
7/26/2004	S		2110		7/26/2004	S		3.4		7/26/2004	S	L	1	0.5	7/26/2004	S		3.49	3.49
8/10/2004	S		1160		8/10/2004	S		2.9		8/10/2004	S	L	1	0.5	8/10/2004	S		1.54	1.54
9/2/2004	S		1600		9/2/2004	S		2.9		9/2/2004	S	L	1	0.5	9/2/2004	S		2.3	2.30
10/14/2004	S		560		10/14/2004	S		2.5		10/14/2004	S	L	1	0.5	10/14/2004	S	L	1	0.91
11/10/2004	S		526		11/10/2004	S		2.2		11/10/2004	S	L	1	0.5	11/10/2004	S		1.04	1.04
12/7/2004	W		708		12/7/2004	W		1.9		12/7/2004	W	L	1	0.5	12/7/2004	W		1.43	1.43
1/18/2005	W		2240		1/18/2005	W		1.7		1/18/2005	W	L	1	0.5	1/18/2005	W		3.24	3.24
2/1/2005	W		724		2/1/2005	W		1.9		2/1/2005	W	L	1	0.5	2/1/2005	W		1.29	1.29
3/8/2005	W		756		3/8/2005	W		1.5		3/8/2005	W	L	1	0.5	3/8/2005	W		1.57	1.57
4/18/2005	W		1020		4/18/2005	W		2.2		4/18/2005	W	L	1	0.5	5/4/2005	S		1.03	1.03
5/4/2005	S		614		5/4/2005	S		1.8		5/4/2005	S	L	1	0.5	6/7/2005	S		1.51	1.51
6/7/2005	S		893		6/7/2005	S		2.5		6/7/2005	S	L	1	0.5	6/30/2005	S		1.13	1.13
6/30/2005	S		454		6/30/2005	S		2.2		6/30/2005	S	L	1	0.5	8/8/2005	S		1.12	1.12
8/8/2005	S		449		8/8/2005	S		2.1		8/8/2005	S	L	1	0.5	9/19/2005	S	L	1	0.91
9/19/2005	S		510		9/19/2005	S		2.0		9/19/2005	S	L	1	0.5	10/11/2005	S		1.02	1.02
10/11/2005	S		781		10/11/2005	S		2.4		10/11/2005	S	L	1	0.5	11/2/2005	S	L	1	0.91
11/2/2005	S		527		11/2/2005	S		1.7		11/2/2005	S	L	1	0.5	12/6/2005	W	L	1	0.91
12/6/2005	W		571		12/6/2005	W		1.5		12/6/2005	W	L	1	0.5	1/3/2006	W		1.31	1.31
1/3/2006	W		662		1/3/2006	W		1.2		1/3/2006	W	L	1	0.5	2/15/2006	W		1.22	1.22
2/15/2006	W		700		2/15/2006	W		1.4		2/15/2006	W	L	1	0.5	3/8/2006	W		1.21	1.21
3/8/2006	W		702		3/8/2006	W		1.6		3/8/2006	W	L	1	0.5	4/6/2006	W		1.72	1.72
4/6/2006	W		1010		4/6/2006	W		2.5		4/6/2006	W	L	1	0.5	5/1/2006	S		1.53	1.53
5/1/2006	S		1080		5/1/2006	S		2.5		5/1/2006	S	L	1	0.5	6/1/2006	S		2.18	2.18
6/1/2006	S		1310		6/1/2006	S		3.1		6/1/2006	S	L	1	0.5	7/11/2006	S		4.32	4.32
7/11/2006	S		855		7/11/2006	S		3.0		7/11/2006	S	L	1	0.5	8/3/2006	S		2.01	2.01
8/3/2006	S		1280		8/3/2006	S		3.5		8/3/2006	S	L	1	0.5	9/28/2006	S		1.5	1.50
9/28/2006	S		703		9/28/2006	S		2.4		9/28/2006	S	L	1	0.5	10/12/2006	S		1.45	1.45
10/12/2006	S		526		10/12/2006	S		1.8		10/12/2006	S	L	1	0.5	11/8/2006	S		1.44	1.44
11/8/2006	S		692		11/8/2006	S		1.8		11/8/2006	S	L	1	0.5	12/28/2006	W		1.89	1.89
12/28/2006	W		645		12/28/2006	W		1.4		12/28/2006	W	L	1	0.5	1/11/2007	W		1.77	1.77

ATTACHMENT 2 (UPSTREAM STATION)

STATION SITE SELECTED : KR-91 , Kankakee River , Dunns Bridge , Porter County

Iron (Total) (ug/L)				Corrected	Arsenic (Total) (ug/L)				Corrected	Cadmium (Total) (ug/L)				Corrected	Copper (Total) (ug/L)				Correct
Sample Date	Season	<	Lab Test	Lab Result	Sample Date	Season	<	Lab Test	Lab Result	Sample Date	Season	<	Lab Test	Lab Result	Sample Date	Season	<	Lab Test	Lab Res
1/11/2007	W		712		1/11/2007	W		1.5		1/11/2007	W	L	1	0.5	2/1/2007	W		1.62	1.62
2/1/2007	W		700		2/1/2007	W		1.6		2/1/2007	W	L	1	0.5	3/1/2007	W		1.87	1.87
3/1/2007	W		886		3/1/2007	W		1.9		3/1/2007	W	L	1	0.5	4/23/2007	W		1.66	1.66
4/23/2007	W		691		4/23/2007	W		2.0		4/23/2007	W	L	1	0.5	5/7/2007	S		2.02	2.02
5/7/2007	S		1130		5/7/2007	S		2.4		5/7/2007	S	L	1	0.5	6/18/2007	S		2.19	2.19
6/18/2007	S		1360		6/18/2007	S		2.8		6/18/2007	S	L	1	0.5	7/19/2007	S		1.68	1.68
7/19/2007	S		851		7/19/2007	S		2.6		7/19/2007	S	L	1	0.5	8/6/2007	S		1.72	1.72
8/6/2007	S		792		8/6/2007	S		2.9		8/6/2007	S	L	1	0.5	9/27/2007	S		1.05	1.05
9/27/2007	S		644		9/27/2007	S		2.71		9/27/2007	S	L	1	0.5	10/2/2007	S		1.15	1.15
10/2/2007	S		678		10/2/2007	S		2.53		10/2/2007	S	L	1	0.5	11/1/2007	S		1.15	1.15
11/1/2007	S		469		11/1/2007	S		2.19		11/1/2007	S	L	1	0.5	12/6/2007	W		1.46	1.46
12/6/2007	W		552		12/6/2007	W		1.99		12/6/2007	W	L	1	0.5					
Iron (Total) (ug/L)					Arsenic (Total) (ug/L)					Cadmium (Total) (ug/L)					Copper (Total) (ug/L)				
MF For Lab Data			Lab Test	Lab Result	MF For Lab Data			Lab Test	Lab Result	MF For Lab Data		0.00	Lab Test	Lab Result	MF For Lab Data		0.92	Lab Test	Lab Res
Samples			60		Samples			60		Samples		60	60	60	Samples		5	59	59
Minimum			449		Minimum			1.23		Minimum			1.0	0.5	Minimum			1.0	0.9
Average			1060		Average			2.46		Average			1.0	0.5	Average			1.8	1.8
Maximum			3720		Maximum			4.68		Maximum			1.0	0.5	Maximum			4.9	4.9
STD_Deviation			669		STD_Deviation			0.77		STD_Deviation			0.0	0.0	STD_Deviation			0.8	0.8
CV			0.6		CV			0.31		CV			0.0	0.0	CV			0.5	0.5
Geometric Mean			901		Geometric Mean			2.3		Geometric Mean			1.0	0.5	Geometric Mean			1.6	1.6

ATTACHMENT 2 (UPSTREAM STATION)

STATION SITE SELECTED : KR-91 , Kankakee River , Dunns Bridge , Porter County

Lead (Total) (ug/L)				Corrected	Nickel (Total) (ug/L)				Corrected
Sample Date	Season	<	Lab Test	Lab Result	Sample Date	Season	<	Lab Test	Lab Result
12/12/2002	W	L	1	0.5	12/12/2002	W		2.8	2.8
2/20/2003	W	L	1	0.5	2/20/2003	W		2.6	2.6
3/5/2003	W	L	1	0.5	3/5/2003	W		2.7	2.7
4/16/2003	W		1.41	1.4	4/16/2003	W		3.8	3.8
5/1/2003	S		1.64	1.6	5/1/2003	S		4.2	4.2
6/18/2003	S	L	1	0.5	6/18/2003	S		4.6	4.6
7/9/2003	S		1.51	1.5	7/9/2003	S		4.3	4.3
8/6/2003	S		1.08	1.1	8/6/2003	S		2.5	2.5
9/15/2003	S	L	1	0.5	9/15/2003	S		2.1	2.1
10/1/2003	S	L	1	0.5	10/1/2003	S		2.1	2.1
11/3/2003	S	L	1	0.5	11/3/2003	S		2.2	2.2
12/17/2003	W	L	1	0.5	12/17/2003	W		2.4	2.4
1/7/2004	W	L	1	0.5	1/7/2004	W		2.2	2.2
2/23/2004	W	L	1	0.5	2/23/2004	W		2.4	2.4
3/4/2004	W		1.97	2.0	3/4/2004	W		3.3	3.3
4/1/2004	W	L	1	0.5	4/1/2004	W		2.2	2.2
5/26/2004	S		3.9	3.9	5/26/2004	S		4.4	4.4
6/28/2004	S		1.23	1.2	6/28/2004	S		2.4	2.4
7/26/2004	S		1.92	1.9	7/26/2004	S		3.1	3.1
8/10/2004	S	L	1	0.5	8/10/2004	S		1.8	1.8
9/2/2004	S		1.2	1.2	9/2/2004	S		2.7	2.7
10/14/2004	S	L	1	0.5	10/14/2004	S		1.8	1.6
11/10/2004	S	L	1	0.5	11/10/2004	S		1.7	1.7
12/7/2004	W	L	1	0.5	12/7/2004	W		1.7	1.7
1/18/2005	W		2	2.0	1/18/2005	W		3.0	3.0
2/1/2005	W	L	1	0.5	2/1/2005	W		1.9	1.9
3/8/2005	W	L	1	0.5	3/8/2005	W		1.6	1.6
4/18/2005	W	L	1	0.5	4/18/2005	W		1.4	1.4
5/4/2005	S	L	1	0.5	5/4/2005	S	L	1.4	1.2
6/7/2005	S	L	1	0.5	6/7/2005	S		1.5	1.5
6/30/2005	S	L	1	0.5	6/30/2005	S	L	1.4	1.2
8/8/2005	S	L	1	0.5	8/8/2005	S	L	1.4	1.2
9/19/2005	S	L	1	0.5	9/19/2005	S	L	1.4	1.2
10/11/2005	S	L	1	0.5	10/11/2005	S		1.5	1.5
11/2/2005	S	L	1	0.5	11/2/2005	S	L	1.4	1.2
12/6/2005	W	L	1	0.5	12/6/2005	W	L	1.4	1.2
1/3/2006	W	L	1	0.5	1/3/2006	W		1.8	1.8
2/15/2006	W	L	1	0.5	2/15/2006	W		1.4	1.4
3/8/2006	W	L	1	0.5	3/8/2006	W		1.4	1.4
4/6/2006	W	L	1	0.5	4/6/2006	W		1.6	1.6
5/1/2006	S	L	1	0.5	5/1/2006	S		1.5	1.5
6/1/2006	S	L	1	0.5	6/1/2006	S		2.1	2.1
7/11/2006	S	L	1	0.5	7/11/2006	S		1.7	1.7
8/3/2006	S	L	1	0.5	8/3/2006	S		1.9	1.9
9/28/2006	S	L	1	0.5	9/28/2006	S		1.8	1.8
10/12/2006	S	L	1	0.5	10/12/2006	S		1.7	1.7
11/8/2006	S	L	1	0.5	11/8/2006	S		2.2	2.2
12/28/2006	W	L	1	0.5	12/28/2006	W		2.3	2.3

ATTACHMENT 2 (UPSTREAM STATION)

STATION SITE SELECTED : KR-91 , Kankakee River , Dunns Bridge , Porter County

Lead (Total) (ug/L)				Corrected	Nickel (Total) (ug/L)				Corrected
Sample Date	Season	<	Lab Test	Lab Result	Sample Date	Season	<	Lab Test	Lab Result
1/11/2007	W	L	1	0.5	1/11/2007	W		2.3	2.3
2/1/2007	W	L	1	0.5	2/1/2007	W		2.0	2.0
3/1/2007	W	L	1	0.5	3/1/2007	W		2.1	2.1
4/23/2007	W	L	1	0.5	4/23/2007	W		1.8	1.8
5/7/2007	S	L	1	0.5	5/7/2007	S		2.4	2.4
6/18/2007	S	L	1	0.5	6/18/2007	S		2.2	2.2
7/19/2007	S	L	1	0.5	7/19/2007	S		1.8	1.8
8/6/2007	S	L	1	0.5	8/6/2007	S		1.8	1.8
9/27/2007	S	L	1	0.5	9/27/2007	S	L	1.4	1.24
10/2/2007	S	L	1	0.5	10/2/2007	S		1.46	1.46
11/1/2007	S	L	1	0.5	11/1/2007	S		1.53	1.53
12/6/2007	W	L	1		12/6/2007	W		1.72	1.72

Lead (Total) (ug/L)				Nickel (Total) (ug/L)				
MF For Lab Data	0.17	Lab Test	Lab Result	MF For Lab Data	0.89	Lab Test	Lab Result
Samples	50	60	59	Samples	7	60	60
Minimum		1.0	0.5	Minimum		1.40	1.24
Average		1.1	0.7	Average		2.16	2.14
Maximum		3.9	3.9	Maximum		4.57	4.57
STD_Deviation		0.4	0.6	STD_Deviation		0.80	0.83
CV		0.4	0.8	CV		0.37	0.39
Geometric Mean		1.1	0.6	Geometric Mean		2.0	2.0

TRACE METALS DATA - STATION SITE SELECTED : KR-68 , Kankakee River , SR 55, Shelby , Newton County ATTACHMENT 3

Aluminum (Total) (ug/L) Sample Date	Season	<	Trace Metal Data	Corrected Trace Data	Antimony (Total) (ug/L) Sample Date	Season	<	Trace Metal Data	Corrected Trace Data	Arsenic (Total) (ug/L) Sample Date	Season	<	Trace Metal Data	Corrected Trace Data	Barium (Total) (ug/L) Sample Date	Season	<	Trace Metal Data	Corrected Trace Data
4/24/2002	W		621		4/24/2002	W	L	0.73	0.37	4/24/2002	W		2.43		4/24/2002	W		40	
7/10/2002	S		296		7/10/2002	S	L	0.73	0.37	7/10/2002	S		3.06		7/10/2002	S		40	
10/23/2002	S		49.5		10/23/2002	S	L	0.73	0.37	10/23/02	S		2.09		10/23/2002	S		38	
5/20/2003	S		309		5/20/2003	S		0.23	0.23	5/20/2003	S		3.26		5/20/2003	S		65	
8/19/2003	S		208		8/19/2003	S	L	0.73	0.37	8/19/2003	S		3.09		8/19/2003	S		52	
11/19/2003	S		291		11/19/2003	S	L	0.73	0.37	11/19/2003	S		2.22		11/19/2003	S		58	
2/24/2004	W		174		2/24/2004	W	L	0.73	0.37	2/24/2004	W		1.96		2/24/2004	W		57	
9/8/2004	S		611		9/8/2004	S	L	0.73	0.37	9/8/2004	S		4.16		9/8/2004	S		63	
10/21/04	S		60.1		10/21/2004	S	L	0.73	0.37	10/21/2004	S		1.91		10/21/2004	S		53	
3/10/2005	W		293		3/10/2005	W	L	0.73	0.37	3/10/2005	W		1.92		3/10/2005	W		54	
6/23/2005	S		702		6/23/2005	S	L	0.73	0.37	6/23/2005	S		3.44		6/23/2005	S		60	
9/1/2005	S		354		9/1/2005	S	L	0.73	0.37	9/1/2005	S		3.08		9/1/2005	S		61	
12/8/2005	W		29		12/8/2005	W	L	0.73	0.37	12/8/2005	W		1.69		12/8/2005	W		61	
3/16/2006	W		4110		3/16/2006	W	L	0.73	0.37	3/16/2006	W		3.23		3/16/2006	W		90	

Aluminum (Total) (ug/L) MF For Lab Data		Trace Metal	Corrected Trace Meta	Antimony (Total) (ug/L) MF For Lab Data	0.1	Trace Metal	Corrected Trace Metal	Arsenic (Total) (ug/L) MF For Lab Data		Lab Test	Corrected Lab Result	Barium (Total) (ug/L) MF For Lab Data		Lab Test	Corrected Lab Result
Samples		14		Samples	13	14	14	Samples		14		Samples		14	
Minimum		29.0		Minimum		0.23	0.23	Minimum		1.7		Minimum		38.0	
Average		579.8		Average		0.69	0.36	Average		2.7		Average		56.8	
Maximum		4110.0		Maximum		0.73	0.37	Maximum		4.2		Maximum		90.0	
STD_Deviation		1037.9		STD_Deviation		0.13	0.04	STD_Deviation		0.7		STD_Deviation		13.1	
CV		1.8		CV		0.19	0.10	CV		0.3		CV		0.2	
Geometeric MEAN		268		Geometeric MEAN		0.67	0.35	Geometeric MEAN		2.6		Geometeric MEAN		55	

TRACE METALS DATA - STATION SITE SELECTED : KR-68 , Kankakee River , SR 55, Shelby , Newton County ATTACHMENT 3

Beryllium (Total) (ug/L) Sample Date	Season	<	Trace Metal Data	Corrected Trace Data
4/24/2002	W		0.0255	0.0255
7/10/2002	S		0.0214	0.0214
10/23/2002	S	L	0.033	0.0236
5/20/2003	S		0.0234	0.0234
8/19/2003	S		0.0203	0.0203
11/19/2003	S		0.0169	0.0169
2/24/2004	W	L	0.033	0.0236
9/8/2004	S		0.0461	0.0461
10/21/2004	S	L	0.033	0.0236
3/10/2005	W		0.0144	0.0144
06/23/05	S		0.0336	0.0336
9/1/2005	S		0.0159	0.0159
12/8/2005	W	L	0.033	0.0236
3/16/2006	W		0.144	0.1440

Manganese (Total) (ug/L) Sample Date	Season	<	Trace Metal Data	Corrected Trace Data
4/24/2002	W		125	
7/10/2002	S		146	
10/23/2002	S		80	
5/20/2003	S		201	
8/19/2003	S		130	
11/19/2003	S		138	
2/24/2004	W		113	
9/8/2004	S		278	
10/21/2004	S		102	
3/10/2005	W		116	
6/23/2005	S		241	
9/1/2005	S		186	
12/8/2005	W		140	
3/16/2006	W		371	

Nickel (Total) (ug/L) Sample Date	Season	<	Trace Metal Data	Corrected Trace Data
4/24/2002	W		2.46	
7/10/2002	S		2.51	
10/23/2002	S		2.01	
5/20/2003	S		3.37	
8/19/2003	S		2.45	
11/19/2003	S		1.87	
2/24/2004	W		1.96	
9/8/2004	S		4.16	
10/21/2004	S		3.17	
3/10/2005	W		3.51	
6/23/2005	S		2.59	
9/1/2005	S		2.82	
12/8/2005	W		3.03	
3/16/2006	W		6.7	

Selenium (Total) (ug/L) Sample Date	Season	<	Trace Metal Data	Corrected Trace Data
4/24/2002	W		0.9	0.9
7/10/2002	S	L	0.9	0.45
10/23/2002	S	L	0.9	0.45
5/20/2003	S	L	0.9	0.45
8/19/2003	S	L	0.9	0.45
11/19/2003	S	L	0.9	0.45
2/24/2004	W		0.4	0.4
9/8/2004	S	L	0.9	0.45
10/21/2004	S	L	0.9	0.45
3/10/2005	W		0.7	0.7
6/23/2005	S		0.5	0.5
9/1/2005	S		1.1	1.1
12/8/2005	W		1.1	1.1
3/16/2006	W		0.9	0.9

Beryllium (Total) (ug/L) MF For Lab Data	0.7	Lab Test	Corrected Lab Result
Samples	4	14	14
Minimum		0.0	0.0
Average		0.0	0.0
Maximum		0.1	0.1
STD_Deviation		0.0	0.0
CV		0.9	1.0
Geometeric MEAN		0.029	0.026

Manganese (Total) (ug/L) MF For Lab Data	Lab Test	Corrected Lab Result
Samples	14	
Minimum	80.0	
Average	169.1	
Maximum	371.0	
STD_Deviation	80.1	
CV	0.5	
Geometeric MEAN	155	

Nickel (Total) (ug/L) MF For Lab Data	Lab Test	Corrected Lab Result
Samples	14	
Minimum	1.9	
Average	3.0	
Maximum	6.7	
STD_Deviation	1.2	
CV	0.4	
Geometeric MEAN	2.9	

Selenium (Total) (ug/L) MF For Lab Data	0.5	Lab Test	Corrected Lab Result
Samples	7	14	14
Minimum		0.4	0.4
Average		0.9	0.6
Maximum		1.1	1.1
STD_Deviation		0.2	0.3
CV		0.2	0.4
Geometeric MEAN		0.8	0.6

TRACE METALS DATA - STATION SITE SELECTED : KR-68 , Kankakee River , SR 55, Shelby , Newton County ATTACHMENT 3

Silver (Total) (ug/L) Sample Date	Season	<	Trace Metal Data	Corrected Trace Data	Thallium (Total) (ug/L) Sample Date	Season	<	Trace Metal Data	Corrected Trace Data	Sample Date	Season	<	Trace Metal Data	Corrected Trace Data	Sample Date	Season	<	Trace Metal Data	Corrected Trace Data
4/24/2002	W		0.0079	0.0079	4/24/2002	W		0.0269	0.0269										
07/10/02	S		0.01	0.01	7/10/2002	S		0.029	0.029										
10/23/2002	S	L	0.014	0.011	10/23/2002	S		0.0121	0.0121										
5/20/2003	S		0.0144	0.0144	5/20/2003	S		0.0287	0.0287										
8/19/2003	S		0.0146	0.0146	8/19/2003	S		0.0246	0.0246										
11/19/2003	S		0.0101	0.0101	11/19/2003	S		0.0131	0.0131										
2/24/2004	W		0.0113	0.0113	2/24/2004	W		0.0094	0.0094										
9/3/2004	S		0.0198	0.0198	9/8/2004	S		0.031	0.031										
10/21/2004	S	L	0.014	0.011	10/21/2004	S		0.0089	0.0089										
3/10/2005	W		0.0086	0.0086	03/10/05	W		0.0174	0.0174										
6/23/2005	S		0.0175	0.0175	6/23/2005	S		0.0301	0.0301										
9/1/2005	S		0.0053	0.0053	9/1/2005	S		0.0237	0.0237										
12/8/2005	W	L	0.014	0.011	12/8/2005	W	L	0.017	0.016										
3/16/2006	W		0.024	0.024	3/16/2006	W		0.0665	0.0665										

Silver (Total) (ug/L)			Corrected	Thallium (Total) (ug/L)			Corrected
MF For Lab Data	0.8	Lab Test	Lab Result	MF For Lab Data	0.8	Lab Test	Lab Result
Samples	3	14	14	Samples	7	14	14
Minimum		0.0053	0.0053	Minimum		0.0089	0.0089
Average		0.013	0.013	Average		0.024	0.024
Maximum		0.024	0.024	Maximum		0.0665	0.0665
STD_Deviation		0.005	0.005	STD_Deviation		0.015	0.015
CV		0.4	0.4	CV		0.6	0.6
Geometeric MEAN		0.012	0.012	Geometeric MEAN		0.021	0.021

ATTACHMENT 4 (DOWN STREAM STATION)

STATION SITE SELECTED : KR-68 , Kankakee River , SR 55 Bridge 1 Mile S of Shelby , Newton County

Hardness (mg/l)				Corrected	Chloride (mg/L)				Corrected
Sample Date	Season	<	Lab Test	Lab Result	Sample Date	Season	<	Lab Test	Lab Result
11/6/2002	S		392		11/6/2002	S		40	
12/12/2002	W		348		12/12/2002	W		32	
3/5/2003	W		352		3/5/2003	W		32	
4/16/2003	W		375		4/16/2003	W		35	
5/1/2003	S		342		5/1/2003	S		28	
6/18/2003	S		366		6/18/2003	S		32	
7/9/2003	S		298		7/9/2003	S		23	
8/6/2003	S		323		8/6/2003	S		26	
9/15/2003	S		352		9/15/2003	S		36	
10/1/2003	S		317		10/1/2003	S		27	
11/3/2003	S		330		11/3/2003	S		29	
12/17/2003	W		363		12/17/2003	W		30	
1/7/2004	W		335		1/7/2004	W		33	
2/23/2004	W		323		2/23/2004	W		41	
3/4/2004	W		313		3/4/2004	W		33	
4/1/2004	W		327		4/1/2004	W		32	
5/26/2004	S		306		5/26/2004	S		27	
6/28/2004	S		325		6/28/2004	S		26	
7/26/2004	S		290		7/26/2004	S		27	
8/10/2004	S		340		8/10/2004	S		29	
9/2/2004	S		313		9/2/2004	S		25	
10/14/2004	S		384		10/14/2004	S		34	
11/10/2004	S		338		11/10/2004	S		27	
12/7/2004	W		326		12/7/2004	W		27	
1/18/2005	W		200		1/18/2005	W		20	
2/1/2005	W		351		2/1/2005	W		26	
3/8/2005	W		271		3/8/2005	W		28	
4/18/2005	W		316		4/18/2005	W		29	
5/4/2005	S		303		5/4/2005	S		26	
6/7/2005	S		284		6/7/2005	S		25	
6/30/2005	S		334		6/30/2005	S		26	
8/8/2005	S		349		8/8/2005	S		37	
9/19/2005	S		342		9/19/2005	S		34	
10/11/2005	S		313		10/11/2005	S		29	
11/2/2005	S		346		11/2/2005	S		37	
12/6/2005	W		377		12/6/2005	W		37	
1/3/2006	W		362		1/3/2006	W		35	
2/15/2006	W		334		2/15/2006	W		31	
3/8/2006	W		337		3/8/2006	W		29	
4/6/2006	W		352		4/6/2006	W		29	
5/1/2006	S		331		5/1/2006	S		29	
6/1/2006	S		355		6/1/2006	S		30	
7/11/2006	S		371		7/11/2006	S		36	
8/3/2006	S		348		8/3/2006	S		30	
9/28/2006	S		401		9/28/2006	S		28	
10/12/2006	S		346		10/12/2006	S		31	
11/8/2006	S		374		11/8/2006	S		27	
12/28/2006	W		305		12/28/2006	W		26	

ATTACHMENT 4 (DOWN STREAM STATION)

STATION SITE SELECTED : KR-68 , Kankakee River , SR 55 Bridge 1 Mile S of Shelby , Newton County

Hardness (mg/l)				Corrected	Chloride (mg/L)				Corrected
Sample Date	Season	<	Lab Test	Lab Result	Sample Date	Season	<	Lab Test	Lab Result
1/11/2007	W		361		1/11/2007	W		25	
2/1/2007	W		368		2/1/2007	W		24	
3/1/2007	W		362		3/1/2007	W		35	
4/23/2007	W		268		4/23/2007	W		26	
5/7/2007	S		257		5/7/2007	S		28	
6/18/2007	S		385		6/18/2007	S		28	
7/19/2007	S		310		7/19/2007	S		33	
8/6/2007	S		236		8/6/2007	S		26	
9/27/2007	S		252		9/27/2007	S		29	
10/2/2007	S		301		10/2/2007	S		31	
11/1/2007	S		299		11/1/2007	S		29	
12/6/2007	W		381		12/6/2007	W		26	
Hardness (mg/l)					Chloride (mg/L)				
MF For Lab Data			Lab Test	Lab Result	MF For Lab Data			Lab Test	Lab Result
Samples			60		Samples			60	
Minimum			200		Minimum			20	
Average			331		Average			30	
Maximum			401		Maximum			41	
STD_Deviation			39		STD_Deviation			4.4	
CV			0.1		CV			0.1	
Percentile	50%		336		Percentile	50%		29	

ATTACHMENT 5

Calculation of Preliminary Effluent Limitations for Discharges in the Non-Great Lakes System (Excluding Discharges to the Ohio River)

General Information	
Facility Name:	NIPSCO Rollin M. Schahfer Generating Station
County:	Jasper
NPDES Number:	IN0033201
WLA Number:	001668
WLA Report Date:	6/18/2020
Outfall:	001
Receiving Stream:	Kankakee River

Receiving Stream Questions (Yes or No)	
Acute Mixing Zone Allowed?	No
Public Water System (PWS) Intake Downstream?	No
Industrial Water Supply (IWS) Intake Downstream?	No
Interstate Wabash River Discharge?	No
Put-and-Take Trout Fishing?	No
Fish Early Life Stages Present?	Yes

Effluent Flow		
	=	33.6 mgd

Receiving Stream Design Flows		
Q7,10 (Outfall)	=	294 cfs
Q7,10 (Public Water System Intake)	=	cfs
Q7,10 (Industrial Water Supply Intake)	=	cfs
Q30,10 (Outfall)	=	331 cfs
Q30 (Outfall)	=	3160 cfs
Q30 (Public Water System Intake)	=	cfs

Ambient Downstream Water Quality Characteristics		
Hardness (50th percentile)	=	206 mg/l
Chloride (50th percentile)	=	29 mg/l
pH (90th percentile)	=	s.u.
Acute Ammonia-N		
Summer pH (75th percentile)	=	s.u.
Winter pH (75th percentile)	=	s.u.
Chronic Ammonia-N		
Summer Temperature (75th percentile)	=	C
Summer pH (75th percentile)	=	s.u.
Winter Temperature (75th percentile)	=	C
Winter pH (75th percentile)	=	s.u.

Mixing Zone Dilution				
Dilution Factor (for acute mixing zone)	=			
		Dilution Fraction	Flow	Location
Chronic Aquatic Life (Except Ammonia)	=	50%	Q7,10	Outfall
Chronic Aquatic Life (Ammonia Only)	=	50%	Q30,10	Outfall
Chronic WET	=	25%	Q7,10	Outfall
Human Noncancer Drinking Water	=	100%	Q7,10	PWS Intake
Human Noncancer Nondrinking Water	=	50%	Q7,10	Outfall
Human Cancer Drinking Water	=	100%	Q50	PWS Intake
Human Cancer Nondrinking Water	=	25%	Q50	Outfall
Public Water Supply	=	100%	Q7,10	PWS Intake
Industrial Water Supply	=	100%	Q7,10	PWS Intake

Metals Translators (dissolved to total recoverable)		
	Acute	Chronic
Aluminum	1.000	1.000
Antimony	1.000	1.000
Arsenic	1.000	1.000
Barium	1.000	1.000
Beryllium	1.000	1.000
Cadmium	0.893	0.858
Chromium III	0.316	0.860
Cobalt	1.000	1.000
Copper	0.960	0.960
Iron	1.000	1.000
Lead	0.614	0.614
Manganese	1.000	1.000
Molybdenum	1.000	1.000
Nickel	0.998	0.997
Silver	0.85	
Strontium	1.000	1.000
Thallium	1.000	1.000
Tin	1.000	1.000
Titanium	1.000	1.000
Vanadium	1.000	1.000
Zinc	0.978	0.986

Source of Criteria [1]							Ambient Upstream Conc. (Outfall) (ug/l)	Ambient Upstream Conc. (Intake) (ug/l)	Remove Mixing Zone? (Yes or Blank)	Sample/ Month	CV	Facility Specific CV? (Yes or No)	CAS Number	Parameters[2]	Indiana Water Quality Criteria for the Non-Great Lakes System (ug/l)							Preliminary Effluent Limitations					
A	B	C	D	E	F	G									A	B	C	D	E	F	G						
															Aquatic Life Criteria		Human Health Noncancer Criteria		Human Health Cancer Criteria		Add. PWS Criteria	Concentration (ug/l)[3]		Mass (lbs/day)		Criteria Type [4]	Basis
															Acute (AAC)	Chronic (CAC)	Drinking (HNC-D)	Nondrinking (HNC-N)	Drinking (HCC-D)	Nondrinking (HCC-N)	(PWS)	Average	Maximum	Average	Maximum		
7	7	3	8				268			1	0.6	No	7429905	Aluminum								170	290	31	52	SSC	CAC[9]
8	8	1	1			8	0.35			1	0.6	No	7440360	Antimony	987	174	970	4520				430	710	78	128	SV[8]	CAC[9]
1	1	8				8	2.9			1	0.6	No	7440382	Arsenic [5][5]	720	80	146	45000			6	490	720	88	130	Tier I	AAC
8	8	1	8			8	55			1	0.6	No	7440393	Barium [7]	360	190	5				10	6200	9100	1118	1640	SV[8]	AAC
8	8	8	8	1	1	8	0.026			1	0.6	No	7440417	Beryllium [5][7]	4329.68	1587.49	1000	160000			2000	6200	9100	1118	1640	SV[8]	AAC
1	1	1	8			8	0.5			1	0.6	No	7440439	Cadmium [5][7]	461.12	51.30	40	300	0.068	1.17	4	11	26	2	4.7	Tier I	HCC-N[9]
1	1	1	1			8	0.7			1	0.6	No	16065831	Chromium (III) [7]	13.75	2.52	10	1460			5	14	22	2.5	4	Tier I	CAC[9]
1	1	1	8				0			1	0.6	No	18540299	Chromium (VI)	148	480	170000	3433000			100	3012.35	4948.13	542.96	891.91	Tier I	CAC[9]
												No	7440473	Total Chromium	15.71	10.58	50	29000				22	31	4	5.6	Tier I	AAC
8	8	8	8				6.7			1	0.6	No	7440484	Cobalt								3000	5000	541	901	Tier I	CAC[9]
1	1	8	8				1.6			1	0.6	No	7440508	Copper [7]	130	19	140	11000				190	260	18	39	SV[8]	CAC[9]
7	7						901			1	0.6	No	7439896	Iron	55.31	31.97	280	56000				76	319	14	70	Tier I	AAC
1	1	1	8				0.6			1	0.6	No	7439921	Lead [5][7]	2744	2693						3800	5500	685	991	SSC	AAC
8	8	8	8				156			1	0.6	No	7439965	Manganese [7]	214.65	9.14	50	100				78	130	14	23	Tier I	CAC[9]
1	1	1	1			8	-		Yes	1	0.6	No	7439976	Mercury[6]	3300	1534	1300	39000				4500	6600	811	1192	SV[8]	AAC
5	6	8	8				10			1	0.6	No	7439987	Molybdenum	0.4	0.012	0.14	0.13			2	0.012	0.02	0.0022	0.0036	Tier I	CAC[9]
1	1	1	1				2			1	0.6	No	7440020	Nickel [7]	84000	1800	320	13000				20000	34000	3605	6129	Tier II	CAC[9]
1	1	1	8			8	0.6			1	0.6	No	7782492	Selenium	3945.06	438.34	13.4	100				530	1300	95	234	Tier I	HNC-N[9]
		1	8				0.012			4	0.6	No	7440224	Silver [7]	130	35	10	3400			50	190	260	32	47	Tier I	AAC
6	6	1	1			8	0.021			1	0.6	No	7440280	Thallium	13.87	-	50	36000				16	33	2.9	5.9	Tier I	AAC
8	8						7.5			1	0.6	No	7440315	Tin	86	35	13	48			2	120	190	22	31	Tier II	AAC
8	8						8.6			1	0.6	No	7440328	Titanium	1600	180						940	1500	169	270	SV[8]	CAC[9]
1	1	1	8				23			4	0.6	No	7440666	Zinc [7]	23000	2500						13000	22500	2343	3966	SV[8]	CAC[9]
5	5	8	8				190			1	0.6	No	7440428	Boron	319.58	291.82	9000	250000				330	650	59	117	Tier I	AAC
1	1					8	0			4	0.6	No	57125	Cyanide, Free	26000	8800	1900	160000				41000	60000	7390	10815	Tier I	AAC
		1	8				0			4	0.6	No	57125	Cyanide, Total	22	5.2					200	22	44	4	7.9	Tier I	AAC
	2					1	77000			4	9.6	No	14808798	Sulfate [7]			200,000	48000				250000	450000	45085	113559	SV[8]	HNC-N[9]
																200,000					250000	8600000	17000000	1590167	3064284	Tier I	SMR

[1] Source of Criteria
1) Indiana numeric water quality criterion in 327 IAC 2-1-6(a)(2), Table 6-1, or in 327 IAC 2-1-6(g).
2) "Shall not exceed" (SNE) criterion in 327 IAC 2-1-6(a)(2); Table 6-1 or 327 IAC 2-1-6(a)(3). The criterion is viewed as a 4-day average criterion and is implemented in the same manner as the chronic aquatic life criterion.
3) Industrial water supply (IWS) criterion in 327 IAC 2-1-6(a)(4); Table 6-1 or 327 IAC 2-1-6(a)(5). The criterion is viewed as a 4-day average criterion and is implemented in the same manner as the chronic aquatic life criterion.
4) Acute (1-hour average) and chronic (30-day average) criteria for total ammonia nitrogen is "1999 Update of Ambient Water Quality Criteria for Ammonia," EPA-822-R-99-014, December 1999.
5) Tier I criterion derived using the methodology in 327 IAC 2-1-6.3 or 327 IAC 2-1-6.3 when the Method I data set is available, or using the methodology in 327 IAC 2-1-6.4, 327 IAC 2-1-6.5 or 327 IAC 2-1-6.6.
6) Tier II criterion derived using the methodology in 327 IAC 2-1-6.3 or 327 IAC 2-1-6.3 when the Method I data set is not available.
7) Site-specific water quality criterion (SSC) in 327 IAC 2-1-6.9, Table 6-3-1 or developed under 327 IAC 2-1-6.8.
8) Screening value (SV).
9) Numeric interpretation of narrative criterion for toxicity using U.S. EPA recommended water quality criteria for whole effluent toxicity (WET).
[2] The "chronic life criteria and screening values for chromium are for the form of dissolved metal. The values for all the metals are in the form of total recoverable metal.
The human health criteria and screening values and the public water supply screening value for all the metals are in the form of total recoverable metal.
[3] The preliminary effluent limitations (PELs) for the metals are in the form of total recoverable metal (with the exception of Chromium (VI) which is in the form of dissolved metal).
[4] See the table "Indiana Water Quality Criteria for the Non-Great Lakes System" for information on the type and source of criteria.
[5] The above-noted substances are pesticide or known human carcinogens.
[6] The above-noted substances are bioaccumulative chemicals of concern (BCCs). Beginning January 1, 2004, the water quality criteria for a BCC shall be applied directly to the undiluted discharge for all discharges of a BCC.
To apply the water quality criteria for a BCC directly to the undiluted discharge, enter "Yes" in the "Mixing Using Zone" column.
[7] The above-noted substances have a criterion that is a function of the effluent chemistry. See the table "Indiana Water Quality Criteria for the Non-Great Lakes System" for information on the criterion equation.
[8] Limits based on screening values (as indicated by SV) ARE NOT to be used as water quality-based effluent limitations. These are solely to be used as preliminary effluent limitations.
[9] The monthly average PEL was set equal to the most stringent WLA because the calculated monthly average PEL exceeded the most stringent WLA and a facility-specific CV was not determined.

Last revised: July 15, 2009

ATTACHMENT 6 MRO Data

For NIPSCO Rollin M. Schahfer Generating Station in Jasper County

DATE		Silver (mg/l) Daily	Silver (mg/l) Monthly	DATE		Zinc (mg/l) Daily	Zinc (mg/l) Monthly	Sulfate (mg/l) Daily	Sulfate (mg/l) Monthly	Cyanide (mg/l) Daily	Cyanide (mg/l) Monthly	DATE		Chromium (mg/l) Daily	Chromium (mg/l) Monthly	Mercury (ng/l) Daily	Mercury (ng/l) Monthly	DATE
1/5/2005	<	0.010	0.0100	1/5/2005		0.21	0.21	630	630	0.005	0.005	1/5/2005	<	0.003	0.0030	1.75		10/6/2005
2/3/2005	<	0.010	0.0100	2/3/2005		0.300	0.300	590	590	0.0058	0.006	2/3/2005	<	0.003	0.0030	11.2		12/7/2005
3/9/2005	<	0.010	0.0100	3/9/2005		0.290	0.290	700	700	0.005	0.005	3/9/2005	<	0.003	0.0030	9.01		2/7/2006
4/3/2005	<	0.010	0.0100	4/3/2005		0.24	0.24	490	490	0.005	0.005	4/3/2005	<	0.003	0.0030	12.8		4/7/2006
5/9/2005	<	0.010	0.0100	5/9/2005		0.130	0.130	740	740	0.0077	0.008	6/10/2005	<	0.003	0.0030	0.50		6/9/2006
6/10/2005	<	0.010	0.0100	6/10/2005		0.084	0.084	840	840	0.011	0.011	7/1/2005	<	0.003	0.0030	0.787		8/10/2006
7/1/2005	<	0.010	0.0100	7/1/2005		0.072	0.072	680	680	0.005	0.005	8/4/2005	<	0.003	0.0030	3.40		10/6/2006
8/4/2005	<	0.010	0.0100	8/4/2005		0.092	0.092	590	590	0.005	0.005	9/1/2005	<	0.003	0.0030	3.43		12/8/2006
9/1/2005	<	0.010	0.0100	9/1/2005		0.087	0.087	648	648	0.006	0.006	10/3/2005	<	0.003	0.0030	8.05		2/16/2007
10/3/2005	<	0.010	0.0100	10/3/2005		0.057	0.057	440	440	0.005	0.005	11/3/2005	<	0.003	0.0030	4.0		4/12/2007
11/3/2005	<	0.010	0.0100	11/3/2005		0.056	0.056	495	495	0.005	0.005	12/9/2005	<	0.003	0.0030	3.15		6/14/2007
12/9/2005	<	0.010	0.0100	12/9/2005		0.062	0.062	872	872	0.005	0.005	1/4/2006	<	0.003	0.0030	4.20		8/9/2007
1/4/2006	<	0.010	0.0100	1/4/2006		0.13	0.13	429	429	0.005	0.005	2/3/2006	<	0.003		4.16		10/16/2007
2/3/2006	<	0.010		2/3/2006		0.15		340		0.005		2/22/2006	<	0.003		8.67		12/19/2007
2/22/2006	<	0.010		2/22/2006		0.18		278		0.005		2/28/2006	<	0.003	0.0030	16.5		2/22/2008
2/28/2006	<	0.010	0.0100	2/28/2006		0.17	0.1667	373	330	0.0064	0.005	3/9/2006	<	0.003		7.27		4/15/2008
3/9/2006	<	0.010		3/9/2006		0.160		303		0.005		3/14/2006	<	0.003		7.15		6/19/2008
3/14/2006	<	0.010		3/14/2006		0.170		400		0.01		3/22/2006	<	0.003	0.0030	8.38		8/13/2008
3/22/2006	<	0.010	0.0100	3/22/2006		0.120	0.1500	420	374	0.013	0.009	4/5/2006	<	0.003		6.79		10/15/2008
4/5/2006	<	0.010		4/5/2006		0.083		335				4/12/2006	<	0.003				
4/12/2006	<	0.010		4/12/2006		0.061		430		0.006		4/23/2006	<	0.003	0.0030			
4/23/2006	<	0.010	0.0100	4/23/2006		0.056	0.0667	347	371	0.005	0.006	5/5/2006	<	0.003				
5/5/2006	<	0.010		5/5/2006		0.022		255		0.017		5/7/2006	<	0.003				
5/7/2006	<	0.010		5/7/2006		0.028		280		0.009		5/15/2006	<	0.003				
5/15/2006	<	0.010		5/15/2006		0.027		582		0.012		5/23/2006	<	0.003				
5/23/2006	<	0.010		5/23/2006		0.034		271		0.006		5/29/2006	<	0.003	0.0030			
5/29/2006	<	0.010	0.0100	5/29/2006	<	0.020	0.0262	326	343	0.005	0.010	6/8/2006	<	0.003				
6/8/2006	<	0.010		6/8/2006		0.033		272		0.005		6/26/2006	<	0.003	0.0030			
6/14/2006	<	0.010		6/14/2006		0.042		302		0.005		7/7/2006	<	0.003				
6/21/2006	<	0.010		6/21/2006		0.038		316		0.0078		7/14/2006	<	0.003				
6/26/2006	<	0.010	0.0100	6/26/2006		0.110	0.0558	588	370	0.005	0.006	7/24/2006	<	0.003	0.0030			
7/7/2006	<	0.010		7/7/2006		0.082						8/1/2006	<	0.003				
7/14/2006	<	0.010		7/14/2006		0.028						8/18/2006	<	0.003				
7/19/2006	<	0.010		7/19/2006		0.037						8/29/2006	<	0.003	0.0030			
7/24/2006	<	0.010	0.0100	7/24/2006	<	0.020	0.0418					9/8/2006		0.0032				
8/1/2006	<	0.010		8/1/2006		0.038		275		0.005		9/13/2006	<	0.003				
8/8/2006	<	0.010		8/8/2006	<	0.020		310		0.005		9/18/2006	<	0.003	0.0031			
8/18/2006	<	0.010		8/18/2006	<	0.020		295		0.005		10/3/2006		0.0056				
8/22/2006	<	0.010		8/22/2006		0.042		414		0.0056		10/20/2006	<	0.003				
8/29/2006	<	0.010	0.0100	8/29/2006		0.036	0.0312	375	334	0.005	0.005	10/24/2006		0.0031	0.0039			

ATTACHMENT 6 MRO Data

For NIPSCO Rollin M. Schahfer Generating Station in Jasper County

DATE	Silver (mg/l)			DATE	Zinc (mg/l)			Sulfate (mg/l)			Cyanide (mg/l)			DATE	Chromium (mg/l)			Mercury (ng/l)		DATE
		Daily	Monthly			Daily	Monthly		Daily	Monthly		Daily	Monthly			Daily	Monthly	Daily	Monthly	
9/8/2006	<	0.010		9/8/2006		0.052			320			0.005		11/1/2006	<	0.003				
9/13/2006	<	0.010		9/13/2006		0.022			319			0.005		11/10/2006	<	0.003				
9/18/2006	<	0.010	0.0100	9/18/2006	<	0.020	0.0313		306	315		0.005	0.005	11/17/2006	<	0.003				
10/3/2006	<	0.010		10/3/2006	<	0.020			392			0.012		11/21/2006	<	0.003	0.0030			
10/12/2006	<	0.010		10/12/2006	<	0.020			364			0.012		12/6/2006	<	0.003	0.0030			
10/20/2006	<	0.010		10/20/2006	<	0.020			314			0.005		1/11/2007	<	0.003	0.0030			
10/24/2006	<	0.010	0.0100	10/24/2006	<	0.020	0.0200		321	348		0.0079	0.009	2/9/2007	<	0.003	0.0030			
11/1/2006	<	0.010		11/1/2006	<	0.020			342			0.005		3/13/2007	<	0.001	0.0010			
11/10/2006	<	0.010		11/10/2006		0.036			304			0.0056		4/9/2007	<	0.001				
11/17/2006	<	0.010		11/17/2006	<	0.020			274			0.0073		4/30/2007	<	0.001	0.0010			
11/21/2006	<	0.010	0.0100	11/21/2006	<	0.020	0.0240		301	305		0.014	0.008	5/8/2007	<	0.001	0.0010			
12/6/2006	<	0.010		12/6/2006		0.027			374			0.005		6/4/2007	<	0.001				
12/10/2006	<	0.010		12/10/2006		0.120			330			0.005		6/13/2007		0.0034	0.0022			
12/19/2006	<	0.010	0.0100	12/19/2006		0.020	0.0557		313	339		0.0052	0.005	7/3/2007		0.0012				
1/11/2007	<	0.010	0.0100	1/11/2007		0.085	0.0850		374	374		0.005	0.005	7/11/2007	<	0.001				
2/9/2007	<	0.010		2/9/2007		0.13			431			0.005		7/19/2007	<	0.0020				
2/15/2007	<	0.010		2/15/2007		0.14			398			0.005		7/23/2007	<	0.001				
2/21/2007	<	0.010		2/21/2007		0.11			447			0.005		7/31/2007	<	0.001	0.0012			
2/26/2007	<	0.010	0.0100	2/26/2007		0.12	0.1250		415	423		0.0069	0.005	8/8/2007	<	0.001				
3/13/2007	<	0.001		3/13/2007		0.096			475			0.0076		8/13/2007	<	0.001				
3/19/2007	<	0.001	0.0010	3/19/2007		0.089	0.0925		480	478		0.005	0.006	8/28/2007	<	0.001	0.0010			
4/9/2007	<	0.001		4/9/2007		0.070			438			0.005		9/12/2007	<	0.003				
4/17/2007	<	0.001		4/17/2007		0.078			491			0.005		9/28/2007	<	0.003	0.0023			
4/30/2007	<	0.001	0.0010	4/30/2007		0.057	0.0683		544	491		0.005	0.005	10/2/2007	<	0.003	0.0030			
5/8/2007	<	0.001		5/8/2007		0.031			644			0.0078		11/1/2007	<	0.003	0.0030			
5/16/2007	<	0.001		5/16/2007		0.019			488			0.005		12/13/2007	<	0.003	0.0030			
5/24/2007	<	0.001	0.0010	5/24/2007		0.013	0.0210		515	549		0.005	0.006	1/10/2008	<	0.003	0.0030			
6/4/2007	<	0.001		6/4/2007		0.0093			396			0.005		2/11/2008	<	0.003	0.0030			
6/13/2007	<	0.001		6/13/2007		0.0140			446			0.012		3/4/2008	<	0.003	0.0030			
6/26/2007	<	0.001	0.0010	6/26/2007		0.0120	0.0118		493	445		0.0062	0.008	4/2/2008	<	0.003	0.0030			
7/3/2007	<	0.001		7/3/2007		0.012			310					5/4/2008	<	0.003	0.0030			
7/11/2007	<	0.001		7/11/2007		0.010								6/18/2008	<	0.003	0.0030			
7/19/2007	<	0.001		7/19/2007		0.007								7/3/2008	<	0.003	0.0030			
7/23/2007	<	0.001		7/23/2007		0.005								8/6/2008	<	0.003	0.0030			
7/31/2007	<	0.001	0.0010	7/31/2007	<	0.005	0.0077			310				9/2/2008		0.0047				
8/8/2007	<	0.001		8/8/2007		0.0082			307			0.005		9/11/2008	<	0.003	0.0039			
8/13/2007	<	0.001		8/13/2007	<	0.005			464			0.005		10/8/2008	<	0.003	0.0030			
8/20/2007	<	0.001		8/20/2007	<	0.005			418			0.005								
8/28/2007	<	0.001	0.0010	8/28/2007		0.0078	0.0065		392	395		0.005	0.005							

ATTACHMENT 6 MRO Data

For NIPSCO Rollin M. Schahfer Generating Station in Jasper County

DATE	Silver (mg/l)		DATE	Zinc (mg/l)		Sulfate (mg/l)		Cyanide (mg/l)		DATE	Chromium (mg/l)		Mercury (mg/l)		DATE
	Daily	Monthly		Daily	Monthly	Daily	Monthly	Daily	Monthly		Daily	Monthly	Daily	Monthly	
9/12/2007	< 0.010		9/12/2007	< 0.020		309		0.011							
9/20/2007	< 0.010		9/20/2007	< 0.020		444		0.005							
9/28/2007	< 0.010	0.0100	9/28/2007	< 0.020	0.0200	428	394	0.005	0.007						
10/2/2007	< 0.010		10/2/2007	< 0.020		427		0.005							
10/11/2007	< 0.010		10/11/2007	< 0.020		341		0.0099							
10/18/2007	< 0.010		10/18/2007	< 0.020		341		0.008							
10/25/2007	< 0.010	0.0100	10/25/2007	< 0.020	0.0200	298	352	0.0097	0.008						
11/1/2007	< 0.010		11/1/2007	< 0.020		449		0.0061							
11/12/2007	< 0.010		11/12/2007	< 0.020		610		0.005							
11/21/2007	< 0.010		11/21/2007	< 0.020		514		0.01							
11/28/2007	< 0.010	0.0100	11/28/2007	< 0.020	0.0200	494	517	0.005	0.007						
12/13/2007	< 0.010		12/13/2007	< 0.022		295		0.005							
12/18/2007	< 0.010		12/18/2007	< 0.020		418		0.005							
12/28/2007	< 0.010	0.0100	12/28/2007	< 0.024	0.0220	433	382	0.005	0.005						
1/10/2008	< 0.010		1/10/2008	< 0.036		426		0.005							
1/14/2008	< 0.010		1/14/2008	< 0.031		488		0.0071							
1/29/2008	< 0.010	0.0100	1/29/2008	< 0.045	0.0373	520	478	0.005	0.006						
2/11/2008	< 0.010		2/11/2008	< 0.035		495		0.005							
2/19/2008	< 0.010	0.0100	2/19/2008	< 0.035	0.0350	482	489	0.0052	0.005						
3/4/2008	< 0.010		3/4/2008	< 0.037		354		0.005							
3/10/2008	< 0.010		3/10/2008	< 0.037		554		0.005							
3/26/2008	< 0.010	0.0100	3/26/2008	< 0.023	0.0323	365	424	0.005	0.005						
4/2/2008	< 0.010		4/2/2008	< 0.026		490		0.005							
4/11/2008	< 0.010		4/11/2008	< 0.020		351		0.005							
4/15/2008	< 0.010		4/15/2008	< 0.020		433		0.005							
4/25/2008	< 0.010		4/25/2008	< 0.049		470		0.005							
4/29/2008	< 0.010	0.0100	4/29/2008	< 0.030	0.0290	491	447	0.005	0.005						
5/4/2008	< 0.010		5/4/2008	< 0.029		654		0.019							
5/13/2008	< 0.010		5/13/2008	< 0.040		628		0.017							
5/27/2008	< 0.010	0.0100	5/27/2008	< 0.020	0.0297	352	545	0.005	0.014						
6/3/2008	< 0.010		6/3/2008	< 0.020		370		0.005							
6/10/2008	< 0.010		6/10/2008	< 0.020		346		0.005							
6/18/2008	< 0.010		6/18/2008	< 0.020		326		0.005							
6/30/2008	< 0.010	0.0100	6/30/2008	< 0.023	0.0208	319	340	0.005	0.005						
7/3/2008	< 0.010		7/3/2008	< 0.033		580		0.005							
7/8/2008	< 0.010		7/8/2008	< 0.032		382		0.005							
7/16/2008	< 0.010		7/16/2008	< 0.020		458		0.005							
7/21/2008	< 0.010		7/21/2008	< 0.020		522		0.005							
7/30/2008	< 0.010	0.0100	7/30/2008	< 0.020	0.0250	289	446	0.005	0.005						

ATTACHMENT 6 MRO Data

For NIPSCO Rollin M. Schahfer Generating Station in Jasper County

DATE	Silver (mg/l)			DATE	Zinc (mg/l)			Sulfate (mg/l)			Cyanide (mg/l)			DATE	Chromium (mg/l)		Mercury (ng/l)		DATE
		Daily	Monthly			Daily	Monthly		Daily	Monthly		Daily	Monthly			Daily	Monthly	Daily	Monthly	
8/6/2008	<	0.010		8/6/2008	<	0.020			476			0.005								
8/13/2008	<	0.010		8/13/2008	<	0.020			482			0.005								
8/22/2008	<	0.010		8/22/2008	<	0.020			502			0.005								
8/25/2008	<	0.010	0.0100	8/25/2008	<	0.020	0.0200		385	461		0.005	0.005							
9/2/2008	<	0.010		9/2/2008	<	0.020			466			0.005								
9/11/2008	<	0.010		9/11/2008	<	0.020			296			0.005								
9/18/2008	<	0.010		9/18/2008	<	0.020			284			0.005								
9/23/2008	<	0.010	0.0100	9/23/2008	<	0.020	0.0200		389	359		0.005	0.005							
10/8/2008	<	0.010		10/8/2008	<	0.020														
10/13/2008	<	0.010		10/13/2008	<	0.020														
10/20/2008	<	0.010		10/20/2008	<	0.020														
10/27/2008	<	0.010	0.0100	10/27/2008	<	0.020	0.0200													

	Silver (mg/l)		Zinc (mg/l)		Sulfate (mg/l)		Cyanide (mg/l)		Chromium (mg/l)		Mercury (ng/l)		
	Daily	Monthly	Daily	Monthly	Daily	Monthly	Daily	Monthly	Daily	Monthly	Daily	Monthly	
COUNT	130	46	130	46	118	44	116	43	77	45	19		COUNT
Average	0.009	0.009	0.050	0.071	427	470	0.006	0.006	0.003	0.003	6.38		Average
Maximum (mg/l)	0.010	0.010	0.300	0.300	872	872	0.019	0.014	0.006	0.004	16.5		Maximum (ng/
Maximum (ug/l)	10	10	300	300	872000	872000	19	14	5.6	3.9	0.0165		Maximum (ug/
Minimum	0.001	0.001	0.005	0.007	255	305	0.005	0.005	0.002	0.001	0.002		Minimum
STDEV	0.003	0.003	0.055	0.072	122	140	0.003	0.002	0.001	0.001	4.20		STDEV
CV	0.4	0.3	1.1	1.0	0.3	0.3	0.4	0.3	0.3	0.2	0.7		CV

ATTACHMENT 7 Permit Renewal Application Data

For NIPSCO Rollin M. Schafer Generating Station in Jasper County

Date	Aluminum, Total (mg/l)	Aluminum, Dissolved (mg/l)	Barium, Total (mg/l)	Boron, Total (mg/l)	Cobalt, Total (mg/l)	Iron, Total (mg/l)	Iron, Dissolved (mg/l)	Magnesium, Total (mg/l)	Molybdenum, Total (mg/l)	Manganese, Total (mg/l)	Tin, Total (mg/l)
February 27, 2007	0.062		0.13	12	0.0018	0.57		74	0.017	0.94	0.00012
June 14, 2007	0.074		0.16	14	0.0014	0.12			0.017	1.1	0.00023
September 13, 2007			0.14	11	0.0006	0.037			0.01	0.54	0.0036
October 16, 2007			0.14	9.8	0.0006	0.088			0.0069	0.72	0.0045
November 16, 2007			0.14	11	0.0006	0.25			0.011	0.75	0.0036
December 13, 2007											
December 15, 2007											
December 19, 2007			0.12	11	0.0006	0.34			0.014	0.59	0.0036
January 11, 2008			0.12	10	0.0006	0.4			0.015	0.55	0.0036
April 30, 2008			0.13	11	0.0006	0.39			0.031	0.86	0.0036
May 15, 2008			0.14	11	0.0006	0.36			0.028	0.88	0.0036
June 11, 2008			0.13	9.7	0.0006	0.12			0.026	0.50	0.0036
July 9, 2008	0.023	0.0096		9.1		0.26	0.041				
August 13, 2008	0.014	0.0035		8.6		0.096	0.021				
September 10, 2008	0.0061	0.0035		13		0.10	0.021				
October 17, 2008	0.0170	0.0053		7.5		0.28	0.13				
November 19, 2008	0.0180	0.0045		6.7		0.30	0.11				

	Aluminum, Total (mg/l)	Aluminum, Dissolved (mg/l)	Barium, Total (mg/l)	Boron, Total (mg/l)	Cobalt, Total (mg/l)	Iron, Total (mg/l)	Iron, Dissolved (mg/l)	Magnesium, Total (mg/l)	Molybdenum, Total (mg/l)	Manganese, Total (mg/l)	Tin, Total (mg/l)
COUNT	7	5	10	15	10	15	5	1	10	10	10
Average	0.031	0.005	0.135	10.360	0.0008	0.247	0.065	74	0.018	0.743	0.003
Maximum (mg/l)	0.074	0.010	0.160	14.000	0.0018	0.570	0.130	74	0.031	1.100	0.005
Maximum (ug/l)	74	10	160	14000	1.8	570	130	74000	31	1100	4.5
Minimum	0.006	0.004	0.120	6.700	0.001	0.037	0.021	74	0.007	0.500	0.000
STDEV	0.026	0.003	0.012	1.929	0.000	0.151	0.052		0.008	0.200	0.002
CV	0.6	0.6	0.1	0.2	0.5	0.6	0.6	0.6	0.5	0.3	0.5

ATTACHMENT 7 Permit Renewal Application Data

For NIPSCO Rollin M. Schafer Generating Station in Jasper County

Date	Titanium, Total (mg/l)	Antimony, Total (mg/l)	Arsenic, Total (mg/l)	Beryllium, Total (mg/l)	Cadmium, Total (mg/l)	Copper, Total (mg/l)	Copper, Dissolved (mg/l)	Lead, Total (mg/l)	Nickel, Total (mg/l)	Selenium, Total (mg/l)	Thallium, Total (mg/l)
February 27, 2007	0.0042	0.0024	0.0019	0.000053	0.000055	0.0094		0.0004	0.022	0.017	0.000037
June 14, 2007	0.0013	0.00056	0.0018	0.000053	0.000055	0.010		0.0002	0.016	0.012	0.00014
September 13, 2007	0.0057	0.0077	0.0025	0.00014	0.0003	0.028		0.020	0.012	0.0078	0.0043
October 16, 2007	0.0057	0.0077	0.005	0.00014	0.0007	0.022		0.0026	0.015	0.018	0.0043
November 16, 2007	0.0057	0.0077	0.0025	0.00014	0.0026	0.022		0.0035	0.016	0.014	0.0043
December 13, 2007											
December 15, 2007											
December 19, 2007	0.0057	0.0077	0.0025	0.00014	0.0003	0.018		0.012	0.018	0.019	0.0043
January 11, 2008	0.0057	0.0077	0.0025	0.00014	0.0012	0.022		0.0025	0.027	0.0053	0.0043
April 30, 2008	0.0057	0.0077	0.0088	0.00014	0.0003	0.025		0.0025	0.022	0.0053	0.0043
May 15, 2008	0.0057	0.0079	0.0025	0.00014	0.0003	0.017		0.0036	0.021	0.0089	0.0043
June 11, 2008	0.0057	0.0077	0.010	0.00014	0.0003	0.016		0.0075	0.0085	0.0053	0.015
July 9, 2008			0.0059	**Cu - value considerd as an outlier wrt to Cu (Dissolved), is not used in the analysis.**		**Total Cu = 0.17**	**0.015**			0.0054	
August 13, 2008			0.0044			0.016	0.00011			0.0061	
September 10, 2008			0.0053			0.015	0.013			0.010	
October 17, 2008			0.0034			0.012	0.01			0.0069	
November 19, 2008			0.0048			0.018	0.015			0.017	

	Titanium, Total (mg/l)	Antimony, Total (mg/l)	Arsenic, Total (mg/l)	Beryllium, Total (mg/l)	Cadmium, Total (mg/l)	Copper, Total (mg/l)	Copper, Dissolved (mg/l)	Lead, Total (mg/l)	Nickel, Total (mg/l)	Selenium, Total (mg/l)	Thallium, Total (mg/l)
COUNT	10	10	15	10	10	14	5	10	10	15	10
Average	0.005	0.006	0.004	0.00012	0.001	0.018	0.011	0.005	0.018	0.011	0.005
Maximum (mg/l)	0.006	0.008	0.010	0.00014	0.003	0.028	0.015	0.020	0.027	0.019	0.015
Maximum (ug/l)	5.7	7.9	10	0.14000	2.6	28	15	20	27	19	15
Minimum	0.001	0.001	0.002	0.00005	0.000	0.009	0.000	0.000	0.009	0.005	0.000
STDEV	0.001	0.003	0.002	0.00004	0.001	0.005	0.006	0.006	0.005	0.005	0.004
CV	0.3	0.4	0.6	0.3	1.3	0.3	0.6	1.1	0.3	0.5	0.9

ATTACHMENT 8

Reasonable Potential Statistical Procedure for Discharges in the Non-Great Lakes System (Excluding Discharges to the Ohio River)

Facility Name: NIPSCO Rollin M. Schahfer Generating St
NPDES Number: IN0053201
WLA Number: 001668
WLA Report Date: 6/18/2009
Outfall: 001
Receiving Stream: Kankakee River

		Monthly Average Determination							Daily Maximum Determination						
Parameters	Reasonable Potential to Exceed? (Yes or No)*	Maximum Monthly Average (ug/l)	Number of Monthly Averages	CV	MF	PEQ (ug/l)	PEL (ug/l)	PEQ > PEL?	Maximum Daily Sample (ug/l)	Number of Daily Samples	CV	MF	PEQ (ug/l)	PEL (ug/l)	PEQ > PEL?
Aluminum	No					150	170	No	74	7	0.6	2	150	290	No
Antimony	No					12	430	No	7.9	10	0.4	1.5	12	730	No
Arsenic III	No					15	490	No	10	15	0.6	1.5	15	720	No
Barium	No					180	6200	No	160	10	0.1	1.1	180	9100	No
Beryllium	No					0.18	11	No	0.14	10	0.3	1.3	0.18	26	No
Cadmium	No					7	14	No	2.6	10	1.3	2.7	7	22	No
Total Chromium	No	3.9	45	0.2	1	3.9	3000	No	5.6	77	0.3	1	5.6	5000	No
Cobalt	No					2.9	100	No	1.8	10	0.5	1.6	2.9	160	No
Copper	No					36	76	No	28	14	0.3	1.3	36	110	No
Iron	No					860	3800	No	570	15	0.6	1.5	860	5500	No
Lead	No					48	78	No	20	10	1.1	2.4	48	130	No
Manganese	No					1400	4500	No	1100	10	0.3	1.3	1400	6600	No
Mercury	Yes I					0.025	0.012	Yes	0.0165	19	0.7	1.5	0.025	0.02	Yes
Molybdenum	No					50	20000	No	31	10	0.5	1.6	50	34000	No
Nickel	No					35	530	No	22	10	0.3	1.3	35	1300	No
Selenium	No					27	180	No	19	15	0.5	1.4	27	260	No
Silver	No	10	46	0.3	1	10	16	No	10	130	0.4	0.9	9	33	No
Thallium	No					33	120	No	15	10	0.9	2.2	33	170	No
Tin	No					7.2	940	No	4.5	10	0.5	1.6	7.2	1500	No
Titanium	No					7.4	15000	No	5.7	10	0.3	1.3	7.4	22000	No
Zinc	No	300	46	1	1.1	330	330	No	300	130	1.1	0.8	240	650	No
Boron	No					17000	41000	No	14000	15	0.2	1.2	17000	60000	No
Cyanide, Free	No	14	43	0.3	1	14	22	No	19	116	0.4	0.9	17	44	No
Cyanide, Total	No	14	43	0.3	1	14	259000	No	19	116	0.4	0.9	17	630000	No
Sulfite	No	872000	44	0.3	1	872000	9600000	No	872000	118	0.3	0.9	785000	17000000	No

* Reasonable Potential to Exceed:

1) "Yes I" means that a projected effluent quality (PEQ) exceeded a preliminary effluent limitation (PEL) based on a Tier I criterion.
2) "Yes II" means that a PEQ exceeded a PEL based on a Tier II criterion.
3) "Yes SSC" means that a PEQ exceeded a PEL based on a site-specific criterion.
4) "No" means that a PEQ did not exceed a PEL.
5) "Evaluate Criteria" means that a PEQ exceeded a PEL based on a screening value.

Attachment C:

COOLING WATER INTAKE STRUCTURE REQUIREMENTS §122.21(R)(2) – (R)(8) 2020 NPDES PERMIT APPLICATION UPDATES

Project name	**NiSource: Schahfer NPDES Permit Renewal Support**
Project no.	**1690015757**
Version	**Original**
Date	**February 28, 2020**
Prepared by	**Ramboll US Corporation**

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1. Introduction

Facility Background

The R. M. Schahfer Generating Station (RMS) is permitted to draw from an intake on the Kankakee River in Wheatfield, Jasper County, Indiana pursuant to National Pollutant Discharge Elimination System (NPDES) Permit No. IN0053201. RMS has four coal-fired boilers (Units 14, 15, 17, and 18) which began operating in 1976 when Unit 14 came online followed by Unit 15 (1979), Unit 17 (1983) and Unit 18 (1986). All four units feature close-cycle cooling via a single multi-cell mechanical draft cooling tower per unit.

Makeup water for the recirculating water system comes from the Kankakee River via Davis Ditch through a single cooling water intake structure (CWIS). The CWIS is located on Davis Ditch approximately two miles north of the plant. Makeup water is drawn through CWIS by a set of three circulating water pumps, each with a capacity of 20,000 gallons per minute (gpm); however, only two of the pumps can be operated together at any one time, thus the maximum Design Intake Flow (DIF) for RMS is approximately 40,000 gpm (57.6 MGD). Nonetheless, the maximum intake flow registered by RMS is 39.0 MGD.

Makeup water is pulled into the service water pump house through a pair of steel bar trash racks then into two separate bays, each containing one traveling screen with stainless steel mesh panels. From the CWIS, makeup water travels via underground pipe to the Intake Basin (IB). Water from the IB is pumped into the plants to be used as cooling tower makeup water, as well as makeup water to the recycle line, and to provide water to the boilers and the Flue-Gas Desulfurization (FGD) equipment. After passing through the plant processes, all water is routed to the Final Setting Basin (FB) located on the north side of the plant. The FB contains a primary outfall to the Kankakee River (Outfall 001) and an emergency outfall to the Davis Ditch.

Regulatory Applicability

The United States Environmental Protection Agency (USEPA) promulgated the Clean Water Act (CWA) Section 316(b) Rule (316(b) Rule) for existing facilities in August 2014, under Title 40 of the Code of the Federal Register (CFR) Parts 122 and 125, as part of the National Pollutant Discharge Elimination System (NPDES) program. Under the 316(b) Rule, which became effective on October 14, 2014, applicable facilities with cooling water intake structures (CWISs) are required to locate, design, and operate their CWIS to minimize adverse environmental impact (AEI) from impingement and entrainment mortality. In accordance with the 316(b) Rule, existing facilities that withdraw greater than a Design Intake Flow (DIF) of 2 million gallons per day (MGD) of water from "waters of the U.S." and utilize greater than 25 percent of the water withdrawn for cooling purposes are subject to the rule requirements under the NPDES Permit Program.

As per 40 CFR 122.21(r)(1)(ii), existing facilities are required to provide cooling water intake information to the regulatory authority related to the intake and source water. As an existing facility with surface water intakes withdrawing greater than 2 MGD based on cumulative design intake flow, but withdrawing less than 125 MGD based on cumulative actual intake flow, and more than 25 percent of the actual intake flow used exclusively for cooling purposes, RMS must address the required information published in 40 CFR Part 122.21(r)(2) through (r)(8). Corresponding federal regulation citations include:

- Physical Information for Source Water (§122.21(r)(2))
- Physical description of CWIS (§122.21(r)(3))
- Biological Information for Source Water (§122.21(r)(4))

- Cooling Water System Data (§122.21(r)(5))
- Impingement Mortality BTA Demonstration (§122.21(r)(6))
- Entrainment Performance Studies (§122.21(r)(7))
- Operational Status (§122.21(r)(8))

Pursuant to 40 CFR 125.95(a)(1), existing facilities whose currently effective permit expires after July 14, 2018 are required to submit the information required in applicable sections of 40 CFR 122.21(r) when applying for a subsequent permit. This information was originally submitted to the Indiana Department of Environmental Management (IDEM) in March 2015 in the report titled "Schahfer Generating Station NPDES Permit Application Submittal Requirements §122.21(r)(2) – (r)(8)" authored by Golder Associates, Inc (referred to herein as the March 2015 CWIS Report).

After the initial submission of the 40 CFR 122.21(r) permit application studies, the permittee may request to reduce the information required, if conditions at the facility and in the waterbody remain substantially unchanged since the previous application so long as the relevant previously submitted information remains representative of current source water, intake structure, cooling water system, and operating conditions. Per federal regulations detailed in 40 CFR 125.94(c), the owner or operator of a facility is required to submit its request for reduced cooling water intake structure and waterbody application information to the Director at least two years and six months prior to the expiration of its NPDES permit. RMS did not request reduced application information, however based on technical review select conditions detailed in the March 2015 CWIS Report continue to be substantially unchanged. This short form report serves as a supplement to the March 2015 CWIS Report (included as Appendix 1) and provides updates for applicable conditions.

2. Source Water Physical Data [40 CFR §122.21(r)(2)]

The description and water quality regime of the Kankakee River has not been modified since the March 2015 CWIS Report. See Appendix 1, Section 2.

3. Cooling water Intake Structure Data [40 CFR §122.21(r)(3)]

The cooling water intake structure configuration has not been modified since the March 2015 CWIS Report. See Appendix 1, Section 3.

4. Source Water baseline Biological Characterization Data [40 CFR §122.21(r)(4)]

No previous impingement or entrainment studies have been performed at RMS; therefore, historic plant impingement and entrainment is not available for this section.

To assess substantially changed conditions from the information submitted in the March 2015 CWIS Report, Ramboll conducted a review of publicly-available information from published and online sources. Rule guidance documents, including the U.S. Fish and Wildlife Service (USFWS)/National Marine Fisheries Service (NMFS) Biological Opinion, as well as USEPA and USFWS online resources/databases, were utilized to guide this data search.

The extensive electrofishing surveys within Indiana portions of the main branch of the Kankakee performed by Price and Robertson.[1] in 2001 continues to be the most recent, representative reference of species and relative abundance in the vicinity of the cooling water intake structure.

Since March 2015 CWIS Report, the Indiana Department of Natural Resources (IDNR) has updated the available Endangered, Threatened and Rare Species list. This list has been expanded from the March 2015 CWIS Report to include Jasper and neighboring counties, La Porte and Porter.

Table 1. Threatened and Endangered (T&E) Species with Potential to Impact [A]

County	Aquatic Life	Species Name	Common Name	T&E Status [B]
La Porte	Mussel	Lymnaea stagnalis	Swamp Lymnaea	SSC
Jasper / Porter	Mussel	Plethobasus cyphyus	Sheepnose	LE, SE
Porter	Mussel	Venustaconcha ellipsiformis	Ellipse	SSC
La Porte / Porter	Fish	Acipenser fulvescens	Lake Sturgeon	SE
La Porte	Fish	Ichthyomyzon fossor	Northern Brook Lamprey	SE
Jasper / La Porte	Fish	Moxostoma valenciennesi	Greater Redhorse	SE
La Porte/ Porter	Fish	Rhinichthys cataractae	Longnose Dace	SSC
La Porte	Amphibian	Acris blanchardi	Blanchard's Cricket Frog	SSC
Jasper / Porter	Amphibian	Ambystoma laterale	Blue-spotted Salamander	SSC
Jasper	Amphibian	Cryptobranchus alleganiensis	Eastern Hellbender	SE
La Porte / Porter	Amphibian	Hemidactylium scutatum	Four-toed Salamander	SSC
Jasper	Amphibian	Lithobates blairi	Plains Leopard Frog	SE
La Porte / Porter	Amphibian	Necturus maculosus	Common mudpuppy	SSC

NOTES:
(A): Indiana Department of Natural Resources (May 9, 2019): County Endangered, Threatened and Rare Species List (Jasper, La Porte, and Porter County): https://www.in.gov/dnr/naturepreserve/4666.htm
(B): LE: Federally Endangered; SE: State Endangers; SSC: State Special Concern

5. Cooling Water System Data [40 CFR §122.21(r)(5)]

The RMS operates a recirculating water closed-cycle cooling system, only withdrawing water from the Kankakee River as makeup water, with a maximum intake of 39 MGD. For the period 2008 through 2014, average daily intake flow was 26.2 MGD (Table 2).

The actual intake volumes associated with the RMS CWIS are reported annually to the Indiana Department of Natural Resources (IDNR) as a Significant Water Withdrawal Facility (SWWF). Surface water withdrawal rates are identified under Registration No. 37-01145-EP as Intake 1. Monthly intake volumes from 2016, 2017, and 2018 are summarized in Table 1.

[1] Price and Robertson. 2005. Fishery, Habitat, and Recreational Use Surveys for the Kankakee River, Indiana. Indiana Department of Natural Resources – Division of Fish and Wildlife Final Report – Workplans #200766, #202766. 31 pp.

Table 2. RMS Intake Volume

Month/Year	Day per Month	Intake Volume (1,000 gals per month)	Average Intake Volume (MGD)	Annual Average
Jan-15	31	636401	20.53	
Feb-15	28	644517	23.02	
Mar-15	31	500451	16.14	
Apr-15	30	602534	20.08	
May-15	31	570162	18.39	
Jun-15	30	753237	25.11	22.03 (2015)
Jul-15	31	1047509	33.79	
Aug-15	31	1006353	32.46	
Sep-15	30	913923	30.46	
Oct-15	31	594264	19.17	
Nov-15	30	451809	15.06	
Dec-15	31	313880	10.13	
Jan-16	31	308880	9.96	
Feb-16	29	466810	16.10	
Mar-16	31	362980	11.71	
Apr-16	30	379320	12.64	
May-16	31	700840	22.61	
Jun-16	30	725590	24.19	18.79 (2016)
Jul-16	31	817933	26.38	
Aug-16	31	468780	15.12	
Sep-16	30	831340	27.71	
Oct-16	31	735230	23.72	
Nov-16	30	614620	20.49	
Dec-16	31	459200	14.81	
Jan-17	31	643062	20.74	
Feb-17	28	578302	20.65	
Mar-17	31	648458	20.92	
Apr-17	30	725041	24.17	
May-17	31	623927	20.13	
Jun-17	30	666956	22.23	20.26 (2017)
Jul-17	31	973910	31.42	
Aug-17	31	786027	25.36	
Sep-17	30	491610	16.39	
Oct-17	31	303430	9.79	
Nov-17	30	488651	16.29	
Dec-17	31	466239	15.04	
Jan-18	31	653358	21.08	
Feb-18	28	439007	15.68	24.56 (2018)
Mar-18	31	464079	14.97	

Month/Year	Day per Month	Intake Volume (1,000 gals per month)	Average Intake Volume (MGD)	Annual Average
Apr-18	30	565346	18.84	
May-18	31	767792	24.77	
Jun-18	30	932382	31.08	
Jul-18	31	1010795	32.61	
Aug-18	31	1081148	34.88	
Sep-18	30	865822	28.86	
Oct-18	31	724876	23.38	
Nov-18	30	715841	23.86	
Dec-18	31	766261	24.72	
Jan-19	31	669582	21.60	
Feb-19	28	463301	16.55	
Mar-19	31	813127	26.23	
Apr-19	30	665709	22.19	
May-19	31	866541	27.95	
Jun-19	30	703959	23.47	22.93 (2019)
Jul-19	31	665828	21.48	
Aug-19	31	884732	28.54	
Sep-19	30	838733	27.96	
Oct-19	31	692020	22.32	
Nov-19	30	543954	18.13	
Dec-19	31	582696	18.80	

The actual intake flow (AIF) is defined as the average volume of water withdrawn on an annual basis by the cooling water intake structures over the past three years. The maximum observed intake flow and AIF are summarized in Table 2 below with the corresponding through-screen velocity (TSV).

Table 3. Calculated TSV

Design Intake Flow, MGD =	**39.00**	**TSV @ DIF, fps =**	**0.39**
Actual Intake Flow (2015-2017), MGD =	20.36	**TSV @ 2017 AIF, fps =**	0.20
Actual Intake Flow (2016-2018), MGD =	21.20	**TSV @ 2018 AIF, fps =**	0.21
Actual Intake Flow (2017-2019), MGD =	22.58	**TSV @ 2019 AIF, fps =**	0.23

6. Chosen Method of Compliance with Impingement Mortality Standard [40 CFR §122.21(r)(6)]

The RMS will continue to comply with the Impingement Mortality Standard by maintaining an AIF of less than 0.50 fps. Compliance monitoring will continue via monitoring and reporting daily intake flow.

7. Entrainment Performance Studies [40 CFR §122.21(r)(7)]

No entrainment performance studies have been conducted at RMS.

8. Operational Status [40 CFR §122.21(r)(8)]

RMS is equipped with four coal-fired base-load units and two gas-fired simple cycle peaking units that came on-line over an 11-year period ending in 1986. Individual unit characteristics from the 2018 NIPSCO Integrated Resource Plan (IRP) are shown in Table 3.

Table 4 RMS Individual Unit Characteristics

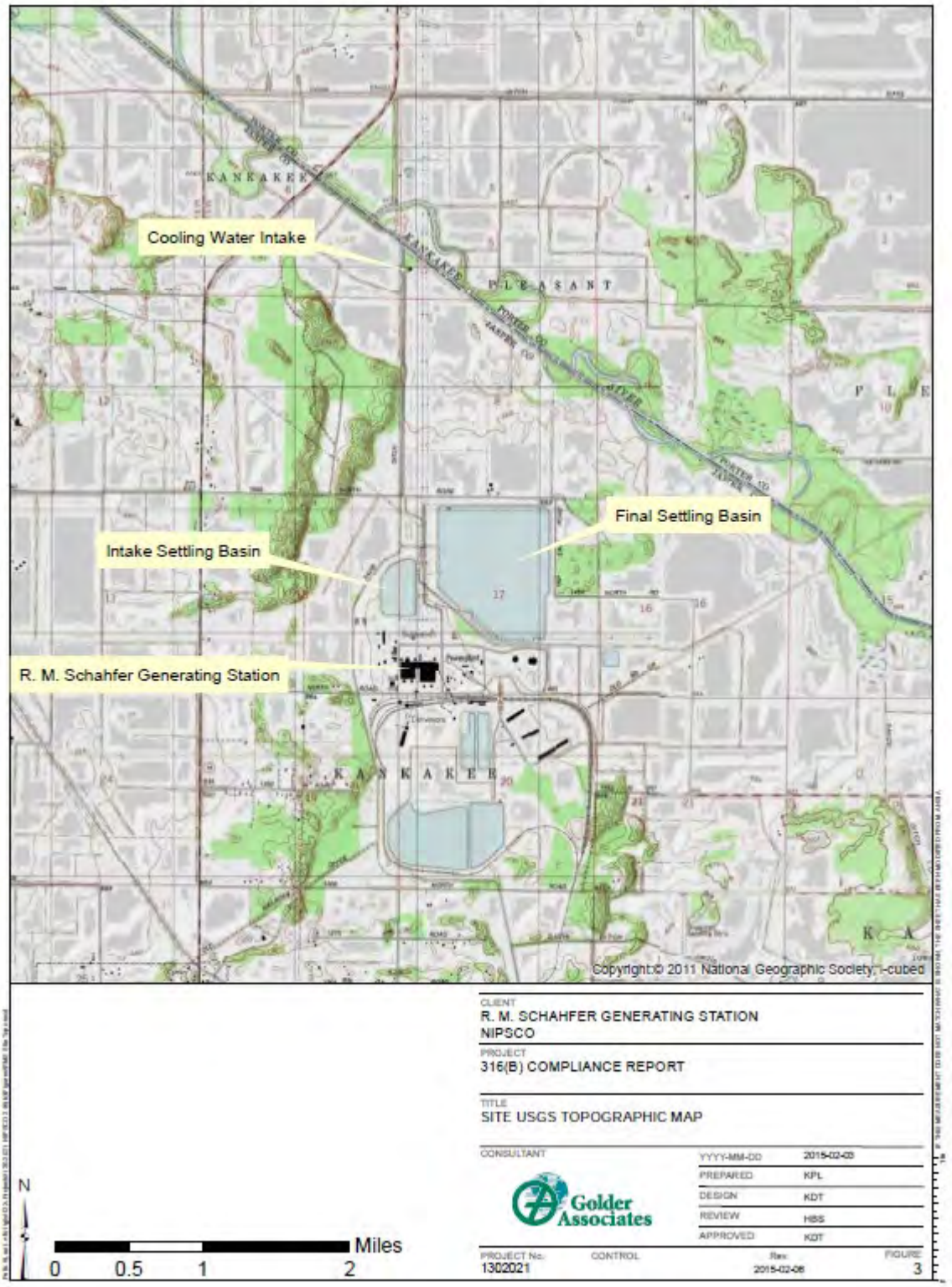
	Unit 14	Unit 15	Unit 17	Unit 18	Unit 16A	Unit 16B
NET Output						
Min (MW)	290	250	125	125	----	----
Max (MW)	431	472	361	361	78	77
Boiler	Babcock & Wilcox	Foster Wheeler	Combustion Engineering	Combustion Engineering	----	----
Burners	10 Cyclone	6 Pulverizers	6 Pulverizers	6 Pulverizers	----	----
Main Fuel	Coal	Coal	Coal	Coal	Gas	Gas
Turbine	Westinghouse	General Electric	Westinghouse	Westinghouse	Westinghouse	Westinghouse
Frame	BB44R	G2	BB243	BB243	D501	D501
In-Service	1976	1979	1983	1986	1979	1979

The 2018 IRP identified the preferred retire path which included the retirements of Schahfer Units 14, 15, 17, 18. NIPSCO's short term action plan covering the period 2019 to 2022 is focused mainly on initiating the planning process for the retirement of the Schahfer 14, 15, 17, 18 units and beginning the procurement of replacement resources. In this period, NIPSCO will make the required notifications to MISO, NERC and other relevant organizations of its intention to retire the Schahfer coal units by the end of 2023. NIPSCO will also identify and implement reliability and transmission upgrades resulting from the retirements of the units.

Attachment D: Aerial View of CWIS



Attachment E: Topographic Map of CWIS



STATE OF INDIANA
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
PUBLIC NOTICE NO. 20200924 – IN0053201
DATE OF NOTICE: SEPTEMBER 24, 2020

The Office of Water Quality issues the following NPDES FINAL PERMIT.

MAJOR– RENEWAL

NIPSCO R.M. SCHAHFER GENERATING STATION, Permit No. IN0053201 JASPER COUNTY, 2723 E. 1500 N., Wheatfield, IN. This industrial facility discharges 0.5 million gallons daily of sanitary, stormwater, process and non-process wastewater to Kankakee River. Permit Manager: Trisha Williams, 317/234-8210, twilliam@idem.in.gov.

Notice of Right to Administrative Review [Permits]

If you wish to challenge this Permit, you must file a Petition for Administrative Review with the Office of Environmental Adjudication (OEA), and serve a copy of the Petition upon IDEM. The requirements for filing a Petition for Administrative Review are found in IC 4-21.5-3-7, IC 13-15-6-1 and 315 IAC 1-3-2. A summary of the requirements of these laws is provided below.

A Petition for Administrative Review must be filed with the Office of Environmental Adjudication (OEA) within fifteen (15) days of the issuance of this notice (eighteen (18) days if you received this notice by U.S. Mail), and a copy must be served upon IDEM. Addresses are:

Director
Office of Environmental Adjudication
Indiana Government Center North
100 North Senate Avenue - Room N103
Indianapolis, Indiana 46204

Commissioner
Indiana Department of Environmental Management
Indiana Government Center North
100 North Senate Avenue - Room 1301
Indianapolis, Indiana 46204

The Petition must contain the following information:

1. The name, address and telephone number of each petitioner.
2. A description of each petitioner's interest in the Permit.
3. A statement of facts demonstrating that each petitioner is:
    a. a person to whom the order is directed;
    b. aggrieved or adversely affected by the Permit;
    c. entitled to administrative review under any law.
4. The reasons for the request for administrative review.
5. The particular legal issues proposed for review.
6. The alleged environmental concerns or technical deficiencies of the Permit.
7. The Permit terms and conditions that the petitioner believes would be appropriate and would comply with the law.
8. The identity of any persons represented by the petitioner.
9. The identity of the person against whom administrative review is sought.
10. A copy of the Permit that is the basis of the petition.
11. A statement identifying petitioner's attorney or other representative, if any.

Failure to meet the requirements of the law with respect to a Petition for Administrative Review may result in a waiver of your right to seek administrative review of the Permit. Examples are:

1. Failure to file a Petition by the applicable deadline;
2. Failure to serve a copy of the Petition upon IDEM when it is filed; or
3. Failure to include the information required by law.

If you seek to have a Permit stayed during the Administrative Review, you may need to file a Petition for a Stay of Effectiveness. The specific requirements for such a Petition can be found in 315 IAC 1-3-2 and 315 IAC 1-3-2.1.
Pursuant to IC 4-21.5-3-17, OEA will provide all parties with Notice of any pre-hearing conferences, preliminary hearings, hearings, stays, or orders disposing of the review of this action. If you are entitled to Notice under IC 4-21.5-3-5(b) and would like to obtain notices of any pre-hearing conferences, preliminary hearings, hearings, stays, or orders disposing of the review of this action without intervening in the proceeding you must submit a written request to OEA at the address above.
More information on the appeal review process is available on the website for the Office of Environmental Adjudication at http://www.in.gov/oea.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF: WP-16J

September 15, 2020

Nikki Gardner, Section Chief
Industrial NPDES Permits
Office of Water Quality
Indiana Department of Environmental Management
100 North Senate Avenue
Indianapolis, IN 46204-2251

Re: Review of NPDES Permit, NIPSCO R.M. Schahfer Generating Station, Wheatfield, IN (IN0053201)

Dear Ms. Gardner:

The U.S. Environmental Protection Agency has reviewed the proposed National Pollutant Discharge Elimination System Permit (permit), fact sheet, and supporting documents for the NIPSCO R.M. Schahfer Generating Station, that was submitted to EPA on September 14, 2020. Based on our review of the permit, EPA has no objections and the permit may be issued in accordance with the Memorandum of Agreement and pursuant to the Clean Water Act. The Region reserves the right to object to any other permit changes that have not been identified by IDEM or to any further permit changes that might occur prior to issuance of the final permit. The Region must be notified of any further changes made to the permit before finalization.

When the final permit is issued, please forward a copy to this office at r5NPDES.gov. Please include the permittee name and permit number in the Subject line and cc: Ackerman.Mark@epa.gov, and Rosenberg.Kathryn@epa.gov. If you have any technical questions related to EPA's review, please contact Mark Ackerman at 312-353-4145 or Ackerman.Mark@epa.gov, and Kathryn Rosenberg at 312-886-6774 or Rosenberg.Kathryn@epa.gov.

Thank you for your cooperation during the review process and your thoughtful consideration of our comments.

Sincerely,

for
Stephen M. Jann, Chief
Permits Branch, Water Division

cc: Trisha Williams, Permit Writer, IDEM, electronically

bc: Andrea Schaller, Chief, Section 1
Mark Ackerman, Environmental Engineer, Section 2
Kathryn Rosenberg, Environmental Scientist, Section 1

https://usepa.sharepoint.com/sites/R5/wd/NPDES/RealTimeRvws/Reviews/IN0053201_Review/IN0053201_NIPSCO R M Schahfer Generating Station_PropPerLtr_20200915.docx

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NIPSCO

September 4, 2020

Ms. Trisha Williams
Indiana Department of Environmental Management
Office of Water Quality / Industrial Permits Section, MC 65-42
100 North Senate Avenue
Indianapolis, IN 46204-2251

RE: **NPDES Draft Permit**
Public Notice No. 20200805 – IN0053201 – D
Permit No. IN0053201
NIPSCO – R. M. Schahfer Generating Station
Wheatfield, Indiana, Jasper County

Ms. Williams:

The Northern Indiana Public Service Company LLC (NIPSCO) is submitting the enclosed comments for your consideration.

Thank you for your assistance in this matter. If you have any questions or require additional information, please do not hesitate to contact me at jloewe@nisource.com or 219-647-5249.

Sincerely,

Jeffrey M. Loewe
Principal
NiSource Environmental

ENCLOSURES
1. Comment, three (3) pages

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IDEM/OWQ

Part I.A.1, Table 1, Intake Flow – NIPSCO requests removal of the daily maximum limit of 39 MGD for Intake Flow. While our 2015 316(b) report as well as our current NPDES permit renewal application identify 39 MGD as the maximum observed intake flow, NIPSCO believes it is inappropriate to limit the intake flow to a daily volume which corresponds to a calculated through screen velocity (TSV) of less than the maximum allowable (i.e. 0.39 fps versus <0.5 fps). Intake values up to 50 MGD correlate to a TSV less than 0.5 fps (i.e. 0.4988 fps) and remain compliant with the impingement BTA standard. As an alternative to a numerical limit, the daily maximum Intake Flow can be designated as "Report". In addition to this requested change for Part I.A.1 Table 1, the same request applies to Part IV.B.7 as well and should also be revised to allow a maximum of 50 MGD intake volume.

Parts I.A.1 and I.A.3 – In light of the August 31, 2020 pre-publication notice of the final Steam Electric Reconsideration Rule ("final Rule") applicable to the Federal Effluent Limits Guidelines (ELGs) at 40 CFR 423 for flue gas desulfurization (FGD) and bottom ash (BA) transport discharges, NIPSCO acknowledges that IDEM may choose to revise certain sections of the draft permit. Under the final Rule, the facility meets the definition of a facility that will cease combustion of coal no later than December 31, 2028 (40 CFR 423.11(w)). As such, once the rule is published and officially effective, the only applicable best available technology economically achievable (BAT) ELGs for both FGD wastewater and bottom ash transport wastewater (40 CFR 432.13(g)(2)(i)) and 40 CFR 432.13(g)(2)(i)), respectively) are those for Total Suspended Solids (TSS) and Oil & Grease (O&G).

Note: the applicable best practicable control technology currently available (BPT) ELGs under 40 CFR 423.12 for TSS and Oil & Grease and these wastewaters remain unchanged.

Provided the timing of the final Rule aligns with IDEM's schedule of permit reissuance, NIPSCO requests the following three draft permit revisions be considered:

1. Part I.A.1., Footnote 19 – should be modified to also address bottom ash transport wastewater. NIPSCO offers the following suggested revised verbiage:

   In the event that wastestreams from various sources are combined for treatment or discharge, the quantity of each pollutant or pollutant property attributable to each controlled waste source shall not exceed the specified limitation for that waste source.

   In lieu of establishing new internal outfalls for low volume waste and bottom ash wastewater, should the permittee require a permit to continue operations beyond December 31, 2023, the permittee must submit an evaluation of alternate limitations for TSS and Oil & Grease developed using the combine wastestream formula (CWF), modified CWF, or building block approach and provide supporting documentation.

2. Part I.A.1., Footnote 20 – "The permittee shall comply with the requirements of the effluent limitation guidelines for Steam Electric Generating Stations, 40 CFR 423.13(k)(1)(i), for bottom ash transport water by December 31, 2023." should be removed, as it is no longer valid in the final Rule.

3. Part I.A.3. – The interim and final requirements/limits for arsenic, mercury, selenium, and nitrate/nitrite (as well as Footnotes [2], [4], and [5]) should be removed for both current Outfall 201 and proposed new Outfall 301.

Part I.A.3, Outfall 301 – If IDEM decides not to address the final Rule at this time (as requested above) then NIPSCO requests the following permit revisions for Part I.A.3 be implemented into the renewed permit. Moreover, to provide clarity NIPSCO requests the suggested verbiage provided below in comment to Part 1.F.6, IDEM decides not to address the final Rule at this time.

> The limits and monitoring requirements in this table apply to both Outfall 201 and Outfall 301. However, Outfall 301 is a new outfall and there is currently no flow metering or sample collection infrastructure in place to assess parameter concentrations or effluent discharge flowrate. Additionally, the Unit 17/18 FGD wastewater currently comingles with other wastewaters and, therefore, an isolated, representative sampling port for Outfall 301 compliance assessment is necessary and may require significant re-piping to isolate this discharge. As such, NIPSCO requests a 3-year compliance schedule to design, procure, install, and debug the necessary power supply and equipment to properly monitor the required parameters at Outfall 301 as well as to properly segregate Unit 17/18 FGD wastewater from other sources at the new outfall location. Further, for the new Outfall 301 (only), monitoring for all parameters should not be required during the three year compliance schedule. After the compliance schedule expires, the numerical limitations for TSS and O&G would become effective when the Outfall 301 sampling equipment is properly configured and operational. Monitoring for all other parameters (i.e., "Report") would also resume at this time. Ultimately, the limits for arsenic, mercury, selenium, and NO2+NO3 established under 40 CFR 423.13(g)(1)(i) shall apply no later than December 31, 2023 for both Outfalls 201 and 301.

Part I.A.3, Mercury – NIPSCO requests that the monitoring frequency for Mercury be reduced from 2 X Monthly to 6 X Yearly. The 6 X Yearly frequency is consistent with the existing permit for Outfall 201, as well as this draft permit for Outfall 001. IDEM has presented no specific rationale in the Fact Sheet for increasing the monitoring frequency of Mercury. NIPSCO respectfully requests the rationale should the frequency remain as proposed.

Part I.A.4 – In the Draft Permit, NIPSCO believes IDEM has erroneously removed the reference to stormwater Outfall 005S and Outfall 006S in the introductory description as well as removed Footnote [5] in its entirety. Both references to outfalls 005S and 006S were in the July 6, 2020 Pre-public notice draft permit as well as the existing permit. These two outfalls still exist and continue to discharge. Accordingly, NIPSCO requests they be reinserted into this section with the acknowledgment that they are representatively sampled at Outfall 004. This request does not change any of the compliance requirements of the existing permit.

Part I.B.1 – NIPSCO requests the renewed permit retain the verbiage in the current permit. While the proposed verbiage is largely a simple restructuring from the current permit, the rewording for this section does change the meaning. The current permit verbiage addresses "the discharge not causing receiving waters to contain.." whereas the proposed verbiage focuses on the discharge itself as being free from substances, materials, floating debris, etc.

Part I.C.2 – Page 15 of 58 (beginning of page through section f) is redundant with the verbiage on page 14 of 58 and should be deleted. NIPSCO believes to be an editorial oversight and removing the verbiage will result in zero effect to the requirements within the permit.

Part I.C.2.b – NIPSCO requests this section be revised to state that an "approved statistical method" includes replacing values reported as <LOQ with 0 (zero) when calculating monthly averages for concentration. This technique is consistent with the provisions given in the current permit.

Part I.C.4 – NIPSCO requests "or the most recently approved version of 40 CFR 136." be added to the end of the first sentence in this section. The 327 IAC 5 reference (327 IAC 5-2-1.5 Incorporation by reference) does not specify a version of 40 CFR 136. However, 327 IAC 1 (specifically 1-1-2 References to the CFR) indicates that the CFR is the July 1, 2016 edition. NIPSCO believes not including the requested revision could potentially be problematic if there is a situation to use more recently approved methods.

Part I.F.6 – NIPSCO requests this section be revised to include the following or similar verbiage "This provision also allows the permittee to request appropriate permit modifications applicable from any newly promulgated Federal Effluent Limitation Guidelines for Steam Electric Generating Stations under 40 CFR 423."

----- END OF COMMENTS -----

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:
WP-16J

August 5, 2020

Nikki Gardner, Section Chief
Industrial NPDES Permits
Office of Water Quality
Indiana Department of Environmental Management
100 North Senate Avenue
Indianapolis, IN 46204-2251

Re: Review of the Pre-Public Notice Draft of NPDES Permit No. IN0053201, for the NIPSCO R.M. Schahfer Generating Station, Wheatfield, IN

Dear Ms. Gardner:

The U.S. Environmental Protection Agency has reviewed the pre-public notice draft National Pollutant Discharge Elimination System Permit (Permit), fact sheet, and supporting documents for the NIPSCO R.M. Schahfer Generating Station Permit No. IN0053201, that was submitted to EPA on July 6th, 2020. Based on our review to date, EPA would not object to issuance of that permit. However, our position could change if any of the following occurs:

a. Prior to the actual date of issuance of a Proposed Permit, an effluent guideline or standard is promulgated which is applicable to the permit and which would require revision or modification of a limitation or condition set forth in the Draft Permit;

b. A variance is granted and the Permit is modified to incorporate the results of that variance;

c. There are additional revisions to be incorporated into the Permit which have not been agreed to by EPA; or

d. EPA learns of new information, including as the result of public comments, that causes EPA to reconsider its position.

Subject to the above conditions, the permit may be issued in accordance with the Memorandum of Agreement and pursuant to the Clean Water Act. Although we currently do not intend to object, EPA recommends you consider and address the comments identified in Enclosure A in order to improve the overall permit.[1]

1 All cited federal regulations are made applicable to states by 33 U.S.C. §§ 1314(i) and 1342(c)(2) and 40 C.F.R. § 123.25.

When the Proposed Permit is prepared, please forward one copy and any significant comments received during any public notice period to this office at r5NPDES.gov. Please include the Permittee name and permit number in the Subject line and cc: Ackerman.Mark@epa.gov, and Rosenberg.Kathryn@epa.gov. If you have any technical questions related to EPA's review, please contact Mark Ackerman at 312-353-4145 or Ackerman.Mark@epa.gov; and Kathryn Rosenberg at 312-886-6774 or Rosenberg.Kathryn@epa.gov.

Thank you for your cooperation during the review process and your thoughtful consideration of our comments.

Sincerely,

for Stephen M. Jann, Chief
Permits Branch, Water Division

Enclosure

cc: Trisha Williams, Permit Writer, IDEM, electronically

Enclosure A

U.S. Environmental Protection Agency
NPDES Permit Received July 6th, 2020
Draft NPDES Permit Dated October 1st, 2020
NIPSCO R.M. Schahfer Generating Facility
NPDES Permit No. IN0053201

Please consider the following comments to clarify and improve the fact sheet and proposed permit:

1. Please revise effluent table for Outfall 001/002 to include the monthly average effluent limitation for chromium. Note this is the same as the daily maximum effluent limitation. See 40 C.F.R. 423.13(d)(1).

2. Please revise permit note [20] for the effluent table for Outfall 001/002 to include the regulatory reference (40 C.F.R. 423.13(k)(1)(i)) for the bottom ash transport best available technology economically achievable (BAT) requirements.

3. Page 11 of 58 in the permit includes an authorization to discharge storm water from several outfalls, including 005S, and 006S. However, these two Outfalls are not identified in the list of storm water outfalls with their corresponding latitude/longitude coordinates, nor are they listed in the subsequent monitoring table. Please revise this section of the permit so that it accurately represents the permitted storm water outfalls by either omitting any reference to 005S, and 006S, or revise the section to include the latitude/longitude coordinates for these two outfalls, and list them under the “Discharge Limitations.”

July 20, 2020

Ms. Nicole Gardner
Indiana Department of Environmental Management
Office of Water Quality / Industrial Permits Section, MC 65-42
100 North Senate Avenue
Indianapolis, IN 46204-2251

RE: **Pre-Public Notice Draft Response**
Permit # IN0053201
NIPSCO – R. M. Schahfer Generating Station
Wheatfield, Indiana, Jasper County

Thank you for proving the draft/proposed version of the above-referenced NPDES permit. The Northern Indiana Public Service Company LLC (NIPSCO) is submitting the enclosed comments for your consideration.

Thank you for your assistance in this matter. If you have any questions or require additional information, please do not hesitate to contact me at jloewe@nisource.com or 219-647-5249.

Sincerely,

Jeffrey M. Loewe
Principal
NiSource Environmental

ENCLOSURES
1. Comment, two (2) pages

Part I.A.1 Table 1 – NIPSCO requests removal of the “Report” requirement for Flow and Cycles of Concentration. Coupled with proposed permit Section IV, NIPSCO requests clarification for the new reporting requirements. As addressed in our 2015 316(b) report, our through screen velocity (TSV) calculations indicate 39 MGD (maximum observed intake flow) is equivalent to an intake TSV of 0.39 fps, while a 50 MGD maximum flow remains under the 0.5 fps threshold (0.4988 fps). See further discussion below in response to Part IV.B. items 7-8.

Part I.A.3 – The outfall detail paragraph is missing minutes symbol in the lat/long coordinates for Outfall 002 (The permittee is authorized to discharge from Internal Outfall 201, located at Latitude 41° 13’ 3”, Longitude -87° 1’ 14”.)

Part I.A.3 – Pursuant to the flexibility allowable in the ELG requirements at 423.13(g)(1)(i), NIPSCO requests the permitting authority define the applicability date for the BAT numeric limitations at Outfall 201 as no later than December 31, 2023.

Part I.A.3 – To address the proposed status of Outfall 301, NIPSCO requests a compliance schedule identifying the applicability date for the limitations at Outfall 301 as no later than December 31, 2023.

Part I.B.1 – NIPSCO requests the new permit retain the verbiage in the current permit. While the proposed verbiage is largely a simple restructuring from the current permit, the rewording for this section does change the meaning. The current permit verbiage addresses “the discharge not causing receiving waters to contain..” whereas the proposed verbiage focuses on the discharge itself as being free from substances, materials, floating debris, etc.

Part I.C.1 – NIPSCO is inquiring to the intention of the revised verbiage. Does the requirement that samples “reflect the full range and concentration” imply or specifically require the permittee to collect samples at times of suspected elevated levels?

Part I.C.2 – NIPSCO requests inclusion of current permit language related to use of zeros when doing certain calculations.

Part I.C.3.c – NIPSCO requests verbiage from the current permit regarding "Temperature Basis” be retained in the definition of Daily Maximum.

Part I.C.4 – NIPSCO suggest “or the most recently approved version of 40 CFR 136.” be added. The 327 IAC 5 reference (327 IAC 5-2-1.5 Incorporation by reference) does not specify a version of 40 CFR 136. However, 327 IAC 1 (specifically 1-1-2 References to the CFR) indicates that the CFR is the July 1, 2016 edition. We feel this could be problematic if we want to use more recently approved methods.

Part IV.B.7 and B.8 – While our 2015 316(b) report and the recent NPDES permit renewal application indicate 39 MGD as the maximum observed intake flow, NIPSCO believes it is inappropriate to limit the intake flow to a daily volume which corresponds to a calculated through screen velocity (TSV) of less than the maximum allowable (i.e. 0.39 fps versus <0.5 fps). Intake values up to 50 MGD correlate to a TSV less than 0.5 fps and remain compliant with the impingement BTA standard. NIPSCO requests Part I.A.1 Table 1 and Part IV.B.7 be revised to allow a maximum of 50 MGD intake volume.

Fact Sheet 2.5 – references our on-site landfill as a “Restricted Waste Site Type II Landfill (RWS II)”. The facility classification is a RWS Type I landfill and should be corrected.

Fact Sheet 2.5 – references storm water management "except that which is related to the FGD construction". The FGD construction project is complete and this verbiage is no longer applicable.

Fact Sheet 5.1 – the section Requirements applicable to all wastewater streams identifies “eight (8) separate wastewater streams that are regulated by 40 CFR Part 423, they are:

1. Once through non-contact cooling water for a plant with a total rated electric generating capacity of 25 or more megawatts”.

While the regulatory reference includes all wastewater streams applicable to a steam electric generation facility we feel including reference to “once through noncontact cooling water” may be confusing for a reader and should be removed or clarified.

----- END OF COMMENTS -----

From: jloewe@nisource.com <jloewe@nisource.com>
Sent: Wednesday, June 17, 2020 5:54 PM
To: Gardner, Nicole <ngardner@idem.IN.gov>
Cc: Gavin, Brad <BGavin@idem.IN.gov>; Novak, Paul <PNovak@idem.IN.gov>; Williams, Trisha <TWilliam@idem.IN.gov>
Subject: Re: Fw: FW: Quick question

**** This is an EXTERNAL email. Exercise caution. DO NOT open attachments or click links from unknown senders or unexpected email. ****

Nikki Brad / Paul / Trisha,

Sorry for the delay but I have finally collected all the information to answer the questions included in the e-mail string. Also, if I missed something I'm sure you'll let me know.

Bromination
We no longer brominate at Schahfer. The use of the bromine chemical (MIOX) was terminated in 2018. Accordingly, I see no reason to retain and would support I removing it from the permit.

Cycles of Concentration
As previously mentioned, the four cooling towers at the Schahfer Station average 1.7 COC. The actual COC has varied at times throughout the history of the Station but our current chemistry plan has been optimized around the design and operating parameters of this facility. The primary goal of our chemistry program is to prevent scaling within the condensers. The current chemistry plan is designed to target 2.0 - 2.2 COC while the average (as mentioned) is currently 1.7. Previous attempts to cycle as high as 3 have failed. This was largely due to the scaling issue experienced under such operating conditions. Water from the Kankakee River is brought into the Intake Settling Basin (ISB) as the source of service water used throughout the facility. The Kankakee has a fairly high concentration of calcium, which left untreated results in our scaling issue. There is no chemical pretreatment performed on the water in the ISB. Accordingly, controlling the FGD blow down rate moderates the COC. The plant engineers routinely monitor the chloride levels within the scrubber to best maximize the system (i.e. to blow down the scrubbers at little as possible; less BD results in increased COC). As an ancillary note to our chemistry control, a purposeful factor in the design of our program is to not increase the sulfate (and other ions) levels in the Final Settling Basin (FSB). All internal ponds and process water combine in the FSB prior to discharge at final outfall 001. The FSB has an engineered capability of providing water directly (if and as needed) into the ISB under low flow conditions in the Kankakee River. Adding unwanted salts into the ISB would only exacerbate the scaling potential and prove problematic in limiting blow down (which results in lower cycles of concentration).

% Reduction
Using real world data and recent operating conditions (such as run times of the various Units), we estimate a Once-Through system would require 1.044B gallons of water per day. We calculate an estimated water use of 48.5M gallons per day at 1.7 COC, and 40M gpd at 2.0 COC. The 1.7 COC results in a 95.4% reduction when compared to a once-through system (and 96.2% at 2.0 COC). We are aware of the 316(b) guidance document reference to reducing actual intake flows (AIF) by 97.5 percent with a closed cycle cooling tower system being operated at a minimum 3.0 cycles of concentration. As affected by the circumstances mentioned above, despite minimizing blow down (thus minimizing make up flow), employing an appropriate chemistry control program, and operating a closed cycle system we are unable to replicate these COC levels or percent flow reduction.

Chemistry Control Program Guidance

The following is feedback from our chemical provider (Suez) after discussing the design of our program with respect to potentially increasing cycles of concentration.

The current target cycles at NIPSCO Schahfer Station is 2 cycles with pH control to pH 8.4 (*via* acid feed). A gauge for the "treatability" of the water from a calcium carbonate scaling perspective is the Langelier Saturation index (LSI), with typical treatable LSIs < 2.6. It is critical to keep the condensers clean of deposit, with calcium carbonate being the main potential culprit at these conditions. Under the abovementioned operating parameters and typical water compositions, LSIs are generally < 2.6, and treatable.

With an increase in cycles and the strict maintenance at the appropriate pH, elevated cycles can be achieved. However, with an upset such as a loss of acid feed or pH measurement issue, calcium carbonate scale and silicate scales can be issues; please refer to Figure 1, below. Note that a modest deviation from the target pH would lead to elevated LSIs and exceedances of limits of select mineral salts. In addition, effluent turbidities will increase, which may pose a challenge with regard to TSS permit limit requirements.

In brief, operating at higher cycles poses more risk and potential negative consequences to the operation.

Figure 1. Water chemistry composition and the associated limits for NIPSCO Schahfer Station as a function of cycles; ***** indicates "over limit".

CYCLES FACTOR	STARTING CYCLES	pH / Alkalinity Relationship	Maximum L.S
0.50	1.00	1.84	2.60

CYCLES FACTOR	STARTING CYCLES	pH / Alkalinity Relationship	Maximum L.S.I.	Maximum Silica
0.50	1.00	1.84	2.60	200

Print Cycle-Up | Print MakeUps | Help | E-Mail

Enter values into the shaded boxes. Enter Cu Enter Customer Name, Location and Account Number Over Labels.

suez

TOWER WATER CYCLING ANALYSIS

NIPSCO SS
Unit 17 or 18
6/1/2020

VOL	3,450,000	(gal)	
RR	165,000	(gpm)	
DT	21.00	(deg F)	
EVAP	3,119	(gpm)	
F	0.90		
Drift	0.0010%	(% of RR)	

150 °F (Hotest Skin) 130 °F (Bulk Water)
0.9 M-ALK FACTOR

CYCLES	pH	M-ALK as CaCO3	Ca as CaCO3	Mg as CaCO3	SiO2	o-PO4	Na	COND uM hos	Cl	SO4	Fe	TDS ppm	LSI	MgSi	CMSi	RT75 (day)	B.D. (gpm)	M.U. (gpm)
	8.10	**206.0**	**189.0**	**85.5**	**10.30**	**0.0**	**25.6**	**761.0**	**29.3**	**102.00**	**0.50**	**494.65**	1.40					
1.5	8.58	278	284	128	15	0.00	38	1142	44	153	0.8	742.0	2.16	ok	ok	0.53	6,238	9,357
2.0	8.81	371	378	171	21	0.00	51	1522	59	204	1.0	989.3	*****	ok	*****	1.06	3,119	6,238
2.5	8.99	464	473	214	26	0.00	64	1903	73	255	1.3	1236.6	*****	ok	*****	1.60	2,079	5,198
3.0	9.13	556	567	257	31	0.00	77	2283	88	306	1.5	1484.0	*****	*****	*****	2.13	1,560	4,679
3.5	9.25	649	662	299	36	0.00	90	2664	103	357	1.8	1731.3	*****	*****	*****	2.66	1,248	4,367
4.0	9.36	742	756	342	41	0.00	102	3044	117	408	2.0	1978.6	*****	*****	*****	3.19	1,040	4,159

MAKE UP: 8.10 206 M-ALK as CaCO3
WITH pH CONTROL: **8.40** 223 M-ALK as CaCO3

1.5 Lbs Cl2 / 1000 g al Recirc

CYCLES	ACID (ppm)	ACID #/day	as CaCO3 Ca	as CaCO3 Mg	SiO2	o-PO4	Bleach Adjusted Na	Acid and Bleach Adjusted COND	Bleach Adjusted Cl	Acid Adjusted SO4	LSI	MgSi	CMSi	Acid and Bleach Adjusted TDS
0.0			189	86	10	0.00	26	761	29	102				495
1.5	55	4143	284	128	15	0.00	42	1184	47	204	1.89	ok	ok	799
2.0	148	5541	378	171	21	0.00	58	1627	65	339	2.01	ok	ok	1138
2.5	241	6007	473	214	26	0.00	74	2070	83	475	2.09	ok	ok	1476
3.0	333	6240	567	257	31	0.00	90	2513	101	610	2.17	ok	ok	1815
3.5	426	6380	662	299	36	0.00	106	2956	119	746	2.23	ok	ok	2153
4.0	519	6473	756	342	41	0.00	122	3399	137	882	2.28	ok	ok	2492

WITH pH CONTROL: **8.80** 367 M-ALK

ACID (ppm)	ACID #/day	LSI	MgSi	CMSi
0	0	2.50	ok	ok
3	125	*****	ok	*****
96	2396	*****	ok	*****
189	3532	*****	ok	*****
281	4213	*****	ok	*****
374	4668	*****	ok	*****

I trust this answers your questions. Should you have additional questions, please do not hesitate....

Thank you,

Jeff Loewe | NiSource | Environmental
P: 219.647.5249 | C: 219.742.1979

From: "Gardner, Nicole" <ngardner@idem.IN.gov>
To: "jloewe@nisource.com" <jloewe@nisource.com>
Cc: "Gavin, Brad" <BGavin@idem.IN.gov>, "Novak, Paul" <PNovak@idem.IN.gov>, "Williams, Trisha" <TWilliam@idem.IN.gov>
Date: 06/17/2020 08:33 AM
Subject: Re: Fw: FW: Quick question

Good morning Jeff! Just checking in with you on the information request below. If you can give us a status update we would appreciate it.

Thank you,

Nikki

From: Gardner, Nicole <ngardner@idem.IN.gov>
Sent: Friday, June 12, 2020 7:07 AM
To: jloewe@nisource.com <jloewe@nisource.com>
Subject: Re: Fw: FW: Quick question

Good morning Jeff, I hope you are doing well!

I wanted to let you know that we are very close to being finished with a draft. I believe the final pieces are the COC and percent reduction calculation. Do you know if those will be available soon?

Nikki

From: Gardner, Nicole <ngardner@idem.IN.gov>
Sent: Wednesday, June 3, 2020 1:41 PM
To: jloewe@nisource.com <jloewe@nisource.com>
Subject: Re: Fw: FW: Quick question

Thank you!

From: jloewe@nisource.com <jloewe@nisource.com>
Sent: Wednesday, June 3, 2020 1:40 PM
To: Gardner, Nicole <ngardner@idem.IN.gov>
Cc: Gavin, Brad <BGavin@idem.IN.gov>; Carlino, Jennifer <JCarlino@idem.IN.gov>; Novak, Paul <PNovak@idem.IN.gov>; Williams, Trisha <TWilliam@idem.IN.gov>
Subject: Re: Fw: FW: Quick question

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Nikki et al, I anticipate some time this week. I requested the percent reduction calculation be performed and was told they would likely have that number to me some time this week. After I receive that value I will be able to complete my response and will submit it to this group.

Thank you,
-Jeff

Jeff Loewe | NiSource | Environmental
P: 219.647.5249 | C: 219.742.1979

From: "Gardner, Nicole" <ngardner@idem.IN.gov>
To: Jeff Loewe <jloewe@nisource.com>,
Cc: "Carlino, Jennifer" <JCarlino@idem.IN.gov>, "Gavin, Brad" <BGavin@idem.IN.gov>, "Novak, Paul" <PNovak@idem.IN.gov>, "Williams, Trisha" <TWilliam@idem.IN.gov>
Date: 06/03/2020 12:33 PM
Subject: Fw: FW: Quick question

Jeff,

Good afternoon! With regard to the email below (cycles of concentration), do you have a timeframe in mind when we might receive a response?

Will you please include the following people on your response: Brad Gavin, Paul Novak, Jennifer Carlino, and Trisha Williams? Trisha will be taking the project over for Jennifer as her maternity leave begins this week.

Thank you,

Nikki

From: jloewe@nisource.com <jloewe@nisource.com>
Sent: Thursday, May 21, 2020 1:40 PM
To: Carlino, Jennifer
Subject: Re: FW: Quick question

**** This is an EXTERNAL email. Exercise caution. DO NOT open attachments or click links from unknown senders or unexpected email. ****

Jennifer,
I am attempting to gather the appropriate staff for a discussion regarding the cycles of concentration. It appears this is becoming an issue as opposed to a simple question and I do not want to provide an inadequate or erroneous reply. I will get back to you as soon as possible.

Thank you,
-Jeff

Jeff Loewe | NiSource | Environmental
P: 219.647.5249 | C: 219.742.1979

From: "Carlino, Jennifer" <JCarlino@idem.IN.gov>
To: "jloewe@nisource.com" <jloewe@nisource.com>,
Date: 05/20/2020 11:05 AM
Subject: FW: Quick question

USE CAUTION: This email was sent from an external source. Think before you click links or open attachments. If suspicious, please forward to security@nisource.com for review.

Jeff, one of our engineers has a question. It is highlighted below.

Also, the previous permit mentions "bromination" in the fact sheet, along with the chlorination justification, but neither the application, nor the table in the previous permit mention it. Is Bromination something the Schahfer facility does, or could I remove it from the permit?

Thanks!

Jennifer Carlino
Senior Environmental Manager
IDEM Office of Water Quality
NPDES Permits
Government Center North
100 N Senate Ave.
Indianapolis, IN 46201
(317) 232-8702 * Jcarlino@idem.in.gov

Indiana Department of Environmental Management

IDEM values your feedback.
Please take two minutes and complete this brief survey.



From: Novak, Paul <PNovak@idem.IN.gov>
Sent: Wednesday, May 20, 2020 8:37 AM
To: Gavin, Brad <BGavin@idem.IN.gov>; Carlino, Jennifer <JCarlino@idem.IN.gov>; Gardner, Nicole <ngardner@idem.IN.gov>
Subject: RE: Quick question

Brad – thanks for providing EPA RTC. Very helpful.

The rule provides flexibility in determining whether a facility is considered closed cycle or not. The determination seems to be based on whether the system is "well operated" . See pages 158 -161 of the RTC.

I suggest we ask NIPSCO why they are operating at the 1.7 COC and if they can re-look at providing a percent reduction in AIF.

From: Gavin, Brad
Sent: Tuesday, May 19, 2020 2:44 PM
To: Carlino, Jennifer <JCarlino@idem.IN.gov>; Gardner, Nicole <ngardner@idem.IN.gov>; Novak, Paul <PNovak@idem.IN.gov>
Subject: Re: Quick question

The below is an excerpt from the document I have now attached.

As an example, in the case of a facility that uses makeup water from a freshwater source, a Director may determine that a closed-cycle recirculating system can generally be deemed to minimize makeup and blowdown flows if it reduces actual intake flows (AIF) by 97.5 percent as compared to a once-through cooling system or if its cooling tower is operated at a minimum cycles of concentration of 3.0. .... These reductions and cycles of concentration are illustrative. A Director may determine that other levels near these numbers could also constitute a closed-cycle system. The final rule further recognizes that in certain unavoidable circumstances, these levels for COC or percent flow reduction might not be achievable at all facilities. Such circumstances could include situations where water quality-based discharge limits might limit the concentration of a pollutant that is not readily treatable in the cooling tower blowdown or situations where varying source water quality could lead to unavoidable problems concerning scale formation, solids buildup, corrosion, or media fouling. Such facilities should demonstrate these circumstances to their Director and indicate the measures they have taken to minimize makeup flows. The Director will retain the discretion to conclude that the particular facility employs a closed-cycle recirculating system when the benchmarks are not met.

They don't meet the COC of 3.0 or 97.5% flow reduction. That is probably why they did not mention their closed cycle recirculating system as an impingement BTA option.

Brad Gavin, Environmental Engineer
Permits Branch
Office of Water Quality
Indiana Department of Environmental Management
bgavin@idem.in.gov

From: Gavin, Brad <BGavin@idem.IN.gov>
Sent: Tuesday, May 19, 2020 2:20 PM
To: Carlino, Jennifer <JCarlino@idem.IN.gov>; Gardner, Nicole <ngardner@idem.IN.gov>; Novak, Paul <PNovak@idem.IN.gov>
Subject: Re: Quick question

I have attached Essay 17A Closed Cycle Recirculating Cooling from EPA's response to comment on the proposed rule. It discusses the issue in detail.

Brad Gavin, Environmental Engineer
Permits Branch
Office of Water Quality
Indiana Department of Environmental Management
bgavin@idem.in.gov
317-234-4155

From: Gavin, Brad <BGavin@idem.IN.gov>
Sent: Tuesday, May 19, 2020 12:51 PM
To: Carlino, Jennifer <JCarlino@idem.IN.gov>; Gardner, Nicole <ngardner@idem.IN.gov>; Novak, Paul <PNovak@idem.IN.gov>
Subject: Re: Quick question

Thanks, Jennifer. 1.7 is low. In the paragraph before the table that he referenced, it states that fresh water cooling towers typically operate at 3.0 cycles and a flow reduction of 97.5 (at a delta T of 20 degrees F).

Brad Gavin, Environmental Engineer
Permits Branch
Office of Water Quality
Indiana Department of Environmental Management
bgavin@idem.in.gov
317-234-4155

From: Carlino, Jennifer <JCarlino@idem.IN.gov>
Sent: Tuesday, May 19, 2020 11:08 AM
To: Gardner, Nicole <ngardner@idem.IN.gov>; Gavin, Brad <BGavin@idem.IN.gov>; Novak, Paul <PNovak@idem.IN.gov>
Subject: Fw: Quick question

Below is Jeff's response

From: jloewe@nisource.com <jloewe@nisource.com>
Sent: Tuesday, May 19, 2020 10:57 AM
To: Carlino, Jennifer <JCarlino@idem.IN.gov>
Subject: Re: Quick question

**** This is an EXTERNAL email. Exercise caution. DO NOT open attachments or click links from unknown senders or unexpected email. ****

Jennifer, the annual average of the four (4) CTs at Schahfer is 1.7 cycles of concentration. I do not have (nor have ever seen) the calculated Percent Reduction. According to Exhibit 6-6 in the TDD, 1.7 COC appears to be approximately a 96-97% reduction.

Thank you,
-Jeff

Jeff Loewe | NiSource | Environmental
P: 219.647.5249 | C: 219.742.1979

April 3, 2020

Ms. Charnell Carter
Indiana Department of Environmental Management
Office of Water Quality / Industrial Permits Section, MC 65-42
100 North Senate Avenue
Indianapolis, IN 46204-2251

RE: **NPDES Permit Renewal**
Permit # IN0053201
NIPSCO – R. M. Schahfer Generating Station
Wheatfield, Indiana, Jasper County

The Northern Indiana Public Service Company LLC (NIPSCO) is submitting the enclosed Application and associated attachments for the renewal of the above referenced NPDES permit. Pursuant to 327 IAC 5-3-2, NIPSCO is filing for reissuance of this permit at least 180 days prior to the expiration of the current permit.

Under my direction and supervision, the enclosed application and all attachments were prepared by Ramboll. Based on my review, the information submitted is, to the best of my knowledge, true, accurate, and complete unless otherwise noted.

In accordance with IC 13-18-20-12, an application fee of $50 must be paid. Check number 5059004841was submitted to the Department under separate cover on March 6, 2020.

Thank you for your attention to this matter. If you have any questions or require additional information, please do not hesitate to contact me at jloewe@nisource.com or 219-647-5249.

Sincerely,



Jeffrey M. Loewe
Principal
NiSource Environmental

EXECUTIVE SUMMARY

This Executive Summary and subsequent attachments constitute the application by Northern Indiana Public Service Co. LLC – R.M. Schahfer Generating Station (RMSGS) for renewal of its existing National Pollutant Discharge Elimination System (NPDES) Permit No. IN0053201. This summary contains a brief description of the source of materials contained in this application and a general overview of the renewal request.

The NPDES permit application consists of the following:

- Identification of Potentially Affected Persons
- IDEM General Information Form - the general application that applies to all applicants
- IDEM Request for Information Form
- IDEM Owner/Operator Affidavit
- Form 2C - applies to all existing industrial facilities with process wastewater
- Form 2F – applicable for stormwater discharges associated with industrial activity
- Application fee

The application also contains the following additional information and/or other requests:

- Request for continued authorization for previously approved water treatment additives; Request for continued authorization for continuous chlorination of the Unit 14 cooling tower;
- Request for continued Best Technology Available (BTA) recognition for 316(b) requirements;
- Description of scheduled plant retirement; and
- Description of proposed waste stream pipe redirection activities.

For convenience, and directly following this Executive Summary, is a listing of documents that provides the general order of the application materials.

OUTFALL INVENTORY

The existing NPDES Permit, which became effective October 1, 2015 authorizes RMSGS to discharge the following wastewaters. Renewal is requested for the continued discharge of these waters.

Table 1. Inventory of Process and Stormwater Outfalls

Location Identification	Description	Location Latitude / Longitude	Receiving Water
Outfall 001	Cooling tower blowdown, treated sanitary wastewater (Outfall 101), treated FGD wastewater (Outfall 201), low volume wastes, bottom ash transport water, coal pipe run-off, construction dewatering water, and stormwater	N 41° 15' 2.34" W 87° 1' 40.55"	Kankakee River
Outfall 002	Outfall 001 Emergency Overflow	N 41° 13' 35.87" W 87° 1' 18.43"	Kankakee River
Outfall 101	Treated Sanitary Wastewater	N 41° 15' 2.34" W 87° 0' 40.55"	Kankakee River via Outfall 001
Outfall 201	Treated Landfill Leachate and FGD Wastewater from Units 14/15	N 41° 13' 3" W 87° 1' 14"	Kankakee River via Outfall 001
Outfall 003S	Stormwater associated with industrial activity; surface water runoff from a perimeter storm water network from the onsite restricted waste landfill	N 41° 13' 8.55" W 87° 0' 20"	Stalbaum Ditch
Outfall 004S	Stormwater associated with industrial activity; drainage from coal car tracks exiting the plant and the perimeter security road (representative of Outfalls 005S and 006S)	N 41° 12' 22" W 87° 1' 38"	Davis Ditch
Outfall 005S	Stormwater associated with industrial activity; drainage from coal car tracks exiting the plant and the perimeter security road	N 41° 12' 31" W 87° 1' 38"	Davis Ditch
Outfall 006S	Stormwater associated with industrial activity; drainage for the perimeter security road and emergency overflow from the Intake Basin	N 41° 13' 31" W 87° 1' 36"	Davis Ditch
Outfall 007S	Stormwater associated with industrial activity; roof drain runoff and storm water collected from the area surrounding the main buildings of the generating facility	N 41° 12' 17.46" W 87° 1' 47.3"	Davis Ditch

Please note, the current Permit includes a requirement for a new internal monitoring location (Outfall 301) for FGD blowdown wastewaters from Units 17 and 18 prior to commingling with non-FGD wastewater in the MSRB. The Permit (as issued on September 16, 2015) allowed 12 months to identify a representative sampling location and develop a sampling plan. However the revised Effluent Limitation Guideline (ELG) Rule finalized in November 2015 defines numeric limits as well as an applicability date for FGD wastewater. Therefore, the intention of the Outfall 301 and the proposed 12-month compliance schedule identified in the Permit has been superseded by the Rule. Per correspondence from IDEM in November 2016, the agency concurred there are no compliance requirements for Outfall 301 in the current Permit.

In the current permit, IDEM noted shallow groundwater has the potential to discharge to surface water by the way of the two primary drainage ditches (Stalbaum and Davis Ditch) that flow through the property. Therefore, permit monitoring was required at various stream monitoring sites (SMS).

Table 2. Stream Monitoring Sites

Location Identification	Description	Location Latitude / Longitude
SMS 010S	Stormwater in Davis Ditch	N 41° 12' 5.22" W 87° 0' 56.4"
SMS 011S	Stormwater in Davis Ditch	N 41° 13' 19.21" W 87° 1' 47.3"
SMS 012S	Stormwater in Stalbaum Ditch	N 41° 12' 29.88" W 87° 0' 3.9"
SMS 013S	Stormwater in Stalbaum Ditch	N 41° 13' 24.52" W 87° 1' 21.3"

EFFLUENT CHARACTERIZATION

Section V of Form 2C requires the presentation of effluent characterization data (concentration and mass) for select constituents. As part of this characterization, a "Believed Absent and Believed Present" assessment for constituents is required in Form 2C Part V-B. RMSGS used the following steps to determine whether a constituent would be "Believed Present" in outfall effluent:

1. Is there an identifiable RMSGS source of constituent?
2. Is it anticipated that the constituent would not be removed or degraded by wastewater treatment system?

3. Was a constituent analytically detected for that monitoring location?

If the answer to any step was "yes", then the constituent was considered to have potential to be present in the discharge.

In regards to sampling and analyses, permit-required conditions were followed. Where no permit requirements were listed, sampling and analyses followed 40 CFR Part 136. A summary of effluent characterization procedures is provided below:

<u>For all data:</u>

- For temperatures, summer was defined as April 1 through November 30 and winter was defined as December 1 through March 31.
- The number of analyses have been presented for both the daily values and the monthly average values.
- Monthly average values were generated only if there was more than one sample in the calendar month.
- Mass values were not calculated if all data for a parameter were non-detect.
- The presence of a "<" flag indicates that all results for that parameter were non-detect.
- Data were used as reported by the analytical laboratory: the majority of data were reported to the method reporting limit, but some data were reported to the method detection limit. The appropriate detection limit (with a "<" symbol) was conservatively substituted for non-detect results.
- When reported by the laboratory, estimated values between the method detection limit and method reporting limit were used as reported.
- Data from split analyses (for non-DMR parameters) and field duplicate analyses (mercury only) were averaged prior to use and counted as 1 sample result. For DMR parameters, individual data were reported as the original sample result (no averaging of duplicates).
- For parameter data sets containing detections and non-detections, all results were used in the calculation of the long term average, but only detections were used to determine the maximum statistics. Therefore, in some cases the maximum (daily or monthly) listed may be less than the calculated average. Data for which elevated non-detects were replaced by the highest detection are:
    - Outfall 004S Total Recoverable Zinc

For parameters currently monitored under the NPDES Permit:

- The MMR/DMR database from January 2016 to December 31, 2019 was utilized for permitted discharges:
  - Form 2C related Outfalls 001, 101, 201, 201 influent;
  - Form 2F related Outfalls 003S, 004S, 007S; and
  - Stream Monitoring Sites (SMS) 010S, SMS 011S, SMS 012S, SMS 013S.

For parameters not currently monitored under the NPDES Permit:

- Samples were collected for the required Form 2C or Form 2F parameters for the following locations on the respective dates.

  - Outfall 001, 101, 201: March 2, 2020 (except for $cBOD_5$ and Fecal Coliform at Outfalls 001 and 201)
  - Outfall 001 & 201 $cBOD_5$: March 17, 2020
  - Outfall 001 & 201 Fecal Coliform: March 27, 2020 (results pending)
  - Outfall 003S: No discharge has been recorded during the permit term and none is anticipated.
  - Outfall 004S: No additional discharge characterization data exists for Outfall 004S, 005S, or 006S at this time as the discharge is very intermittent and may only discharge during extreme rain events.
  - Outfall 007S: March 26, 2020 (results pending)

RAMBOLL

OTHER PERMIT RENEWAL ITEMS

Water Treatment Additives

Attachment I contains the list of all approved water treatment additives for use at RMSGS. Required materials (e.g., MSDSs, dosage information) for the already approved water treatment additives listed in Attachment I have been submitted to IDEM previously and are on file with the agency. Approvals for use of new chemicals are not requested at this time. NIPSCO requests continued approval for the use of the water treatment additives for which approval has already been provided.

Continuous Chlorination for the Unit 14 Cooling Tower

RMSGS requests continued recognition and approval of the continuous chlorination operations for the Unit 14 Cooling Tower. This provides for more effective biological control of cooling tower waters.

316(b) Requirements

RMSGS requests continued recognition that their existing cooling water intake structures (CWIS) represent the best technology available (BTA) for minimizing Adverse Environmental Impact (AEI) in accordance with Section 316(b) of the Clean Water Act. There have been no material changes to the existing CWIS nor any change in facility operations that would require additional intake flow. RMSGS believes their existing CWIS still represents BTA for minimizing AEI from Impingement Mortality (IM) and Entrainment Mortality (EM) impacts pursuant to the Final Section 316(b) Regulations for Existing Facilities, which were promulgated in August 2014 and effective in October 2014. RMSGS full-flow design withdrawal volumes of 50 MGD. Additional details and updates are provide in Attachment II.

Scheduled Plant Retirement

Announced through NIPSCO's 2018 Integrated Resource Plan released October 31, 2018, the Northern Indiana Public Service Company LLC has publicly announced the planned retirement of all coal-fired generation at the R.M. Schahfer Generating Station (RMSGS). Actions supporting this goal have already been initiated. The short term action plan includes the initiation of activities in preparation for the retirement of RMSGS Units 14, 15, 17, and 18 by 2023 thereby aligning with NIPSCO's long term action plan to fully retire the RMSGS Units 14, 15, 17, and 18 by the end of 2023.

Waste Stream Pipe Redirect

To implement the Coal Combustion Residual (CCR) rule compliance plan for NIPSCO's R. M. Schahfer Generating Station (RMSGS) piping will be rerouted from the Metal Cleaning Waste Basin (MCWB) and Material Storage Runoff Basin (MSRB), collectively referred to as the Multi-cell Unit (MCU), to the larger Waste Disposal Area (WDA) or Recycle Basin (RB). Engineering design is currently being finalized. The following information is PROPOSED / DRAFT and subject to change pursuant to final engineering specifications. CCR waste streams (flue gas desulfurization blowdown from Units 17 and 18 [i.e. U17/18 FGD WW]) currently going to the MCU will be routed to the WDA. Non-CCR waste streams currently going to the MCU will be routed to the RB. Pipe redirects will employ a combination of new and existing collection sumps as well as new and existing pipelines. Work also includes the installation of an additional cross-

tie between the Recycle Basin discharge lines and the MSRB/MCWB discharge line to the Final Settling Basin (FSB) to allow for greater blowdown capacity to the FSB.

The following table presents the disposition of the waste streams to be redirected and the peak flow rates from their respective sources. The peak flows rates can occur simultaneously; although most are intermittent, with the exception of the FGD Filter Building Sump Pumps which always have some level of flow in order to minimize solids deposition.

Table 3. Draft Waste Stream Pipe Redirect Summary

Contributing Streams	Re-Piped from WDA to Recycle Basin	Re-Piped To Recycle Basin via Coal Pile Runoff (CPR) Sump	Re-Piped To WDA via Existing Ash Piping[1]
	(gpm)	(gpm)	(gpm)
Non-CCR Streams to (WDA)			
Yard Drains	1,200		
U14 Boiler Room Sump	4,000		
U14 Boiler Room Sump	3,000		
Material Storage Runoff Basin (MSRB) Streams			
U17 & 18 FGD Filter Building North Sump			1,500
U17 & 18 FGD Filter Building South Sump			1,500
Coal Pile Run Off		6,000	
Unit 14/15 Chimney Drain[2]		0	
Run Off Retention Pond		500	
Metal Cleaning Waste Basin (MCWB) Streams			
U17 Fly Ash Truck Scale Sump		200	
U18 Fly Ash Truck Scale Sump		200	
U14 Fly Ash Silo Sump		200	
U17/18 Chimney Drain		125	
U14 Waste Neutralization		450	
U17 Make Up Demineralizer Sump		400	
U17/18 Metal Cleaning Waste Sumps		3,400	
U14/15 WWT Emergency Bypass			0
U14/15 Storm Water Run Off[3]		820	
Totals	8,200	12,295	3,000

[1] Deleted

[2] NIPSCO confirmed U14/15 Chimney Drain had no flow. This pipe will be capped.

[3] The U14/15 WWT Emergency Bypass and Storm Water Runoff currently discharge to the MCWB through a common line. The storm Water flow will be redirected to the Recycle Pond and the WWT Emergency Bypass will be disconnected.

Order of Materials

Identification of Potentially Affected Persons Form

General Information Form
- Figure 1. Site Location Map

IDEM Request for Information

IDEM Owner/Operator Affidavit

Form 2C Materials
- Outfall 001/002, 101, 201: Form 2C Pages 1 – 4

- Figure RMS-WF (07-02-2019): Water Flow Diagram – Current
- Figure RMS-WF (Proposed): Waste Stream Pipe Redirect
- Figure RMS-TREAT: Treatment Schematic for the FGD Wastewater Treatment System

- Outfall 001: Form 2C Part V
- Outfall 101: Form 2C Part V
- Outfall 201: Form 2C Part V
- Outfall 201 Influent DMR/MMR Data

- Method Information For Permit Required Sample Analyses
- Method Information for Non-Permit Required Sample Analyses

Form 2F Materials

- Stormwater Outfalls (003S, 004S, 005S, 006S, 007S): Form 2F Pages 1 – 3
  - 003S: Discharge Information
  - 004S: Discharge Information
  - 007S: Discharge Information

- Figure RMS-DRAIN: Site Drainage Map

Stream Monitoring Locations (010S, 011S, 012S, 013S) DMR/MMR Data

Supporting Attachments

- Attachment 1: Listing of Water Treatment Additives

- Attachment 2: 316(b) Cooling Water Intake Structure Updates

Identification of Potentially Affected Persons Form

I. Identification of Potentially Affected Persons

Please list here any and all persons whom you have reason to believe have a substantial or proprietary interest in this matter, or could otherwise be considered to be potentially affected under the law. Failure to notify any person who is later determined to be potentially affected could result in voiding our decision on procedural grounds. To ensure conformance with AOPA and to avoid reversal of a decision, please list all such parties. The letter attached to this form will further explain the requirements under the AOPA. Attach additional names and addresses on a separate sheet of paper, as needed. Please indicate below the type of action you are requesting.

Name: Herman Stanley		Name: Jane Campbell
Street address: 2100 E. 1300 North		Street address: 407 S. East Street
City/State/ZIP code: Wheatfield, IN 46392		City/State/ZIP code: Knox, IN 46534
Name: Rollin Hay		Name: Corey Partin
Street address: 2063 E. 1350 North		Street address: 621 S. Marshall Street
City/State/ZIP code: Wheatfield, IN 46392		City/State/ZIP code: Wheatfield, IN 46392
Name: John Monroe		Name: Rosita Garrett
Street address: 2313 E.1350 North		Street address: P.O. Box 304
City/State/ZIP code: Wheatfield, IN 46392		City/State/ZIP code: Boone Grove, IN 46302
Name: Jean Hunter		Name: Christopher Hunter
Street address: 2837 E. 1350 North		Street address: 13288 N. 300 East
City/State/ZIP code: Wheatfield, IN 46392		City/State/ZIP code: Wheatfield, IN 46392
Name: Robert Boonstra		Name: Francis Tenta
Street address: 13460 N. 300 East		Street address: 3304 E. 1350 North
City/State/ZIP code: Wheatfield, IN 46392		City/State/ZIP code: Wheatfield, IN 46392
Name: Edward Deardorff		Name: Adelaide Deardorff
Street address: 1808 E. 1500 North		Street address: 1808 E. 1500 North
City/State/ZIP code: Wheatfield, IN 46392		City/State/ZIP code: Wheatfield, IN 46392
Name: Georgia Pacific Gypsum		Name: Darwin Whited
Street address: 484 E. 1400 North		Street address: 109 W Grove
City/State/ZIP code: Wheatfield, IN 46392		City/State/ZIP code: Wheatfield, IN 46392
Name: Sammy Wireman		Name: Richard & Linda Duttlinger
Street address: P.O. Box 279		Street address: 3743 E. State Road 10
City/State/ZIP code: Wheatfield, IN 46392		City/State/ZIP code: Wheatfield, IN 46392
Name: Jonathon Wendt		Name: The Nature Conservancy
Street address: 14113 N. State Road 10		Street address: 620 E. Ohio Street
City/State/ZIP code: Wheatfield, IN 46392		City/State/ZIP code: Indianapolis, IN 46202
Name: John & Patricia Mize		Name: William Davis
Street address: 3032 E. 1100 North		Street address: 686 E. 1350 North
City/State/ZIP code: Wheatfield, IN 46392		City/State/ZIP code: Wheatfield, IN 46392

I. Identification of Potentially Affected Persons

Please list here any and all persons whom you have reason to believe have a substantial or proprietary interest in this matter, or could otherwise be considered to be potentially affected under the law. Failure to notify any person who is later determined to be potentially affected could result in voiding our decision on procedural grounds. To ensure conformance with AOPA and to avoid reversal of a decision, please list all such parties. The letter attached to this form will further explain the requirements under the AOPA. Attach additional names and addresses on a separate sheet of paper, as needed. Please indicate below the type of action you are requesting.

Name: Ben Corrett		Name: Ricarda Perez Trust
Street address: 439 E. 1350 North		Street address: 3105 Hedgerow Lane
City/State/ZIP code: Wheatfield, IN 46392		City/State/ZIP code: Homewood, IL 60430
Name: Walter & Michelle Howes		Name: Sarah Ann Bailey
Street address: 659 E. 1300 North		Street address: 75 W. 890 North
City/State/ZIP code: Wheatfield, IN 46392		City/State/ZIP code: Wheatfield, IN 46392
Name: Anthony & Joyce Boyle Indihar		Name: Matthew Hunter
Street address: 2301 Knox Avenue		Street address: 1369 E. 1300 North
City/State/ZIP code: Chicago, IL 60639		City/State/ZIP code: Wheatfield, IN 46392
Name: Vera Vukadinovic		Name: Chandler & Toni Smith
Street address: 1129 E. 1300 North		Street address: 1504 E. 1275 North
City/State/ZIP code: Wheatfield, IN 46392		City/State/ZIP code: Wheatfield, IN 46392
Name: Gerald & Catherine Smith		Name: Elizabeth Herzog
Street address: 1461 E. 1275 North		Street address: 340 E. Dewey
City/State/ZIP code: Wheatfield, IN 46392		City/State/ZIP code: Northlake, IL 60164
Name: Norfolk Southern Railroad Company		Name: Duggleby Farms LLC
Street address: 110 Franklin Road SE		Street address: 12552 N. 300 East
City/State/ZIP code: Roanoke, VA 24042-0028		City/State/ZIP code: Wheatfield, IN 46392
Name: Corey & Lisa Hamstra		Name: Stuart Orr, the Nature Conservancy
Street address: 10281 N. 1100 North		Street address: 436 Northwest Street
City/State/ZIP code: Demotte, IN 46310		City/State/ZIP code: Winamac, IN 46996
Name: John Kelly Hall (in care of V. Cavinder Estate)		Name: INDR Div. of Fish & Wildlife
Street address: 3451 E. 153rd Road		Street address: 402 W. Washington, Room W273
City/State/ZIP code: Hebron, IN 46341		City/State/ZIP code: Indianapolis, IN 46204
Name:		Name:
Street address:		Street address:
City/State/ZIP code:		City/State/ZIP code:
Name:		Name:
Street address:		Street address:
City/State/ZIP code:		City/State/ZIP code:

II. Please complete this form by signing the following statement.

I certify to the best of my knowledge I have listed all potentially affected parties, as defined by IC 4-21.5.			
Signature:	Bertil Valenkamph		
Printed name:	Bertil Valenkamph, Director Station Chemistry & Environmental Compliance	Date:	3/25/2020
Facility name:	NIPSCO R. M. Schahfer Generating Station		
Facility address:	2723 E. 1500 N.		
Facility city: Wheatfield	Facility state: IN	ZIP code: 46392	

III. Type of Action (check one)

- [x] NPDES Permit-327 IAC 5
- [ ] Pretreatment Permit -327 IAC 5
- [ ] Construction Permit-327 IAC 3

A $50.00 fee is required for a New permit, a Renewal or a Modification; if this is a renewal or modification request, include NPDES permit No. on check and return to:
INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
Cashiers Office – Mail Code 50-10C
100 North Senate Avenue
Indianapolis, IN 46204-2251

If No Fee Is Required (Fee has previously been paid), Return To:
INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
Office of Water Quality – Mail Code 65-42
Room N1255
Permits Branch
100 North Senate Avenue
Indianapolis, Indiana 46204-2251

General Information Form

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

GENERAL INFORMATION FORM

(TO BE SUBMITTED WITH FORMS 2C, 2D AND 2E)

(Replaces EPA General Form 1)

Revised 4/12/12

1. Name of Facility: R.M. Schahfer Generating Station

2. Facility Contact

Name: Nicholas Babbitt

Address: R.M Schahfer Generating Station. 2723 E. 1500 N.

City or Town: Wheatfield State: IN Zip Code: 46392

County: Jasper

Telephone: Work: 219-956-5385 Email: nbabbitt@nisource.com

3. Certified Operator

Name: Mark Hein

Certification #: WW019499 Classification: D

Address: R.M Schahfer Generating Station. 2723 E. 1500 N.

City or Town: Wheatfield State: IN Zip Code: 46392

Telephone: Work: 219-956-5310 Email: mhein@nisource.com

4. Facility Mailing Address

Street or P.O. Box: R.M Schahfer Generating Station. 2723 E. 1500 N.

City or Town: Wheatfield State: IN Zip Code: 46392

5. Facility Location

Street, Route No.,County,Other Specific Identifier: R.M Schahfer Generating Station. 2723 E. 1500 N.

6. Type of Permit Action:

New ___ Renewal _X_ Modification ___

7. EPA I.D. Number: IND082859455

8. Does or will this facility (either existing or proposed) include a concentrated animal feeding operation or aquatic animal production facility which results in a discharge to waters of the state? (Form 2B)

Yes ___ No _X_ Form Attached ___

9. Is this a facility which currently results in discharges to waters of the state other than described in 8? (Form 2C-Process Wastewater or Form 2E-Nonprocess Wastewater)

Yes _X_ No ___ Form Attached _X_____

10. Is this a proposed facility (other than described in 8) which will result in a discharge to waters of the state? (Form 2D)

Yes ___ No_X_Form Attached ___

11. SIC Codes (4-digit, in order of priority)

First: 4911 Specify: Electric Power Services
Second:___ Specify: _____
Third: ___ Specify: _____
Fourth: ___ Specify: _____

12. Existing Environmental Permits (Identification #)

NPDES (Discharges to Surface Waters): IN0053201

UIC (Underground Injection of Fluids): NA

RCRA (Hazardous Wastes): IND082859455

PSD (Air Emissions from Proposed Sources): NA

Other: 180730008 and 1807300040 Specify: Air (Operating Majors)

Other:_____ Specify: _____

Other: _____ Specify:_____

13. Nature of Business (Provide a Brief Description)

Electric Power Generation – coal fired, in addition to natural gas, boilers covert water to high pressure steam which drives turbines directly connected to electrical generators.

14. Map
Attach to this application a topographic map of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluid underground. Include all springs, rivers and other surface water bodies in the map area.

SEE FIGURE 1

15. Signature Block:

This application must be signed by a person in responsible charge to be valid. This signature attests to the following:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations".

Bertil C. Valenkamph, Director Station Chemistry & Environmental Compliance
(Printed Name) (Title)

Bertil C Valenkamph 3/25/2020
(Signature) (Date Signed)

Return Completed Application, Fee and Associated Materials to:
Indiana Department of Environmental Management
Cashiers Office – Mail Code 50-10C
100 North Senate Avenue
Indianapolis, Indiana 46204-2251



NIPSCO R.M. Schahfer Generating Station

FIGURE 1. SITE LOCATION MAP - Outfall, Stormwater and Stream Monitoring Site Locations

IDEM Request for Information

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

REQUEST FOR INFORMATION

We request that you fill in the blanks on this form and return it along with your NPDES PERMIT application. The information provided will be helpful in our personal contact with officials of your municipality, industry, or other facility in assuring prompt delivery of correspondence, etc. Thank you for your cooperation.

I. Current NPDES Permit Number IN0053201
(New applicants will be assigned a number later)

II. WASTEWATER TREATMENT FACILITY LOCATION ADDRESS

Name of Facility: NIPSCO R. M. Schahfer Generating Station
Address: 2723 East 1500 North
City: Wheatfield State: IN Zip code: 46392
Telephone: NA Email: NA

III. DISCHARGE MONITORING REPORT (DMR) MAILING ADDRESS (ADDRESS WHERE IDEM IS TO SEND PRE-PRINTED DMRS)

Name: Craig A. Myers Title: Manager, Environmental Compliance
Address: 2755 Raystone Drive
City: Valparaiso State: IN Zip code: 46383
Telephone: 219-286-8465 Email: camyers@nisource.com
Cognizant Official (Representative responsible for completing DMR):
Craig A. Myers Title: Manager, Environmental Compliance

IV. OWNER ADDRESS

Name of Owner: Bertil Valenkamph Title: Station Chemistry & Environmental Compliance
Address: 2755 Raystone Drive
City: Valparaiso State: IN Zip code: 46383
Telephone: 219-477-6265 Email: bcvalenkamph@nisource.com

V. WASTEWATER TREATMENT PLANT OPERATOR/SUPERINTENDENT ADDRESS

Name of Operator: Mark Hein Certificate Number: WW019499
Address: R.M. Schahfer Generating Station, 2723 E 1500 N
City: Wheatfield State: IN Zip code: 46392
Telephone: Work: 219-956-5310 Email: mhein@nisource.com

IDEM Owner / Operator Affidavit

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

OWNER/OPERATOR AFFIDAVIT TO DETERMINE THE APPROPRIATE NPDES PERMITTEE(S)

327 IAC 5-2-3(c) requires the operator to apply for and obtain the NPDES permit for the NPDES discharge, unless the operator is an employee of the owner of the facility (in which case it is the owner's responsibility to apply for and obtain the NPDES permit). This is consistent with the federal regulations at 40 CFR 122.21(b). Additionally, pursuant to 327 IAC 5-2-6(c), the permittee is required to notify the IDEM if there is a change in either the ownership or the operation of the wastewater treatment plant.

When an NPDES permittee contracts with a private firm to operate its wastewater treatment plant, and the contractual agreement is one in which the private entity is not an employee of the owner, the permit should be issued to the private firm. Some contractual arrangements may have been made without the knowledge of this rule requirement, and the contract may not have been adequately set up to reflect this private firm as the sole permittee. Or the private contractor may not want to be the sole permittee. Therefore, in such instances EPA has suggested that the permit be issued to both the owner and to the private contractor, as co-permittees.

In order to help us determine who should be listed on the NPDES permit as the permittee(s), please complete the following information:

1. Name of Facility: NIPSCO R.M. Schahfer Generating Station
2. NPDES Permit Number: IN0053201
3. Name of Owner: Northern Indiana Public Service Company, LLC
   (individual or legal business name)

   Mailing Address of Owner: 801 E. 86th Avenue, Merrillville, IN 46410
4. Name of Operator:: Mark Hein
   (individual or legal business name)

   Mailing Address of Owner: 2723 E. 1500 N, Wheatfield, IN 46392
5. Is the operator an employee of the owner: ■ YES ☐ NO
6. If the answer to #5 is "No", is the operator willing to be the sole permittee?

   ☐ YES ☐ NO ☐ N/A
7. If the answer to #6 is "No", the NPDES permit will be issued to both the owner and the operator as co-permittees.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

(Signature of Owner) (Signature of Operator)

Please complete this form and return it to the IDEM, Office of Water Quality, Municipal NPDES Permits Section 100 North Senate Ave. Indianapolis, IN 46204

Outfall 001/002, 101, 201: Form 2C Pages 1 – 4

APPLICATION FOR PERMIT TO DISCHARGE WASTEWATER

EXISTING MANUFACTURING, COMMERCIAL, MINING, AND SILVICULTURAL OPERATIONS

(OWQ Industrial NPDES Application 2C)

EPA Identification Number *(copy from Item 1 of Form 1)*
110000493706

I. OUTFALL LOCATION

For each outfall, list the latitude and longitude of its location to the nearest 15 seconds and the name of the receiving water.

A. OUTFALL NUMBER	B. LATITUDE			C. LONGITUDE			D. RECEIVING WATER *(name)*
	1. DEG.	2. MIN.	3. SEC.	1. DEG.	2. MIN.	3. SEC.	
Outfall 001	N 41°	15'	2.34"	W 87°	1'	40.55"	Kankakee River (Main Outfall)
Outfall 002	N 41°	13'	35.87"	W 87°	1'	18.43"	Kankakee River (FSB Emergency Overflow)
Outfall 101	N 41°	15'	2.34"	W 87°	0'	40.55"	Final Settling Basin (Internal to Outfall 001)
Outfall 201	N 41°	13'	3"	W 87°	1'	14"	Final Settling Basin (Internal to Outfall 001)

II. FLOWS, SOURCES OF POLLUTION, AND TREATMENT TECHNOLOGIES

A. Attach a line drawing showing the water flow through the facility. Indicate sources of intake water, operations contributing wastewater to the effluent, and treatment units labeled to correspond to the more detailed descriptions in Item B. Construct a water balance on the line drawing by showing average flows between intakes, operations, treatment units, and outfalls. If a water balance cannot be determined (e.g. for certain mining activities) provide a pictorial description of the nature and amount of any sources of water and any collection or treatment measures.

B. For each outfall, provide a description of: (1) All operations contributing wastewater to the effluent, including process wastewater, sanitary wastewater, cooling water, and storm water runoff; (2) The average flow contributed by each operation; and (3) The treatment received by the wastewater. Continue on additional sheets if necessary.

1. OUTFALL NUMBER	2. OPERATION(S) CONTRIBUTING FLOW		3. TREATMENT	
	a. OPERATION	b. AVERAGE FLOW *(Include units)*	a. DESCRIPTION	b. LIST CODES FROM TABLE 2C-1
001	Low Volume Wastewater Bottom Ash Transport Water Cooling Tower Blowdown Coal Pile Runoff Treated Sanitary Wastewater (internal Outfall 101) Treated FGD Wastewater and landfill leachate (internal Outfall 201) Stormwater Construction Dewater Water	20.3 MGD	Sedimentation, Dechlorination	1-U, 2-E
002	Emergency Overflow from Final Settling Basin (FSB)	None Anticipated	Same as Outfall 001	Same as Outfall 001
101	Treated sanitary wastewater	0.0092 MGD	Preaeration, Activated Sludge, Sedimentation, UV Disinfection	3-E, 3-A, 1-U, 2-H
201	Treated FGD Wastewater (Unit 14/15 blowdown) Landfill Leachate	0.05 MGD	Neutralization, Chemical Precipitation, Coagulation, Flocculation, Sedimentation, Filtration, Ion Exchange, Sludge Thickening	2-K, 2-C, 2-D, 1-G, 1-U, 1-Q, 2-J, 5-L
OFFICAL USE ONLY *(effluent guidelines sub-categories)*				

EPA Identification Number *(copy from Item 1 of Form 1*
110000493706

C. Except for storm runoff, leaks, or spills, are any of the discharges described in Items II-A or B intermittent or seasonal?

■ Yes (*complete the following table)* ☐ NO *(go to Section III)*

1. OUTFALL NUMBER	2. OPERATION(s) CONTRIBUTING FLOW	3. FREQUENCY		4. FLOW				
		a. DAYS PER WEEK *(specify average)*	b. MONTHS PER YEAR *(specify average)*	a. FLOW RATE *(in mgd)*		b. TOTAL VOLUME *(specify with units)*		c. DURATION *(in days)*
				1. LONG TERM AVERAGE	2. MAXIMUM DAILY	1. LONG TERM AVERAGE	2. MAXIMUM DAILY	
002	Final Settling Basin Overflow							
001	Construction Dewatering							
201	FGD Wastewater and landfill leachate							

III. PRODUCTION

A. Does an effluent guideline limitation promulgated by EPA under Section 304 of the Clean Water Act apply to your facility?

■ YES *(complete Item III-B)* ☐ NO *(go to Section IV)*

B. Are the limitations in the applicable effluent guideline expressed in terms of production (or other measure of operation)?

☐ YES *(complete Item III-C)* ■ NO *(go to Section IV)*

C. If you answered "yes" to Item III-B, list the quantity which represents an actual measurement of your level of production, expressed in the terms and units used in the applicable effluent guidelines, and indicate the affected outfalls.

1. AVERAGE DAILY PRODUCTION			2. AFFECTED OUTFALLS *(list outfall numbers)*
a. QUANTITY PER DAY	b. UNITS OF MEASURE	c. OPERATION, PRODUCT, MATERIAL, ETC. *(specify)*	

IV. IMPROVEMENTS

A. Are you now required by any Federal, State, or local authority to meet any implementation schedule for the construction, upgrading or operation of wastewater treatment equipment or practices or any other environmental programs which may affect the discharges described in the application? This includes, but is not limited to, permit conditions, administrative or enforcement orders, enforcement compliance schedule letters, stipulations, court orders, and grant or loan conditions.

☐ YES *(complete the following table)* ■ NO *(go to Section IV)*

1. IDENTIFICATION OF CONDITION, AGREEMENT, ETC	2. AFFECTED OUTFALLS		3. BRIEF DESCRIPTION OF PROJECT	4. FINAL COMPLIANCE DATE	
	a. NO.	b. SOURCE OF DISCHARGE		a. REQUIRED	b. PROJECTED

B. Optional : You may attach additional sheets describing any additional water pollutant control programs *(or other environmental projects which may affect your discharges*) you now have underway or which you plan. Indicate whether each program is now underway or planned, and indicate your actual or planned schedules for construction. ☐ MARK "X" IF DESCRIPTION OF ADDITIONAL CONTROL PROGRAMS IS ATTACHED

EPA Identification Number *(copy from Item 1 of Form 1)*
110000493706

V. INTAKE AND EFFLUENT CHARACTERISTICS

A, B, & C: See instructions before proceeding - Complete one set of tables for each outfall - Annotate the outfall number in the space provided. NOTE: Tables V-A, V-B, and V-C are included on separate sheets numbered V-1 through V-10.

D. Use the space below to list any of the pollutants listed in Table 2C-3 of the instructions, which you know or have reason to believe is discharged or may be discharged from any outfall. For every pollutant you list, briefly describe the reasons you believe it to be present and report any analytical data in your possession.

1. POLLUTANT	2. SOURCE	1. POLLUTANT	2. SOURCE
None known			

VI. POTENTIAL DISCHARGES NOT COVERED BY ANALYSIS

Is any pollutant listed in Item V-C a substance or a component of a substance which you currently use or manufacture as an intermediate or final product or byproduct?

☐ YES *(list all such pollutants below)* ■ NO *(go to Item VI-B)*

EPA Identification Number *(copy from Item 1 of Form 1)*
IN000049370o

VII. BIOLOGICAL TOXICITY TESTING DATA

Do you have any knowledge or reason to believe that any biological test for acute or chronic toxicity has been made on any of your discharges or on a receiving water in relation to your discharge within the last 3 years?

☐ YES *(identify the test(s) and describe their purpose below)* ■ NO *(go to Section VIII)*

VIII. CONTRACT ANALYSIS INFORMATION

Were any of the analysis reported in Item V performed by a contract laboratory or consulting firm?

☐ YES *(list the name, address, and telephone number of, and pollutants analyzed by, each such laboratory or firm below)* ☐ NO *(go to Section IX)*

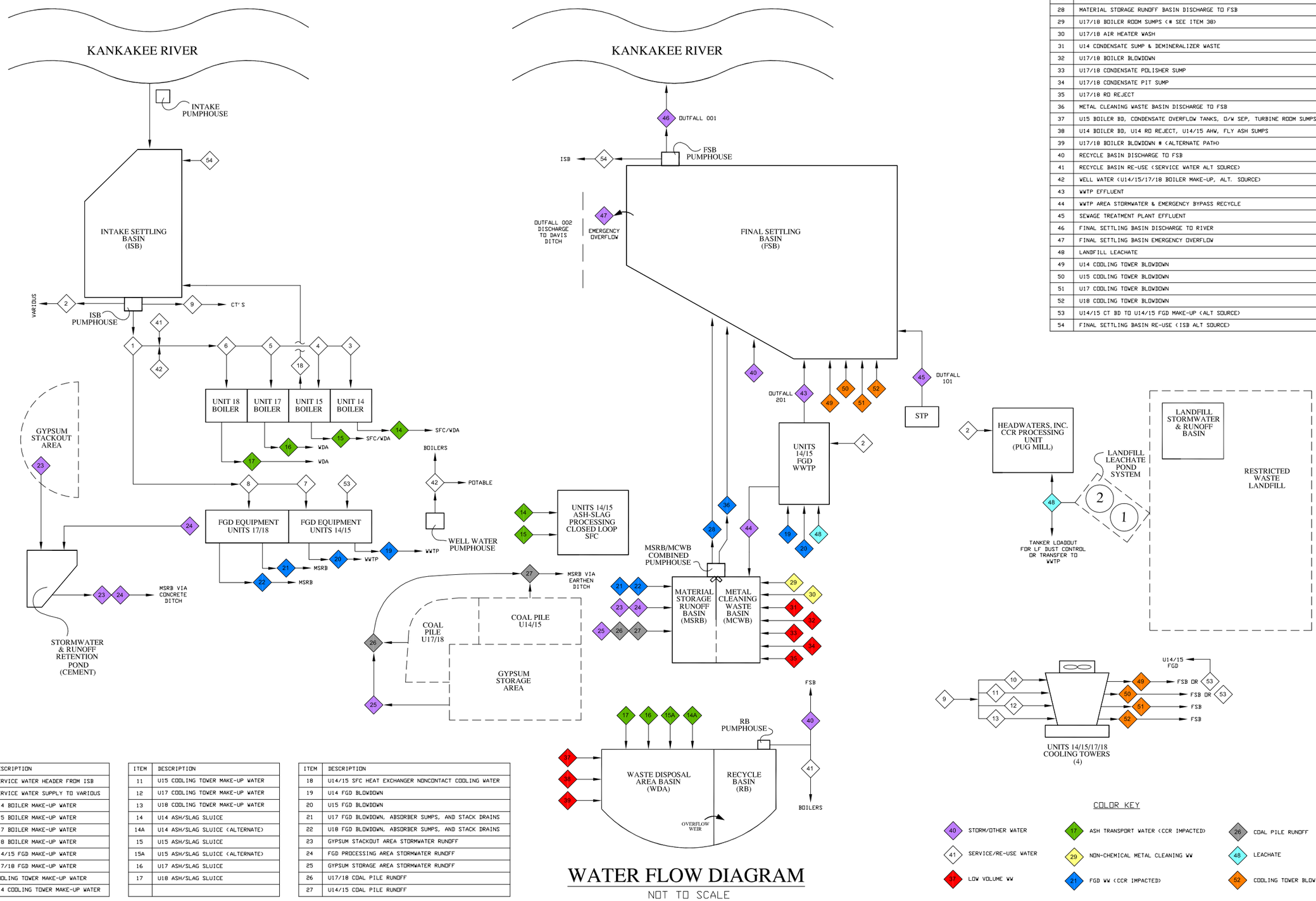
A. NAME	B. ADDRESS	C. TELEPHONE *(area code & no.)*	D. POLLUTANT ANALYZED
Microbac Laboratories	250 West 84th Drive Merrillville, IN 46410	219-769-8378	All parameters, except free cyanide
	158 Starlite Dr Marietta, OH 45750	800-373-4071	
	3323 Gilmore Industrial Blvd Louisville, KY 40213	502-962-6400	
ALS Environmental	3352 128th Ave Holland, MI 49424	616-399-6070	Free Cyanide

IX. CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

A. NAME & OFFICIAL TITLE *(type or print)*	B. PHONE NO. *(area code & no.)*
Bertil C Valenkamph, Director Station Chemistry & Environmental Compliance	219-256-8403
C. SIGNATURE Bertil Valenkamph	D. DATE SIGNED 3/25/2020

Figure RMS-WF (07-02-2019): Water Flow Diagram – Current



ITEM	DESCRIPTION
28	MATERIAL STORAGE RUNOFF BASIN DISCHARGE TO FSB
29	U17/18 BOILER ROOM SUMPS (# SEE ITEM 38)
30	U17/18 AIR HEATER WASH
31	U14 CONDENSATE SUMP & DEMINERALIZER WASTE
32	U17/18 BOILER BLOWDOWN
33	U17/18 CONDENSATE POLISHER SUMP
34	U17/18 CONDENSATE PIT SUMP
35	U17/18 RO REJECT
36	METAL CLEANING WASTE BASIN DISCHARGE TO FSB
37	U15 BOILER BD, CONDENSATE OVERFLOW TANKS, D/W SEP, TURBINE ROOM SUMPS
38	U14 BOILER BD, U14 RO REJECT, U14/15 AHW, FLY ASH SUMPS
39	U17/18 BOILER BLOWDOWN # (ALTERNATE PATH)
40	RECYCLE BASIN DISCHARGE TO FSB
41	RECYCLE BASIN RE-USE (SERVICE WATER ALT SOURCE)
42	WELL WATER (U14/15/17/18 BOILER MAKE-UP, ALT. SOURCE)
43	WWTP EFFLUENT
44	WWTP AREA STORMWATER & EMERGENCY BYPASS RECYCLE
45	SEWAGE TREATMENT PLANT EFFLUENT
46	FINAL SETTLING BASIN DISCHARGE TO RIVER
47	FINAL SETTLING BASIN EMERGENCY OVERFLOW
48	LANDFILL LEACHATE
49	U14 COOLING TOWER BLOWDOWN
50	U15 COOLING TOWER BLOWDOWN
51	U17 COOLING TOWER BLOWDOWN
52	U18 COOLING TOWER BLOWDOWN
53	U14/15 CT BD TO U14/15 FGD MAKE-UP (ALT SOURCE)
54	FINAL SETTLING BASIN RE-USE (ISB ALT SOURCE)

ITEM	DESCRIPTION
1	SERVICE WATER HEADER FROM ISB
2	SERVICE WATER SUPPLY TO VARIOUS
3	U14 BOILER MAKE-UP WATER
4	U15 BOILER MAKE-UP WATER
5	U17 BOILER MAKE-UP WATER
6	U18 BOILER MAKE-UP WATER
7	U14/15 FGD MAKE-UP WATER
8	U17/18 FGD MAKE-UP WATER
9	COOLING TOWER MAKE-UP WATER
10	U14 COOLING TOWER MAKE-UP WATER

ITEM	DESCRIPTION
11	U15 COOLING TOWER MAKE-UP WATER
12	U17 COOLING TOWER MAKE-UP WATER
13	U18 COOLING TOWER MAKE-UP WATER
14	U14 ASH/SLAG SLUICE
14A	U14 ASH/SLAG SLUICE (ALTERNATE)
15	U15 ASH/SLAG SLUICE
15A	U15 ASH/SLAG SLUICE (ALTERNATE)
16	U17 ASH/SLAG SLUICE
17	U18 ASH/SLAG SLUICE

ITEM	DESCRIPTION
18	U14/15 SFC HEAT EXCHANGER NONCONTACT COOLING WATER
19	U14 FGD BLOWDOWN
20	U15 FGD BLOWDOWN
21	U17 FGD BLOWDOWN, ABSORBER SUMPS, AND STACK DRAINS
22	U18 FGD BLOWDOWN, ABSORBER SUMPS, AND STACK DRAINS
23	GYPSUM STACKOUT AREA STORMWATER RUNOFF
24	FGD PROCESSING AREA STORMWATER RUNOFF
25	GYPSUM STORAGE AREA STORMWATER RUNOFF
26	U17/18 COAL PILE RUNOFF
27	U14/15 COAL PILE RUNOFF

WATER FLOW DIAGRAM

NOT TO SCALE

COLOR KEY

- 40 STORM/OTHER WATER
- 41 SERVICE/RE-USE WATER
- 37 LOW VOLUME WW
- 17 ASH TRANSPORT WATER (CCR IMPACTED)
- 29 NON-CHEMICAL METAL CLEANING WW
- 21 FGD WW (CCR IMPACTED)
- 26 COAL PILE RUNOFF
- 48 LEACHATE
- 52 COOLING TOWER BLOWDOWN

REV.	W.O.	DESCRIPTION	DATE	APP'D DRAFT	APP'D ENGR.	FILM
A		UPDATE WATER FLOW	7-12-2019	GA	JL	

Northern Indiana Public Service Company
A NiSource Company

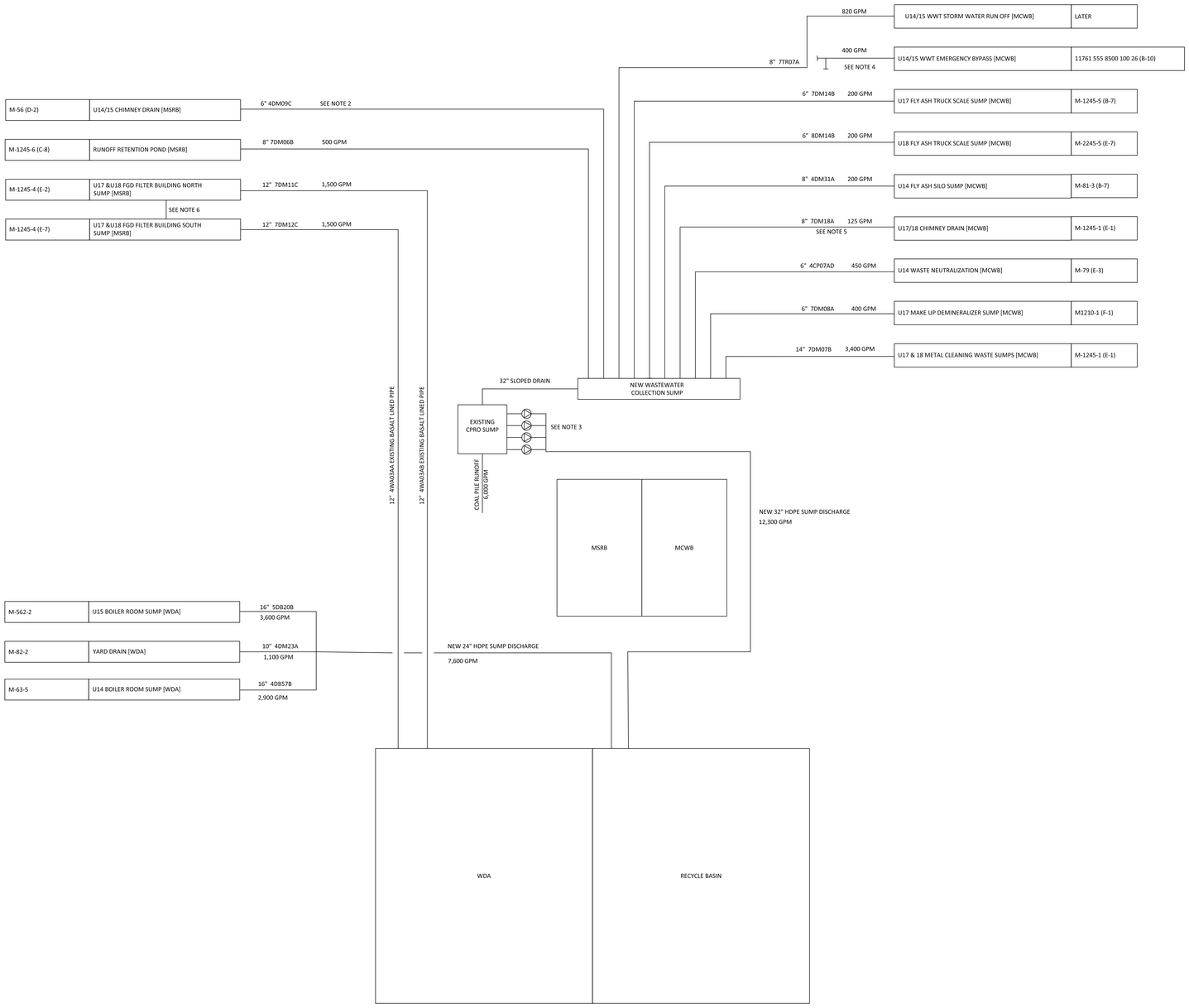
DRAWN:	GA/JL
ENGINEER:	
APPROVED:	
DATE:	7-12-2019
SCALE:	NONE

TITLE	ROLLIN M. SCHAHFER GEN. STA.
LOCATION	WHEATFIELD, INDIANA
DETAIL	WATER FLOW DIAGRAM
W.O./ACCT. NO.	

NIPSCO DRAWING NO.	REV.
RMS-WF	A
SHEET	

Figure RMS-WF (Proposed): Waste Stream Pipe Redirect

PROPOSED DRAFT as of 20-JAN-2020



NOTES:
1. ALL FLOWS ARE PEAK VALUES. THE LABELS WITHIN SQUARE BRACKETS, [ ], INDICATE THE BASIN INTO WHICH THE WASTE STREAM DISCHARGED PRIOR TO THIS PROJECT.
2. NIPSCO CONFIRMED U14/15 CHIMNEY DRAIN HAD NO FLOW. THIS LINE WILL NOT BE CONNECTED TO THE NEW SUMP.
3. REPLACE EXISTING COAL PILE RUNOFF PUMPS WITH FOUR NEW NON-CCR SUMP PUMPS 4,100 GPM 40FT TDH 75HP EACH (3) OPERATING (1) STANDBY
4. A TEE CONNECTION IS PROVIDED IN LINE 7TR07A TO REDIRECT DISCHARGE OF WWT EMERGENCY BYPASS TO TEMPORARY STORAGE.
5. LINE IDENTIFIED ON COMPOSITE PIPING DRAWINGS AS ABANDONED.
6. U17 &U18 FGD FILTER BUILDING NORTH AND SOUTH SUMPS ARE INTERCONNECTED.

REV.	W.O.	DESCRIPTION	DATE	APP'D DRAFT	APP'D ENGR.	FILM
4						
3						
2	B	ISSUED FOR BID	1/17/20	DWP	KM	
1	A	ISSUED FOR REVIEW	11/6/19	DWP	KM	

NIPSCO

DRAWN:	DWP
ENGINEER:	J. MAGEE
APPROVED:	
DATE:	11/6/19
SCALE:	NONE

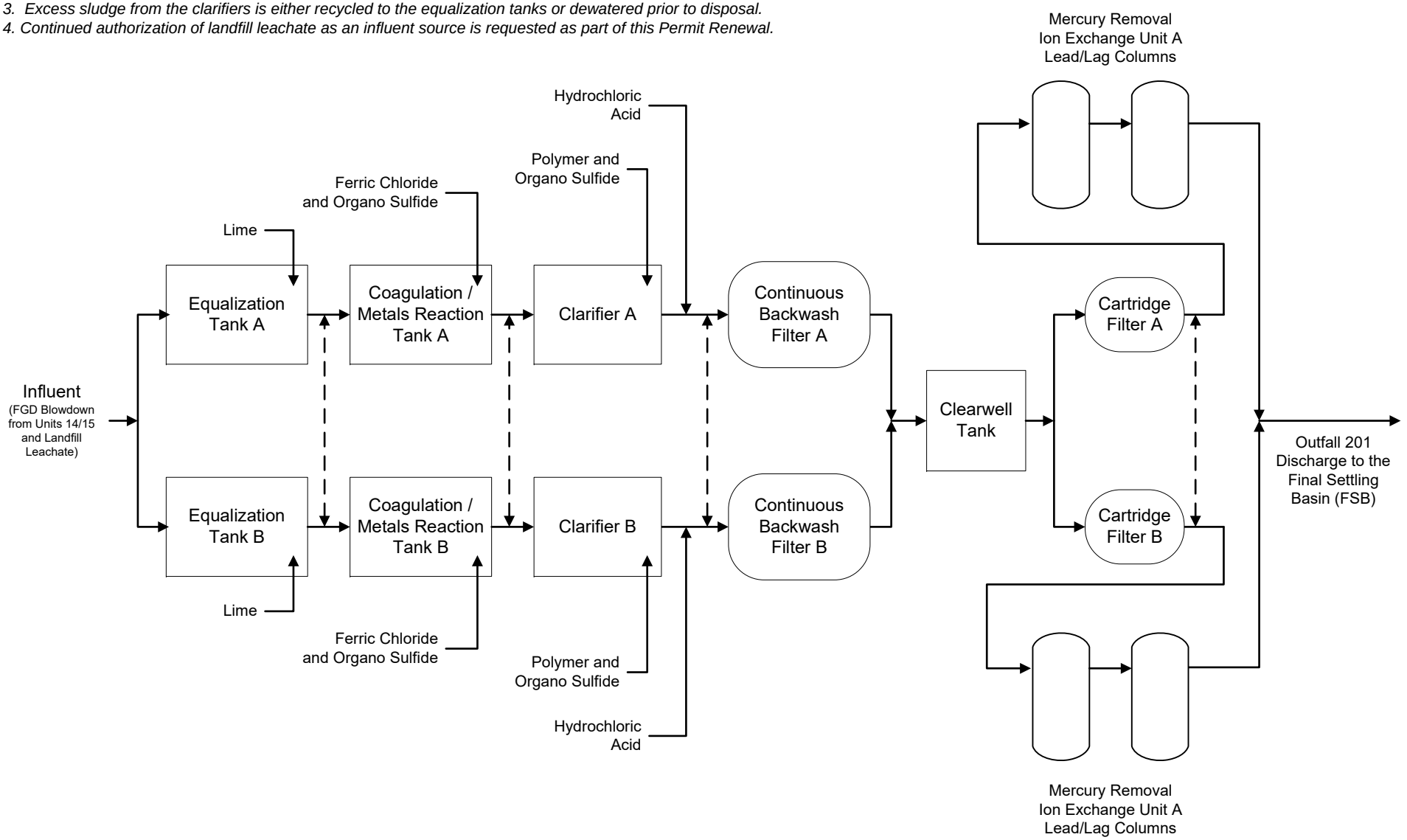
TITLE	ROLLIN M. SCHAHFER GEN. STA.
LOCATION	WHEATFIELD, INDIANA
DETAIL	PIPING REDIRECT PROJECT PROCESS FLOW DIAGRAM
W.O./ACCT. NO.	80156-72

NIPSCO DRAWING NO.	REV.
M-1260	B
SHEET 1	

Figure RMS-TREAT: Treatment Schematic - FGD Wastewater Treatment System

Notes:

1. *The figure is not intended to show all details, but provides an overview of the treatment system. For example, associated backwash flows and filter press water are also recycled to or sent to the equalization tanks.*
2. *The treatment system design includes redundancy and interconnectivity (dashed lines).*
3. *Excess sludge from the clarifiers is either recycled to the equalization tanks or dewatered prior to disposal.*
4. *Continued authorization of landfill leachate as an influent source is requested as part of this Permit Renewal.*



Prepared for:

R.M. Schahfer Generating Station

NPDES Permit IN0053201

Prepared by:

RAMBOLL

FIGURE RMS-TREAT
Treatment Schematic for the
FGD Wastewater Treatment System

02/24/2020

Form 2C Part V – Outfall 001, 101, 201

EPA Identification Number *(copy from Item 1 of Form 1)* 110000493706

V. INTAKE AND EFFLUENT CHARACTERISTICS (Continued from page 3) | OUTFALL NO. 001

PART A - You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

1. POLLUTANT	2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Maximum Daily Values		b. Maximum 30 Day Values *(if available)*		c. Long Term Average *(if available)*		d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)*		b. No. of Analysis	a. Method	b. **Reporting** Limit
	(1) Concentration	(2) Mass	(1) Concentration	(2) Mass	(1) Concentration	(2) Mass				(1) Concentration	(2) Mass			
a. Biochemical Oxygen Demand, Carbonaceous Cas No. E10106	1.77	315.9					1	mg/L	lb/day					
b. Escherichia coli (E-coli - units in count/100ml) Cas No. I-1000	4.1						1	MPN/100mL						
Fecal coliform (units in count/100 ml) Cas No. I-1000	TBD						1	cfu/100mL						
Chemical Oxygen Demand (COD) Cas No. E10107	20.0	3,570					1	mg/L	lb/day					
Dissolved Oxygen (DO) Cas No. E-14539	11.02						1	mg/L	lb/day					
Total Dissolved Solids (TDS) Cas No. E-10173	880.0	157,059					1	mg/L	lb/day					
Total Organic Carbon (TOC) Cas No. E-10195	5.0	892					1	mg/L	lb/day					
Total Suspended Solids (TSS) Cas No. E-10162	42.8	7,638.8	28.7	5,115.8	10.4	1,787.2	168/47	mg/L	lb/day					
Ammonia (as N) Cas No. 7664-41-7	2.0	360.0	1.1	195.0	0.4	60.0	163/47	mg/L	lb/day					
Flow	VALUE 23		VALUE 21.2		VALUE 20.3		975/48	MGD		VALUE				
Temperature (Winter) Cas No. E-14540	VALUE 54		VALUE 52		VALUE 41		114/32	°F		VALUE				
Temperature (Summer) Cas No. E-14540	VALUE 84		VALUE 83		VALUE 69		163/47	°F		VALUE				
Hardness, Total (as (CaCO3) Cas No. E-11778	570.0	101,731						mg/L	lb/day					
pH (S.U.) Cas No. E-10139	MINIMUM 7.4	MAXIMUM 8.9	MINIMUM 7.7	MAXIMUM 8.8			163/47	s.u.						

EPA Identification Number *(copy from Item 1 of Form 1)* 110000493706 | Outfall Number 001

PART B - Mark "X" in column 2-a for each pollutant you know or have reason to believe is present. Mark "X" in column 2-b for each pollutant you believe to be absent. Pollutants for which you mark column 2-a , you must provide a minimum of twelve (12) samples (three (3) samples per month for a period of four (4) months). You must use, or require your contract laboratory to use, an analytical method with detection level low enough to provide a detectable value for the pollutant of concern. Please provide the method used and detection limit achieved by the laboratory. You must provide data or an explanation for the presence of the pollutant in your discharge. Complete one table for each outfall. See the instructions for additional details and requirements.

1. POLLUTANT	2. MARK (*X*)		2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Be-lieved Pre-sent	b. Be-lieved Ab-sent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
Bromide Cas No. 7726-95-6	X		2.3	410					1	mg/L	lb/day					
Chloride Cas No. 1688-70-6	X		363	65,392	245	39,280	133	22,679	164 / 47	mg/L	lb/day					
Chlorine, Total Residual Cas No. 7782-50-5		X	< 0.02						944/48	mg/L						
Color (C.U.) Cas No. E-11712	X		20.0						1	CU						
Fluoride Cas No. 16984-48-8	X		0.76	136					1	mg/L	lb/day					
Nitrate/Nitrite (as N) Cas No. E-10128	X		1.90	339					1	mg/L	lb/day					
Nitrogen, Total Organic (as N) Cas No. 7727-37-9	X		1.13	201.0					1	mg/L	lb/day					
Oil & Grease Cas No. E-10140		X	< 5.0						162/47	mg/L						
Phosphorus, Total Cas No. 7723-14-0	X		0.08	14.3					1	mg/L	lb/day					
Radioactivity																
(1) Radioactivity: Alpha, Total (pCi/L) Cas No. 12587-46-1		X	---	---												
(2) Radioactivity: Beta, Total (pCi/L) Cas No. 12587-47-2		X	---	---												
(3) Radioactivity: Radium ,Total (pCi/L) Cas No. 13982-63-3		X	---	---												
(4) Radioactivity: Radium 226,Total (pCi/L) Cas No. 13982-63-3		X	---	---												
Sulfate (as SO4) Cas No. 14808-79-8	X		646.0	115,295.0	622.0	111,012.0	372.8	63,561.0	162 / 47	mg/L	lb/day					
Sulfide (as S) Cas No. 18496-25-8		X	< 0.015						1	mg/L						
Sulfite (as SO3) Cas No. 14264-45-3		X	< 1.0	Sample was analyzed past holding time.					1	mg/L						
Surfactants (MBAS) Cas No. 61-73-4		X	< 0.2						1	mg/L						
Aluminum Cas No. 7429-90-5	X		0.025	4.46					1	mg/L	lb/day					
Barium Cas No. 7440-39-3	X		0.068	12.1					1	mg/L	lb/day					
Boron Cas No. 7440-42-8	X		35,000	6,305	13,867	2,498	6,405	1,089	162 / 47	ug/L	lb/day					
Cobalt Cas No. 7440-48-4	X		0.00056	0.100					1	mg/L	lb/day					
Iron Cas No. 7439-89-6	X		0.15	26.8					1	mg/L	lb/day					
Magnesium Cas No. 7439-95-4	X		47.0	8,388					1	mg/L	lb/day					
Molybdenum Cas No. 7439-98-7	X		0.18	32.1					1	mg/L	lb/day					

EPA Identification Number *(copy from Item 1 of Form 1)* 110000493706											Outfall Number 001						
1. POLLUTANT	2. MARK (*X*)		2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Be-lieved Pre-sent	b. Be-lieved Ab-sent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
Manganese Cas No. 7439-96-5	X		100.0	17,848.0	34.0	6,066.4	1.2	203.0	162/47	mg/L	lb/day					
Tin Cas No. 74400-31-5		X	< 0.00050						1	mg/L						
Titanium Cas No. 7440-32-6		X	< 0.00370						1	mg/L						
OTHER CONVENTIONAL																
Kjeldahl Nitrogen, Total Cas No. E-10264	X		1.20	214					1	mg/L	lb/day					
Nitrate Cas No. 14797-55-8	X		1.90	339					1	mg/L	lb/day					
Nitrite Cas No. 14797-65-0	X		0.016	2.86					1	mg/L	lb/day					

EPA Identification Number *(copy from Item 1 of Form 1)*	110000493706	Outfall Number	001

Part C - If you are a primary industry and this outfall contains process wastewater, refer to Table 2C-2 in the instructions to determine which of the GC/MS fractions you must test for Mark "X" in column 2-a for all such GC/MS fractions that apply to your industry and for ALL toxic metals, cyanides, and total phenols. If you are not required to mark column 2-a (secondary industries, nonprocess wastewater outfalls, and nonrequired GC/MS fractions), mark "X" in column 2-b for each pollutant you know or have reason to believe is present. Mark "X" in column 2-c for each pollutant you believe is absent. Pollutants for which you mark column 2-a or 2-b, you must provide a minimum of twelve (12) samples (three (3) samples per month for a period of four (4) months). You must use, or require your contract laboratory to use, an analytical method with detection level low enough to provide a detectable value for the pollutant of concern. Please provide the method used and the detection limit achieved by the laboratory. You must provide data or an explanation for the presence of the pollutant in your discharge. Note that there are 7 pages to this part; please review each carefully. Complete one table (all 7 pages) for each outfall. See instructions for additional details and requirements.

1. POLLUTANT	2. MARK (*X*)			2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Testing Required	b. Believed Present	c. Believed Absent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis daily / monthly average	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
METALS																	
Antimony Cas No. 7440-36-0	X		X	< 0.0005						1	mg/L						
Arsenic Cas No. 7440-38-2	X	X		0.0051	0.9	0.0035	0.6	0.0049	2.3	162/47	mg/L	lb/day					
Beryllium Cas No. 7440-41-7	X		X	< 0.00011						1	mg/L						
Cadmium Cas No. 7440-43-9	X		X	< 0.00014						1	mg/L						
Chromium Cas No. 7440-47-3	X	X		0.021	3.75	0.007	1.31	0.0008	0.13	162/47	mg/L	lb/day					
Chromium, Hex. (dissolved) Cas No. 18540-29-9	X	X		0.0055	0.98					1	mg/L	lb/day					
Copper Cas No. 7440-50-8	X	X		0.016	2.86					1	mg/L	lb/day					
Lead Cas No. 7439-92-1	X		X	< 0.00026						1	mg/L						
Mercury Cas No. 7439-97-6	X	X		6.7	0.0012			2.3	0.00040	22	ng/L	lb/day					
Nickel Cas No. 7440-02-0	X	X		0.012	2.14					1	mg/L	lb/day					
Selenium Cas No. 7782-49-2	X	X		0.013	2.3	0.0127	2.3	0.0068	1.2	162/47	mg/L	lb/day					
Silver Cas No. 7440-22-4	X		X	< 0.00005						1	mg/L						
Thallium Cas No. 7440-28-0	X		X	< 0.00010						1	mg/L						
Vanadium Cas No. 7440-62-2	X	X		0.0016	0.29					1	mg/L	lb/day					
Zinc Cas No. 7440-66-6	X	X		0.4	70.3	0.1	24.2	0.029	4.9	162/47	mg/L	lb/day					
CYANIDE																	
Cyanide, Free Cas No. 57-12-5	X		X	< 0.91						1	ug/L						
Cyanide, Total Cas No. 57-12-5	X		X	< 4.0						1	ug/L						
TOTAL PHENOLS																	
Phenols, Total (4AAP) Cas No. E-10253	X		X	< 6.0						1	ug/L						
DIOXIN																	
2,3,7,8-Tetrachloro dibenzo-P-Dioxin Cas No. 1746-01-6	X		X	Negative						1	--						

EPA Identification Number *(copy from Item 1 of Form 1)* 110000493706 | Outfall Number 001

1. POLLUTANT	2. MARK (*X*)			2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*				5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Test-ing Re-quired	b. Be-lieved Pre-sent	c. Be-lieved Ab-sent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
OTHER																		
4-Methylphenol Cas No. 106-44-5	X		X	< 0.92						1	ug/L						
Acetaldehyde Cas No. 75-07-0	X		X	< 50						1	ug/L						
Bis(chloromethyl)ether Cas No. 542-88-1	X			Per 46 Federal Register 2264, this analyte was removed from the Priority Pollutant List.													
Dibutyl amine * Cas No. 111-92-2	X			No test method available for analysis.													
Dimethylpropyl phenol * Cas No. 80-46-6	X			No test method available for analysis.													
Formaldehyde Cas No. 5-00-0	X		X	< 50						1	ug/L						
Tributyl tin oxide * Cas No. 56-35-9	X			No test method available for analysis.													
VOLATILE ORGANIC																		
1,1,2,2-Tetrachloroethane Cas No. 79-34-5	X		X	< 0.32						1	ug/L						
1,1,2-Trichloroethane Cas No. 79-00-5	X		X	< 0.26						1	ug/L						
l,l,l-Trichloroethane Cas No. 71-55-6	X		X	< 0.23						1	ug/L						
1,1-Dichloroethane Cas No. 75-34-3	X		X	< 0.25						1	ug/L						
1,1-Dichloroethene Cas No. 75-35-4	X		X	< 0.23						1	ug/L						
1,2,4-Trimethylbenzene Cas No. 95-63-6	X		X	< 0.24						1	ug/L						
1,2-Dichlorethane Cas No. 107-06-2	X		X	< 0.38						1	ug/L						
1,2-Dichloroethene, Trans Cas No. 156-60-5	X		X	< 0.22						1	ug/L						
1,2-Dichloropropane Cas No. 78-87-5	X		X	< 0.19						1	ug/L						
1,3,5-Trimethylbenzene Cas No. 108-67-8	X		X	< 0.25						1	ug/L						
1,3-Dichloropropane Cas No. 142-28-9	X		X	< 0.29						1	ug/L						
1,3-Dichloropropene, Cis Cas No. 10061-01-5	X		X	< 0.26						1	ug/L						
1,3-Dichloropropene, Trans Cas No. 10061-02-6	X		X	< 0.26						1	ug/L						
1,3-Dichloropropylene Cas No. 542-75-6	X		X	< 0.26	Listed separately as cis and tras 1,3-dichloropropene					1	ug/L						
2-Butanone (Methyl Ethyl Ketone) Cas No. 78-93-3	X		X	< 0.18						1	ug/L						
2-Chloroethyl vinyl ether Cas No. 110-75-8	X		X	< 0.19						1	ug/L						
Acetone Cas No. 67-64-1	X	X		2.7	0.482					1	ug/L	lb/day					
Acrolein Cas No. 1070-20-8	X		X	< 2.20						1	ug/L						
Acrylonitrile Cas No. 107-13-1	X		X	< 1.90						1	ug/L						
Benzene Cas No. 71-43-2	X		X	< 0.15						1	ug/L						
Bromoform Cas No. 75-25-2	X		X	< 0.25						1	ug/L						

EPA Identification Number *(copy from Item 1 of Form 1)* 110000493706 | Outfall Number 001

1. POLLUTANT	2. MARK (*X*) a. Test-ing Re-quired	b. Be-lieved Pre-sent	c. Be-lieved Ab-sent	2. EFFLUENT a. Maximum Daily Values (1) Concentration	a. (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. (2) Mass	d. No. of Analysis	3. UNITS *(specify if blank)* a. Concentration	b. Mass	4. INTAKE *(optional)* a. Long Term Average Value *(if available)* (1) Concentration	a. (2) Mass	b. No. of Analysis	5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)* a. Method	b. **Reporting** Limit
Carbon disulfide Cas No. 75-15-0	X		X	< 0.22						1	ug/L						
Carbon Tetrachloride Cas No. 56-23-5	X		X	< 0.25						1	ug/L						
Chlorobenzene Cas No. 108-90-7	X		X	< 0.26						1	ug/L						
Chlorodibromomethane Cas No. 124-48-1	X		X	< 0.24						1	ug/L						
Chloroethane Cas No. 75-00-3	X		X	< 0.22						1	ug/L						
Dichlorobromomethane Cas No. 75-27-4	X		X	< 0.21						1	ug/L						
Dichlorodifluoromethane Cas No. 75-71-8	X			Per 46 Federal Register 2264, this analyte was removed from the Priority Pollutant List.													
Ethylbenzene Cas No. 100-41-4	X		X	< 0.25						1	ug/L						
Ethylene glycol Cas No. 107-21-1	X		X	< 5	Sample was analyzed past holding time.					1	mg/L						
Methanol Cas No. 67-56-1	X		X	< 1						1	mg/L						
Methyl Bromide (Bromomethane) Cas No. 74-83-9	X		X	< 0.29						1	ug/L						
Methyl chloride (Chloromethane) Cas No. 74-87-3	X		X	< 0.24						1	ug/L						
Methyl tert-butyl ether (MTBE) Cas No. 1634-04-4	X		X	< 0.26						1	ug/L						
Methylamine * Cas No. 74-89-5	X			No test method available for analysis.													
Methylene chloride Cas No. 75-09-2	X		X	< 10						1	ug/L						
Propylene glycol Cas No. 57-55-6	X		X	< 5	Sample was analyzed past holding time.					1	mg/L						
Tetrachloroethene Cas No. 127-18-4	X		X	< 0.26						1	ug/L						
Trichloroethene Cas No. 79-01-6	X		X	< 0.26						1	ug/L						
Trichlorofluoromethane Cas No. 75-69-4	X			Per 46 Federal Register 2264, this analyte was removed from the Priority Pollutant List.													
Toluene Cas No. 108-88-3	X		X	< 0.30						1	ug/L						
Vinyl chloride Cas No. 75-01-4	X		X	< 0.26						1	ug/L						
Xylene Cas No. 1330-20-7	X		X	< 0.75						1	ug/L						
SEMI-VOLATILE ORGANIC-ACID																	
2,4-Dichlorophenol Cas No. 120-83-2	X		X	< 0.68						1	ug/L						
2,4-Dimethylphenol Cas No. 105-67-9	X		X	< 0.76						1	ug/L						
2,4-Dinitrophenol Cas No. 51-28-5	X		X	< 0.33						1	ug/L						
2,4.6-Trichlorophenol Cas No. 88-06-2	X		X	< 0.82						1	ug/L						

EPA Identification Number *(copy from Item 1 of Form 1)* 110000493706 | Outfall Number 001

1. POLLUTANT	2. MARK (*X*)			2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Test-ing Re-quired	b. Be-lieved Pre-sent	c. Be-lieved Ab-sent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
2-Chlorophenol Cas No. 95-57-8	X		X	< 0.80						1	ug/L						
2-Nitrophenol Cas No. 88-75-5	X		X	< 1.00						1	ug/L						
4-Nitrophenol Cas No. 100-02-7	X		X	< 0.92						1	ug/L						
4,6-Dinitro-o-cresol (2-methyl-4,6-dinitrophenol) Cas No. 534-52-1	X		X	< 0.38						1	ug/L						
Benzoic acid Cas No. 65-85-0	X		X	< 0.56						1	ug/L						
p-Chloro-m-cresol (4-chloro-3-methylphenol) Cas No. 59-50-7	X		X	< 0.84						1	ug/L						
Pentachlorophenol Cas No. 87-86-5	X		X	< 0.34						1	ug/L						
Phenol Cas No. 108-95-2	X		X	< 0.41						1	ug/L						
SEMI-VOLATILE ORGANIC-BASE																	
1,2,4-Trichlorobenzene Cas No. 120-82-1	X		X	< 0.66						1	ug/L						
1,2-Dichlorobenzene Cas No. 95-50-1	X		X	< 0.81						1	ug/L						
1,2-Diphenylhydrazine Cas No. 122-66-7	X		X	< 1.10						1	ug/L						
1,3-Dichlorobenzene Cas No. 541-73-1	X		X	< 0.71						1	ug/L						
1,4-Dichlorobenzene Cas No. 106-46-7	X		X	< 0.69						1	ug/L						
2-Chloronaphthalene Cas No. 91-58-7	X		X	< 0.79						1	ug/L						
2-Methylnaphthalene Cas No. 91-57-6	X		X	< 0.77						1	ug/L						
2.4-Dinitrotoluene Cas No. 121-14-2	X		X	< 0.52						1	ug/L						
2.6-Dinitrotoluene Cas No. 606-20-2	X		X	< 0.63						1	ug/L						
3,3-Dichlorobenzidine Cas No. 91-94-1	X		X	< 1.40						1	ug/L						
3,4-Benzofluoranthene (benzo(b)fluoranthene) Cas No. 205-99-2	X		X	< 0.0067						1	ug/L						
4-Bromophenyl phenyl ether Cas No. 101-55-3	X		X	< 0.74						1	ug/L						
4-Chlorophenyl phenyl ether Cas No. 7005-72-3	X		X	< 0.77						1	ug/L						
Acenaphthene Cas No. 83-32-9	X		X	< 0.013						1	ug/L						
Acenaphthylene Cas No. 208-96-8	X		X	< 0.0033						1	ug/L						
Anthracene Cas No. 120-12-7	X		X	< 0.0078						1	ug/L						
Benzidine Cas No. 92-87-5	X		X	< 56.00						1	ug/L						
Benzo(a)anthracene Cas No. 56-55-3	X		X	< 0.0044						1	ug/L						
Benzo(a)pyrene Cas No. 50-32-8	X		X	< 0.0067						1	ug/L						

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1. POLLUTANT	2. MARK (*X*)			2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Test-ing Re-quired	b. Be-lieved Pre-sent	c. Be-lieved Ab-sent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
Benzo(ghi)perylene Cas No. 191-24-2	X		X	< 0.0056						1	ug/L						
Benzo(k)fluoranthene Cas No. 207-06-9	X		X	< 0.0078						1	ug/L						
Bis(2-chloroethoxy)methane Cas No. 111-91-1	X		X	< 0.94						1	ug/L						
Bis(2-chloroethyl) ether Cas No. 111-44-4	X		X	< 0.86						1	ug/L						
Bis(2-chloroisopropyl) ether Cas No. 108-60-1	X		X	< 0.76						1	ug/L						
Bis(2-ethylhexyl)phthalate Cas No. 117-81-7	X		X	< 1.30						1	ug/L						
Butyl benzyl phthalate Cas No. 85-68-7	X		X	< 1.00						1	ug/L						
Chrysene Cas No. 218-01-9	X		X	< 0.0067						1	ug/L						
Di-n-butyl phthalate Cas No. 84-74-2	X		X	< 0.91						1	ug/L						
Di-n-octyl phthalate Cas No. 117-84-0	X		X	< 0.78						1	ug/L						
Dibenzo(a,h)anthracene Cas No. 53-70-3	X		X	< 0.0067						1	ug/L						
Dibenzofuran Cas No. 132-64-9	X		X	< 0.76						1	ug/L						
Diethylphthalate Cas No. 84-66-2	X		X	< 1.40						1	ug/L						
Dimethylphthalate Cas No. 131-11-3	X		X	< 0.76						1	ug/L						
Fluoranthene Cas No. 206-44-0	X		X	< 0.0056						1	ug/L						
Fluorene Cas No. 86-73-7	X		X	< 0.0044						1	ug/L						
Hexachlorobenzene Cas No. 118-74-1	X		X	< 1.10						1	ug/L						
Hexachlorobutadiene Cas No. 87-68-3	X		X	< 1.10						1	ug/L						
Hexachlorocyclopentadiene Cas No. 77-47-4	X		X	< 0.44						1	ug/L						
Hexachloroethane Cas No. 67-72-1	X		X	< 1.10						1	ug/L						
Indeno(1,2,3-cd) Pyrene Cas No. 193-39-5	X		X	< 0.0044						1	ug/L						
Isophorone Cas No. 78-59-1	X		X	< 0.89						1	ug/L						
N-nitrosodi-n-propyl amine Cas No. 621-64-7	X		X	< 1.10						1	ug/L						
N-nitrosodimethyl amine Cas No. 62-75-9	X		X	< 1.00						1	ug/L						
N-nitrosodiphenyl amine Cas No. 86-30-6	X			< 0.80						1	ug/L						
Naphthalene Cas No. 91-20-3	X		X	< 0.01						1	ug/L						
Nitrobenzene Cas No. 98-95-3	X		X	< 0.88						1	ug/L						
Phenanthrene Cas No. 85-01-8	X		X	< 0.0078						1	ug/L						
Pyrene Cas No. 129-00-0	X		X	< 0.0056						1	ug/L						

EPA Identification Number *(copy from Item 1 of Form 1)* 110000493706 | Outfall Number 001

1. POLLUTANT	2. MARK (*X*)			2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Test-ing Re-quired	b. Be-lieved Pre-sent	c. Be-lieved Ab-sent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
Styrene Cas No. 100-42-5	X		X	< 0.22						1	ug/L						
PESTICIDES																	
2,4-Dichlorophenoxy Acetic Acid Cas No. 94-75-7			X														
Alachlor Cas No. 15972-60-8			X														
Aldrin Cas No. 309-00-2			X														
Atrazine Cas No. 1912-24-9			X														
BHC-Alpha Cas No. 319-84-6			X														
BHC-Beta Cas No. 319-85-7			X														
BHC-Gamma (Lindane) Cas No. 58-89-9			X														
BHC-Delta Cas No. 319-86-8			X														
Chlordane Cas No. 57-74-9			X														
DDD Cas No. 72-54-8			X														
DDE Cas No. 72-55-9			X														
DDT Cas No. 50-29-3			X														
Dieldrin Cas No. 60-57-1			X														
Endosulfan Sulfate Cas No. 1031-07-8			X														
Endosulfan, Alpha Cas No. 959-98-8			X														
Endosulfan, Beta Cas No. 33213-65-9			X														
Endrin Cas No. 72-20-8			X														
Endrin Aldehyde Cas No. 7421-93-4			X														
Heptachlor Cas No. 76-44-8			X														
Heptachlor Epoxide Cas No. 1024-57-3			X														
Methoxychlor Cas No. 72-43-5			X														
Metolachlor Cas No. 51218-45-2			X														
Mirex Cas No. 2385-85-5			X														
Parathion ethyl Cas No. 56-38-2			X														
Parathion methyl Cas No. 56-38-2			X														
Simazine Cas No. 122-34-9			X														

EPA Identification Number *(copy from Item 1 of Form 1)* 110000493706

Outfall Number 001

1. POLLUTANT	2. MARK (*X*) a. Test-ing Re-quired	2. MARK (*X*) b. Be-lieved Pre-sent	2. MARK (*X*) c. Be-lieved Ab-sent	2. EFFLUENT a. Maximum Daily Values (1) Concentration	2. EFFLUENT a. Maximum Daily Values (2) Mass	2. EFFLUENT b. Maximum 30 Day Values *(if available)* (1) Concentration	2. EFFLUENT b. Maximum 30 Day Values *(if available)* (2) Mass	2. EFFLUENT c. Long Term Average *(if available)* (1) Concentration	2. EFFLUENT c. Long Term Average *(if available)* (2) Mass	2. EFFLUENT d. No. of Analysis	3. UNITS *(specify if blank)* a. Concentration	3. UNITS *(specify if blank)* b. Mass	4. INTAKE *(optional)* a. Long Term Average Value *(if available)* (1) Concentration	4. INTAKE *(optional)* a. Long Term Average Value *(if available)* (2) Mass	4. INTAKE *(optional)* b. No. of Analysis	5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)* a. Method	5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)* b. **Reporting** Limit
PCB-1242 Cas No. 534469-21-9			X	< 0.43				< 0.253		2	ug/L						
PCB-1254 Cas No. 11097-69-1			X	< 0.43				< 0.290		2	ug/L						
PCB-1221 Cas No. 11104-28-2			X	< 0.43				< 0.405		2	ug/L						
PCB-1232 Cas No. 11141-16-5			X	< 0.43				< 0.285		2	ug/L						
PCB-1248 Cas No. 12672-29-6			X	< 0.43				< 0.237		2	ug/L						
PCB-1260 Cas No. 11096-82-5			X	< 0.43				< 0.295		2	ug/L						
PCB-1016 Cas No. 12674-11-2			X	< 0.43				< 0.285		2	ug/L						
Toxaphene Cas No. 8001-35-2																	
WHOLE EFFLUENT TOXICITY																	
Acute, Freshwater Organisms Cas No. I-1100			X														
Chronic Freshwater Organisms Cas No. I-1101			X														

ADDITIONAL ANALYSES																	
Chloroform			X	< 0.26						1	ug/L						

EPA Identification Number *(copy from Item 1 of Form 1)* 110000493706

V. INTAKE AND EFFLUENT CHARACTERISTICS (Continued from page 3)

OUTFALL NO. 101

PART A - You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

1. POLLUTANT	2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Maximum Daily Values		b. Maximum 30 Day Values *(if available)*		c. Long Term Average *(if available)*		d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)*		b. No. of Analysis	a. Method	b. **Reporting** Limit
	(1) Concentration	(2) Mass	(1) Concentration	(2) Mass	(1) Concentration	(2) Mass				(1) Concentration	(2) Mass			
a. Biochemical Oxygen Demand, Carbonaceous Cas No. E10106	57.1	4.4	35.9	2.3	4.8	0.2	99/47	mg/L	lb/day					
b. Escherichia coli (E-coli - units in count/100ml) Cas No. I-1000	>2419.6						1	MPN/100mL						
Fecal coliform (units in count/100 ml) Cas No. I-1000	>600						1	cfu/100mL						
Chemical Oxygen Demand (COD) Cas No. E10107	66.0	1.9					1	mg/L	lb/day					
Dissolved Oxygen (DO) Cas No. E-14539	9.08						1	mg/L						
Total Dissolved Solids (TDS) Cas No. E-10173	510.0	14.9					1	mg/L	lb/day					
Total Organic Carbon (TOC) Cas No. E-10195	7.0	0.20					1	mg/L	lb/day					
Total Suspended Solids (TSS) Cas No. E-10162	67.6	17.2	30.5	8.7	14.2	0.9	98/47	mg/L	lb/day					
Ammonia (as N) Cas No. 7664-41-7	0.08	0.002					1	mg/L	lb/day					
Flow	VALUE 0.3		VALUE 0.15		VALUE 0.009		113/47	MGD		VALUE				
Temperature (Winter) Cas No. E-14540	VALUE 50.1		VALUE		VALUE		1	F		VALUE				
Temperature (Summer) Cas No. E-14540	VALUE		VALUE		VALUE					VALUE				
Hardness, Total (as (CaCO3) Cas No. E-11778	240.0	7.006					1	mg/L	lb/day					
pH (S.U.) Cas No. E-10139	MINIMUM	MAXIMUM 7.1	MINIMUM	MAXIMUM			1	s.u.						

EPA Identification Number *(copy from Item 1 of Form 1)* 110000493706 | Outfall Number 101

PART B - Mark "X" in column 2-a for each pollutant you know or have reason to believe is present. Mark "X" in column 2-b for each pollutant you believe to be absent. Pollutants for which you mark column 2-a , you must provide a minimum of twelve (12) samples (three (3) samples per month for a period of four (4) months). You must use, or require your contract laboratory to use, an analytical method with detection level low enough to provide a detectable value for the pollutant of concern. Please provide the method used and detection limit achieved by the laboratory. You must provide data or an explanation for the presence of the pollutant in your discharge. Complete one table for each outfall. See the instructions for additional details and requirements.

1. POLLUTANT	2. MARK (*X*)		2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Be-lieved Pre-sent	b. Be-lieved Ab-sent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
Bromide Cas No. 7726-95-6		X	< 0.5						1	mg/L						
Chloride Cas No. 1688-70-6	X		82.0	2.39					1	mg/L	lb/day					
Chlorine, Total Residual Cas No. 7782-50-5		X	< 0.02						1	mg/L						
Color (C.U.) Cas No. E-11712	X		30.0						1	CU						
Fluoride Cas No. 16984-48-8	X		0.47	0.014					1	mg/L	lb/day					
Nitrate/Nitrite (as N) Cas No. E-10128	X		35.0	1.02					1	mg/L	lb/day					
Nitrogen, Total Organic (as N) Cas No. 7727-37-9		X	< 0.32						1	mg/L						
Oil & Grease Cas No. E-10140		X	< 5.0						1	mg/L						
Phosphorus, Total Cas No. 7723-14-0	X		1.0	0.030					1	mg/L	lb/day					
Radioactivity																
(1) Radioactivity: Alpha, Total (pCi/L) Cas No. 12587-46-1		X	---	---												
(2) Radioactivity: Beta, Total (pCi/L) Cas No. 12587-47-2		X	---	---												
(3) Radioactivity: Radium ,Total (pCi/L) Cas No. 13982-63-3		X	---	---												
(4) Radioactivity: Radium 226,Total (pCi/L) Cas No. 13982-63-3		X	---	---												
Sulfate (as SO4) Cas No. 14808-79-8	X		94.9	2.77					1	mg/L	lb/day					
Sulfide (as S) Cas No. 18496-25-8	X		0.027	0.0008					1	mg/L	lb/day					
Sulfite (as SO3) Cas No. 14264-45-3		X	< 1.0	Sample was analyzed past holding time					1	mg/L						
Surfactants (MBAS) Cas No. 61-73-4		X	< 0.2						1	mg/L						
Aluminum Cas No. 7429-90-5	X		0.180	0.005					1	mg/L	lb/day					
Barium Cas No. 7440-39-3	X		0.036	0.0011					1	mg/L	lb/day					
Boron Cas No. 7440-42-8	X		0.4	0.012					1	mg/L	lb/day					
Cobalt Cas No. 7440-48-4	X		0.00072	0.000021					1	mg/L	lb/day					
Iron Cas No. 7439-89-6	X		0.43	0.013					1	mg/L	lb/day					
Magnesium Cas No. 7439-95-4	X		17.0	0.50					1	mg/L	lb/day					
Molybdenum Cas No. 7439-98-7	X		0.015	0.0004					1	mg/L	lb/day					

EPA Identification Number *(copy from Item 1 of Form 1)* 110000493706										Outfall Number 101						
1. POLLUTANT	2. MARK (*X*)		2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Be-lieved Pre-sent	b. Be-lieved Ab-sent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
Manganese Cas No. 7439-96-5	X		0.08	0.0023					1	mg/L	lb/day					
Tin Cas No. 74400-31-5		X	< 0.0005						1	mg/L						
Titanium Cas No. 7440-32-6	X		0.0091	0.00027					1	mg/L	lb/day					
OTHER CONVENTIONAL																
Kjeldahl Nitrogen, Total Cas No. E-10264		X	< 0.44						1	mg/L						
Nitrate Cas No. 14797-55-8	X		35.0	1.02					1	mg/L	lb/day					
Nitrite Cas No. 14797-65-0		X	< 0.016						1	mg/L						

EPA Identification Number *(copy from Item 1 of Form 1)*	110000493706	Outfall Number	101

Part C - If you are a primary industry and this outfall contains process wastewater, refer to Table 2C-2 in the instructions to determine which of the GC/MS fractions you must test for Mark "X" in column 2-a for all such GC/MS fractions that apply to your industry and for ALL toxic metals, cyanides, and total phenols. If you are not required to mark column 2-a (secondary industries, nonprocess wastewater outfalls, and nonrequired GC/MS fractions), mark "X" in column 2-b for each pollutant you know or have reason to believe is present. Mark "X" in column 2-c for each pollutant you believe is absent. Pollutants for which you mark column 2-a or 2-b, you must provide a minimum of twelve (12) samples (three (3) samples per month for a period of four (4) months). You must use, or require your contract laboratory to use, an analytical method with detection level low enough to provide a detectable value for the pollutant of concern. Please provide the method used and the detection limit achieved by the laboratory. You must provide data or an explanation for the presence of the pollutant in your discharge. Note that there are 7 pages to this part; please review each carefully. Complete one table (all 7 pages) for each outfall. See instructions for additional details and requirements.

1. POLLUTANT	2. MARK (*X*)			2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Testing Required	b. Believed Present	c. Believed Absent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis daily / monthly average	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
METALS																	
Antimony Cas No. 7440-36-0	X		X	< 0.0005						1	mg/L						
Arsenic Cas No. 7440-38-2	X	X		0.0054	0.00016					1	mg/L	lb/day					
Beryllium Cas No. 7440-41-7	X		X	< 0.00011						1	mg/L						
Cadmium Cas No. 7440-43-9	X		X	< 0.00014						1	mg/L						
Chromium Cas No. 7440-47-3	X	X		0.00082	0.00002					1	mg/L	lb/day					
Chromium, Hex. (dissolved) Cas No. 18540-29-9	X	X		0.0075	0.00022					1	mg/L	lb/day					
Copper Cas No. 7440-50-8	X	X		0.039	0.0011					1	mg/L	lb/day					
Lead Cas No. 7439-92-1	X	X		0.0010	0.00003					1	mg/L	lb/day					
Mercury Cas No. 7439-97-6	X		X	< 0.000093						1	mg/L						
Nickel Cas No. 7440-02-0	X	X		0.0045	0.00013					1	mg/L	lb/day					
Selenium Cas No. 7782-49-2	X		X	< 0.00055						1	mg/L						
Silver Cas No. 7440-22-4	X	X		0.00010	0.0000029					1	mg/L	lb/day					
Thallium Cas No. 7440-28-0	X		X	< 0.00010						1	mg/L						
Vanadium Cas No. 7440-62-2	X	X		0.0020	0.00006					1	mg/L	lb/day					
Zinc Cas No. 7440-66-6	X	X		0.16	0.0047					1	mg/L	lb/day					
CYANIDE																	
Cyanide, Free Cas No. 57-12-5	X	X		1.1	0.00003					1	ug/L	lb/day					
Cyanide, Total Cas No. 57-12-5	X		X	< 4						1	ug/L						
TOTAL PHENOLS																	
Phenols, Total (4AAP) Cas No. E-10253	X		X	< 6						1	mg/L						
DIOXIN																	
2,3,7,8-Tetrachloro dibenzo-P-Dioxin Cas No. 1746-01-6			X														

EPA Identification Number *(copy from Item 1 of Form 1)*	110000493706	Outfall Number	101

1. POLLUTANT	2. MARK (*X*)			2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Test-ing	b. Be-lieved	c. Be-lieved	a. Maximum Daily Values		b. Maximum 30 Day Values *(if available)*		c. Long Term Average *(if available)*		d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)*		b. No. of Analysis	a. Method	b. **Reporting** Limit
	Re-quired	Pre-sent	Ab-sent	(1) Concentration	(2) Mass	(1) Concentration	(2) Mass	(1) Concentration	(2) Mass				(1) Concentration	(2) Mass			
OTHER																	
4-Methylphenol Cas No. 106-44-5			X														
Acetaldehyde Cas No. 75-07-0			X														
Bis(chloromethyl)ether Cas No. 542-88-1			X														
Dibutyl amine * Cas No. 111-92-2			X														
Dimethylpropyl phenol * Cas No. 80-46-6			X														
Formaldehyde Cas No. 5-00-0			X														
Tributyl tin oxide * Cas No. 56-35-9			X														
VOLATILE ORGANIC																	
1,1,2,2-Tetrachloroethane Cas No. 79-34-5			X														
1,1,2-Trichloroethane Cas No. 79-00-5			X														
l,l,l-Trichloroethane Cas No. 71-55-6			X														
1,1-Dichloroethane Cas No. 75-34-3			X														
1,1-Dichloroethene Cas No. 75-35-4			X														
1,2,4-Trimethylbenzene Cas No. 95-63-6			X														
1,2-Dichlorethane Cas No. 107-06-2			X														
1,2-Dichloroethene, Trans Cas No. 156-60-5			X														
1,2-Dichloropropane Cas No. 78-87-5			X														
1,3,5-Trimethylbenzene Cas No. 108-67-8			X														
1,3-Dichloropropane Cas No. 142-28-9			X														
1,3-Dichloropropene, Cis Cas No. 10061-01-5			X														
1,3-Dichloropropene, Trans Cas No. 10061-02-6			X														
1,3-Dichloropropylene Cas No. 542-75-6			X														
2-Butanone (Methyl Ethyl Ketone) Cas No. 78-93-3			X														
2-Chloroethyl vinyl ether Cas No. 110-75-8			X														
Acetone Cas No. 67-64-1			X														
Acrolein Cas No. 1070-20-8			X														
Acrylonitrile Cas No. 107-13-1			X														
Benzene Cas No. 71-43-2			X														
Bromoform Cas No. 75-25-2			X														

EPA Identification Number *(copy from Item 1 of Form 1)* 110000493706 | Outfall Number 101

1. POLLUTANT	2. MARK (*X*)			2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Test-ing Re-quired	b. Be-lieved Pre-sent	c. Be-lieved Ab-sent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
Carbon disulfide Cas No. 75-15-0			X														
Carbon Tetrachloride Cas No. 56-23-5			X														
Chlorobenzene Cas No. 108-90-7			X														
Chlorodibromomethane Cas No. 124-48-1			X														
Chloroethane Cas No. 75-00-3			X														
Dichlorobromomethane Cas No. 75-27-4			X														
Dichlorodifluoromethane Cas No. 75-71-8			X														
Ethylbenzene Cas No. 100-41-4			X														
Ethylene glycol Cas No. 107-21-1			X														
Methanol Cas No. 67-56-1			X														
Methyl Bromide (Bromomethane) Cas No. 74-83-9			X														
Methyl chloride (Chloromethane) Cas No. 74-87-3			X														
Methyl tert-butyl ether (MTBE) Cas No. 1634-04-4			X														
Methylamine * Cas No. 74-89-5			X														
Methylene chloride Cas No. 75-09-2			X														
Propylene glycol Cas No. 57-55-6			X														
Tetrachloroethene Cas No. 127-18-4			X														
Trichloroethene Cas No. 79-01-6			X														
Trichlorofluoromethane Cas No. 75-69-4			X														
Toluene Cas No. 108-88-3			X														
Vinyl chloride Cas No. 75-01-4			X														
Xylene Cas No. 1330-20-7			X														
SEMI-VOLATILE ORGANIC-ACID																	
2,4-Dichlorophenol Cas No. 120-83-2			X														
2,4-Dimethylphenol Cas No. 105-67-9			X														
2,4-Dinitrophenol Cas No. 51-28-5			X														
2,4.6-Trichlorophenol Cas No. 88-06-2			X														

EPA Identification Number *(copy from Item 1 of Form 1)* 110000493706

Outfall Number 101

1. POLLUTANT	2. MARK (*X*)			2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Test-ing Re-quired	b. Be-lieved Pre-sent	c. Be-lieved Ab-sent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
2-Chlorophenol Cas No. 95-57-8			X														
2-Nitrophenol Cas No. 88-75-5			X														
4-Nitrophenol Cas No. 100-02-7			X														
4,6-Dinitro-o-cresol (2-methyl-4,6-dinitrophenol) Cas No. 534-52-1			X														
Benzoic acid Cas No. 65-85-0			X														
p-Chloro-m-cresol (4-chloro-3-methylphenol) Cas No. 59-50-7			X														
Pentachlorophenol Cas No. 87-86-5			X														
Phenol Cas No. 108-95-2			X														
SEMI-VOLATILE ORGANIC-BASE																	
1,2,4-Trichlorobenzene Cas No. 120-82-1			X														
1,2-Dichlorobenzene Cas No. 95-50-1			X														
1,2-Diphenylhydrazine Cas No. 122-66-7			X														
1,3-Dichlorobenzene Cas No. 541-73-1			X														
1,4-Dichlorobenzene Cas No. 106-46-7			X														
2-Chloronaphthalene Cas No. 91-58-7			X														
2-Methylnaphthalene Cas No. 91-57-6			X														
2.4-Dinitrotoluene Cas No. 121-14-2			X														
2.6-Dinitrotoluene Cas No. 606-20-2			X														
3,3-Dichlorobenzidine Cas No. 91-94-1			X														
3,4-Benzofluoranthene (benzo(b)fluoranthene) Cas No. 205-99-2			X														
4-Bromophenyl phenyl ether Cas No. 101-55-3			X														
4-Chlorophenyl phenyl ether Cas No. 7005-72-3			X														
Acenaphthene Cas No. 83-32-9			X														
Acenaphthylene Cas No. 208-96-8			X														
Anthracene Cas No. 120-12-7			X														
Benzidine Cas No. 92-87-5			X														
Benzo(a)anthracene Cas No. 56-55-3			X														
Benzo(a)pyrene Cas No. 50-32-8			X														

EPA Identification Number *(copy from Item 1 of Form 1)* 110000493706 | Outfall Number 101

1. POLLUTANT	2. MARK (*X*)			2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Test-ing Re-quired	b. Be-lieved Pre-sent	c. Be-lieved Ab-sent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
Benzo(ghi)perylene Cas No. 191-24-2			X														
Benzo(k)fluoranthene Cas No. 207-06-9			X														
Bis(2-chloroethoxy)methane Cas No. 111-91-1			X														
Bis(2-chloroethyl) ether Cas No. 111-44-4			X														
Bis(2-chloroisopropyl) ether Cas No. 108-60-1			X														
Bis(2-ethylhexyl)phthalate Cas No. 117-81-7			X														
Butyl benzyl phthalate Cas No. 85-68-7			X														
Chrysene Cas No. 218-01-9			X														
Di-n-butyl phthalate Cas No. 84-74-2			X														
Di-n-octyl phthalate Cas No. 117-84-0			X														
Dibenzo(a,h)anthracene Cas No. 53-70-3			X														
Dibenzofuran Cas No. 132-64-9			X														
Diethylphthalate Cas No. 84-66-2			X														
Dimethylphthalate Cas No. 131-11-3			X														
Fluoranthene Cas No. 206-44-0			X														
Fluorene Cas No. 86-73-7			X														
Hexachlorobenzene Cas No. 118-74-1			X														
Hexachlorobutadiene Cas No. 87-68-3			X														
Hexachlorocyclopentadiene Cas No. 77-47-4			X														
Hexachloroethane Cas No. 67-72-1			X														
Indeno(1,2,3-cd) Pyrene Cas No. 193-39-5			X														
Isophorone Cas No. 78-59-1			X														
N-nitrosodi-n-propyl amine Cas No. 621-64-7			X														
N-nitrosodimethyl amine Cas No. 62-75-9			X														
N-nitrosodiphenyl amine Cas No. 86-30-6			X														
Naphthalene Cas No. 91-20-3			X														
Nitrobenzene Cas No. 98-95-3			X														
Phenanthrene Cas No. 85-01-8			X														
Pyrene Cas No. 129-00-0			X														

EPA Identification Number *(copy from Item 1 of Form 1)* 110000493706 | Outfall Number 101

1. POLLUTANT	2. MARK (*X*)			2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Test-ing Re-quired	b. Be-lieved Pre-sent	c. Be-lieved Ab-sent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
Styrene Cas No. 100-42-5			X														
PESTICIDES																	
2,4-Dichlorophenoxy Acetic Acid Cas No. 94-75-7			X														
Alachlor Cas No. 15972-60-8			X														
Aldrin Cas No. 309-00-2			X														
Atrazine Cas No. 1912-24-9			X														
BHC-Alpha Cas No. 319-84-6			X														
BHC-Beta Cas No. 319-85-7			X														
BHC-Gamma (Lindane) Cas No. 58-89-9			X														
BHC-Delta Cas No. 319-86-8			X														
Chlordane Cas No. 57-74-9			X														
DDD Cas No. 72-54-8			X														
DDE Cas No. 72-55-9			X														
DDT Cas No. 50-29-3			X														
Dieldrin Cas No. 60-57-1			X														
Endosulfan Sulfate Cas No. 1031-07-8			X														
Endosulfan, Alpha Cas No. 959-98-8			X														
Endosulfan, Beta Cas No. 33213-65-9			X														
Endrin Cas No. 72-20-8			X														
Endrin Aldehyde Cas No. 7421-93-4			X														
Heptachlor Cas No. 76-44-8			X														
Heptachlor Epoxide Cas No. 1024-57-3			X														
Methoxychlor Cas No. 72-43-5			X														
Metolachlor Cas No. 51218-45-2			X														
Mirex Cas No. 2385-85-5			X														
Parathion ethyl Cas No. 56-38-2			X														
Parathion methyl Cas No. 56-38-2			X														
Simazine Cas No. 122-34-9			X														

EPA Identification Number *(copy from Item 1 of Form 1)* 110000493706 | Outfall Number 101

1. POLLUTANT	2. MARK (*X*)			2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Test-ing Re-quired	b. Be-lieved Pre-sent	c. Be-lieved Ab-sent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
PCB-1242 Cas No. 534469-21-9			X														
PCB-1254 Cas No. 11097-69-1			X														
PCB-1221 Cas No. 11104-28-2			X														
PCB-1232 Cas No. 11141-16-5			X														
PCB-1248 Cas No. 12672-29-6			X														
PCB-1260 Cas No. 11096-82-5			X														
PCB-1016 Cas No. 12674-11-2			X														
Toxaphene Cas No. 8001-35-2			X														
WHOLE EFFLUENT TOXICITY																	
Acute, Freshwater Organisms Cas No. I-1100			X														
Chronic Freshwater Organisms Cas No. I-1101			X														

ADDITIONAL ANALYSES																	

EPA Identification Number *(copy from Item 1 of Form 1)* 110000493706

V. INTAKE AND EFFLUENT CHARACTERISTICS (Continued from page 3)

OUTFALL NO. 201

PART A - You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

1. POLLUTANT	2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Maximum Daily Values		b. Maximum 30 Day Values *(if available)*		c. Long Term Average *(if available)*		d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)*		b. No. of Analysis	a. Method	b. **Reporting** Limit
	(1) Concentration	(2) Mass	(1) Concentration	(2) Mass	(1) Concentration	(2) Mass				(1) Concentration	(2) Mass			
a. Biochemical Oxygen Demand, Carbonaceous Cas No. E10106	1.32	0.29					1	mg/L	lb/day					
b. Escherichia coli (E-coli - units in count/100ml) Cas No. I-1000	< 1.0						1	MPN/ 100 mL						
Fecal coliform (units in count/100 ml) Cas No. I-1000	TBD						1	cfu/100mL						
Chemical Oxygen Demand (COD) Cas No. E10107	110.0	25.7					1	mg/L	lb/day					
Dissolved Oxygen (DO) Cas No. E-14539	9.52						1	mg/L						
Total Dissolved Solids (TDS) Cas No. E-10173	11,000.0	2,567					1	mg/L	lb/day					
Total Organic Carbon (TOC) Cas No. E-10195	1.9	0.44					1	mg/L	lb/day					
Total Suspended Solids (TSS) Cas No. E-10162	45.0	11.1	28.1	10.6	6.0	2.6	97/48	mg/L	lb/day					
Ammonia (as N) Cas No. 7664-41-7	615.0	290.1	457.5	193.4	158.1	67.7	98/48	mg/L	lb/day					
Flow	VALUE 0.12		VALUE 0.1		VALUE 0.05		97/48	MGD		VALUE				
Temperature (Winter) Cas No. E-14540	VALUE 59		VALUE		VALUE		1	F		VALUE				
Temperature (Summer) Cas No. E-14540	VALUE		VALUE		VALUE					VALUE				
Hardness, Total (as (CaCO3) Cas No. E-11778	1,900.0	443					1	mg/L	lb/day					
pH (S.U.) Cas No. E-10139	MINIMUM 5.9	MAXIMUM 9.6	MINIMUM 7.1	MAXIMUM 9.3			97/48	S.U.						

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PART B - Mark "X" in column 2-a for each pollutant you know or have reason to believe is present. Mark "X" in column 2-b for each pollutant you believe to be absent. Pollutants for which you mark column 2-a , you must provide a minimum of twelve (12) samples (three (3) samples per month for a period of four (4) months). You must use, or require your contract laboratory to use, an analytical method with detection level low enough to provide a detectable value for the pollutant of concern. Please provide the method used and detection limit achieved by the laboratory. You must provide data or an explanation for the presence of the pollutant in your discharge. Complete one table for each outfall. See the instructions for additional details and requirements.

1. POLLUTANT	2. MARK (*X*)		2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Be-lieved Pre-sent	b. Be-lieved Ab-sent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
Bromide Cas No. 7726-95-6	X		65.0	15.2					1	mg/L	lb/day					
Chloride Cas No. 1688-70-6	X		7,113.0	3,138.2	6,549.0	2,971.7	2,379.8	1,007.9	97/48	mg/L	lb/day					
Chlorine, Total Residual Cas No. 7782-50-5		X	< 0.02						1	mg/L						
Color (C.U.) Cas No. E-11712	X		15.0						1	CU						
Fluoride Cas No. 16984-48-8	X		7.8	1.82					1	mg/L	lb/day					
Nitrate/Nitrite (as N) Cas No. E-10128	X		33.0	7.7					1	mg/L	lb/day					
Nitrogen, Total Organic (as N) Cas No. 7727-37-9	X		1.0	0.23					1	mg/L	lb/day					
Oil & Grease Cas No. E-10140	X		16.5	12.4	10.8	7.5	5.4	2.4	97/48	mg/L	lb/day					
Phosphorus, Total Cas No. 7723-14-0	X		0.056	0.01					1	mg/L	lb/day					
Radioactivity																
(1) Radioactivity: Alpha, Total (pCi/L) Cas No. 12587-46-1		X	---	---												
(2) Radioactivity: Beta, Total (pCi/L) Cas No. 12587-47-2		X	---	---												
(3) Radioactivity: Radium ,Total (pCi/L) Cas No. 13982-63-3		X	---	---												
(4) Radioactivity: Radium 226,Total (pCi/L) Cas No. 13982-63-3		X	---	---												
Sulfate (as SO4) Cas No. 14808-79-8	X		5,728	1,337					1	mg/L	lb/day					
Sulfide (as S) Cas No. 18496-25-8		X	< 0.015						1	mg/L						
Sulfite (as SO3) Cas No. 14264-45-3		X	< 1.0	Sample was analyzed past holding time.					1	mg/L						
Surfactants (MBAS) Cas No. 61-73-4		X	< 0.2						1	mg/L						
Aluminum Cas No. 7429-90-5		X	< 0.007						1	mg/L						
Barium Cas No. 7440-39-3	X		75.0	52.5	74.0	32.5	25.0	11.5	97/48	mg/L	lb/day					
Boron Cas No. 7440-42-8	X		34.0	7.9					1	mg/L	lb/day					
Cobalt Cas No. 7440-48-4	X		0.00034	0.00008					1	mg/L	lb/day					
Iron Cas No. 7439-89-6		X	< 0.0095						1	mg/L						
Magnesium Cas No. 7439-95-4	X		230.0	53.7					1	mg/L	lb/day					
Molybdenum Cas No. 7439-98-7	X		38.0	8.9					1	mg/L	lb/day					

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1. POLLUTANT	2. MARK (*X*)		2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Be-lieved Pre-sent	b. Be-lieved Ab-sent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
Manganese Cas No. 7439-96-5	X		2.3	1.0	2.0	0.6	0.1	0.1	97/48	mg/L	lb/day					
Tin Cas No. 74400-31-5		X	< 0.001						1	mg/L						
Titanium Cas No. 7440-32-6		X	< 0.0074						1	mg/L						
OTHER CONVENTIONAL																
Kjeldahl Nitrogen, Total Cas No. E-10264	X		46.0	10.7					1	mg/L	lb/day					
Nitrate Cas No. 14797-55-8	X		34.0	7.9					1	mg/L	lb/day					
Nitrite Cas No. 14797-65-0	X		0.56	0.13					1	mg/L	lb/day					

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Part C - If you are a primary industry and this outfall contains process wastewater, refer to Table 2C-2 in the instructions to determine which of the GC/MS fractions you must test for Mark "X" in column 2-a for all such GC/MS fractions that apply to your industry and for ALL toxic metals, cyanides, and total phenols. If you are not required to mark column 2-a (secondary industries, nonprocess wastewater outfalls, and nonrequired GC/MS fractions), mark "X" in column 2-b for each pollutant you know or have reason to believe is present. Mark "X" in column 2-c for each pollutant you believe is absent. Pollutants for which you mark column 2-a or 2-b, you must provide a minimum of twelve (12) samples (three (3) samples per month for a period of four (4) months). You must use, or require your contract laboratory to use, an analytical method with detection level low enough to provide a detectable value for the pollutant of concern. Please provide the method used and the detection limit achieved by the laboratory. You must provide data or an explanation for the presence of the pollutant in your discharge. Note that there are 7 pages to this part; please review each carefully. Complete one table (all 7 pages) for each outfall. See instructions for additional details and requirements.

1. POLLUTANT	2. MARK (*X*)			2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Testing Required	b. Believed Present	c. Believed Absent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis daily / monthly average	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
METALS																	
Antimony Cas No. 7440-36-0	X	X		0.00057	0.00013					1	mg/L	lb/day					
Arsenic Cas No. 7440-38-2	X	X		0.017	0.0094	0.015	0.0100	0.0069	0.0028	97/48	mg/L	lb/day					
Beryllium Cas No. 7440-41-7	X		X	< 0.00022						1	mg/L						
Cadmium Cas No. 7440-43-9	X	X		0.0073	0.0017					1	mg/L	lb/day					
Chromium Cas No. 7440-47-3	X	X		0.002	0.00047					1	mg/L	lb/day					
Chromium, Hex. (dissolved) Cas No. 18540-29-9	X		X	< 0.001						1	mg/L						
Copper Cas No. 7440-50-8	X	X		0.00078	0.00018					1	mg/L	lb/day					
Lead Cas No. 7439-92-1	X		X	< 0.00052						1	mg/L						
Mercury Cas No. 7439-97-6	X	X		265	0.00014			54.6	0.00001	24	ng/L	lb/day					
Nickel Cas No. 7440-02-0	X	X		0.00094	0.00022					1	mg/L	lb/day					
Selenium Cas No. 7782-49-2	X	X		2.90	0.94	2.25	0.79	0.77	0.32	97/48	mg/L	lb/day					
Silver Cas No. 7440-22-4	X		X	< 0.00010						1	mg/L						
Thallium Cas No. 7440-28-0	X		X	< 0.00021						1	mg/L						
Vanadium Cas No. 7440-62-2	X	X		0.00220	0.00051					1	mg/L	lb/day					
Zinc Cas No. 7440-66-6	X	X		0.084	0.030	0.052	0.020	0.013	0.010	96/48	mg/L	lb/day					
CYANIDE																	
Cyanide, Free Cas No. 57-12-5	X	X		13.0	0.0030					1	**ug/L**	lb/day					
Cyanide, Total Cas No. 57-12-5	X	X		11.0	0.0026					1	**ug/L**	lb/day					
TOTAL PHENOLS																	
Phenols, Total (4AAP) Cas No. E-10253	X		X	< 6						1	**ug/L**						
DIOXIN																	
2,3,7,8-Tetrachloro dibenzo-P-Dioxin Cas No. 1746-01-6	X		X	Negative													

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1. POLLUTANT	2. MARK (*X*)			2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Test-ing Re-quired	b. Be-lieved Pre-sent	c. Be-lieved Ab-sent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
OTHER																	
4-Methylphenol Cas No. 106-44-5	X		X	< 0.89						1	ug/L						
Acetaldehyde Cas No. 75-07-0	X		X	< 50						1	ug/L						
Bis(chloromethyl)ether Cas No. 542-88-1	X			Per 46 Federal Register 2264, this analyte was removed from the Priority Pollutants List.													
Dibutyl amine * Cas No. 111-92-2	X			No test method available for analysis													
Dimethylpropyl phenol * Cas No. 80-46-6	X			No test method available for analysis													
Formaldehyde Cas No. 5-00-0	X		X	< 50						1	ug/L						
Tributyl tin oxide * Cas No. 56-35-9	X			No test method available for analysis													
VOLATILE ORGANIC																	
1,1,2,2-Tetrachloroethane Cas No. 79-34-5	X		X	< 0.32						1	ug/L						
1,1,2-Trichloroethane Cas No. 79-00-5	X		X	< 0.26						1	ug/L						
l,l,l-Trichloroethane Cas No. 71-55-6	X		X	< 0.23						1	ug/L						
1,1-Dichloroethane Cas No. 75-34-3	X		X	< 0.25						1	ug/L						
1,1-Dichloroethene Cas No. 75-35-4	X		X	< 0.23						1	ug/L						
1,2,4-Trimethylbenzene Cas No. 95-63-6	X		X	< 0.24						1	ug/L						
1,2-Dichlorethane Cas No. 107-06-2	X		X	< 0.38						1	ug/L						
1,2-Dichloroethene, Trans Cas No. 156-60-5	X		X	< 0.22						1	ug/L						
1,2-Dichloropropane Cas No. 78-87-5	X		X	< 0.19						1	ug/L						
1,3,5-Trimethylbenzene Cas No. 108-67-8	X		X	< 0.25						1	ug/L						
1,3-Dichloropropane Cas No. 142-28-9	X		X	< 0.29						1	ug/L						
1,3-Dichloropropene, Cis Cas No. 10061-01-5	X		X	< 0.26						1	ug/L						
1,3-Dichloropropene, Trans Cas No. 10061-02-6	X		X	< 0.26						1	ug/L						
1,3-Dichloropropylene Cas No. 542-75-6	X		X	< 0.26	Reported separately as cis and trans 1,3-dichloropropene					1	ug/L						
2-Butanone (Methyl Ethyl Ketone) Cas No. 78-93-3	X		X	< 0.18						1	ug/L						
2-Chloroethyl vinyl ether Cas No. 110-75-8	X		X	< 0.19						1	ug/L						
Acetone Cas No. 67-64-1	X	X		6.2	0.0014					1	ug/L	lb/day					
Acrolein Cas No. 1070-20-8	X		X	< 2.20						1	ug/L						
Acrylonitrile Cas No. 107-13-1	X		X	< 1.90						1	ug/L						
Benzene Cas No. 71-43-2	X		X	< 0.15						1	ug/L						
Bromoform Cas No. 75-25-2	X	X		3.2	0.0007					1	ug/L	lb/day					

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1. POLLUTANT	2. MARK (*X*) a. Test-ing Re-quired	b. Be-lieved Pre-sent	c. Be-lieved Ab-sent	2. EFFLUENT a. Maximum Daily Values (1) Concentration	a. (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. (2) Mass	d. No. of Analysis	3. UNITS *(specify if blank)* a. Concentration	b. Mass	4. INTAKE *(optional)* a. Long Term Average Value *(if available)* (1) Concentration	a. (2) Mass	b. No. of Analysis	5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)* a. Method	b. **Reporting** Limit
Carbon disulfide Cas No. 75-15-0	X	X		40.0	0.009					1	ug/L	lb/day					
Carbon Tetrachloride Cas No. 56-23-5	X		X	< 0.25						1	ug/L						
Chlorobenzene Cas No. 108-90-7	X		X	< 0.26						1	ug/L						
Chlorodibromomethane Cas No. 124-48-1	X		X	< 0.24						1	ug/L						
Chloroethane Cas No. 75-00-3	X		X	< 0.22						1	ug/L						
Dichlorobromomethane Cas No. 75-27-4	X	X		0.47	0.00011					1	ug/L	lb/day					
Dichlorodifluoromethane Cas No. 75-71-8	X			Per 46 Federal Register 2264, this analyte was removed from the Priority Pollutants List.													
Ethylbenzene Cas No. 100-41-4	X		X	< 0.25						1	ug/L						
Ethylene glycol Cas No. 107-21-1	X		X	< 5	Sample was analyzed past holding time.					1	mg/L						
Methanol Cas No. 67-56-1	X		X	< 1						1	mg/L						
Methyl Bromide (Bromomethane) Cas No. 74-83-9	X		X	< 0.29						1	ug/L						
Methyl chloride (Chloromethane) Cas No. 74-87-3	X		X	< 0.24						1	ug/L						
Methyl tert-butyl ether (MTBE) Cas No. 1634-04-4	X		X	< 0.26						1	ug/L						
Methylamine * Cas No. 74-89-5	X			No test method available for analysis.													
Methylene chloride Cas No. 75-09-2	X		X	< 10						1	ug/L						
Propylene glycol Cas No. 57-55-6	X		X	< 5	Sample was analyzed past holding time.					1	mg/L						
Tetrachloroethene Cas No. 127-18-4	X		X	< 0.26						1	ug/L						
Trichloroethene Cas No. 79-01-6	X		X	< 0.26						1	ug/L						
Trichlorofluoromethane Cas No. 75-69-4	X			Per 46 Federal Register 2264, this analyte was removed from the Priority Pollutants List.													
Toluene Cas No. 108-88-3	X		X	< 0.30						1	ug/L						
Vinyl chloride Cas No. 75-01-4	X		X	< 0.26						1	ug/L						
Xylene Cas No. 1330-20-7	X		X	< 0.75						1	ug/L						
SEMI-VOLATILE ORGANIC-ACID																	
2,4-Dichlorophenol Cas No. 120-83-2	X		X	< 0.66						1	ug/L						
2,4-Dimethylphenol Cas No. 105-67-9	X		X	< 0.73						1	ug/L						
2,4-Dinitrophenol Cas No. 51-28-5	X		X	< 0.32						1	ug/L						
2,4.6-Trichlorophenol Cas No. 88-06-2	X		X	< 0.80						1	ug/L						

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1. POLLUTANT	2. MARK (*X*)			2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Test-ing Re-quired	b. Be-lieved Pre-sent	c. Be-lieved Ab-sent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
2-Chlorophenol Cas No. 95-57-8	X		X	< 0.77						1	ug/L						
2-Nitrophenol Cas No. 88-75-5	X		X	< 0.98						1	ug/L						
4-Nitrophenol Cas No. 100-02-7	X		X	< 0.89						1	ug/L						
4,6-Dinitro-o-cresol (2-methyl-4,6-dinitrophenol) Cas No. 534-52-1	X		X	< 0.37						1	ug/L						
Benzoic acid Cas No. 65-85-0	X		X	< 0.54						1	ug/L						
p-Chloro-m-cresol (4-chloro-3-methylphenol) Cas No. 59-50-7	X		X	< 0.82						1	ug/L						
Pentachlorophenol Cas No. 87-86-5	X		X	< 0.33						1	ug/L						
Phenol Cas No. 108-95-2	X		X	< 0.40						1	ug/L						
SEMI-VOLATILE ORGANIC-BASE																	
1,2,4-Trichlorobenzene Cas No. 120-82-1	X		X	< 0.63						1	ug/L						
1,2-Dichlorobenzene Cas No. 95-50-1	X		X	< 0.78						1	ug/L						
1,2-Diphenylhydrazine Cas No. 122-66-7	X		X	< 1.10						1	ug/L						
1,3-Dichlorobenzene Cas No. 541-73-1	X		X	< 0.69						1	ug/L						
1,4-Dichlorobenzene Cas No. 106-46-7	X		X	< 0.67						1	ug/L						
2-Chloronaphthalene Cas No. 91-58-7	X		X	< 0.76						1	ug/L						
2-Methylnaphthalene Cas No. 91-57-6	X		X	< 0.74						1	ug/L						
2.4-Dinitrotoluene Cas No. 121-14-2	X		X	< 0.51						1	ug/L						
2.6-Dinitrotoluene Cas No. 606-20-2	X		X	< 0.61						1	ug/L						
3,3-Dichlorobenzidine Cas No. 91-94-1	X		X	< 1.40						1	ug/L						
3,4-Benzofluoranthene (benzo(b)fluoranthene) Cas No. 205-99-2	X		X	< 0.0065						1	ug/L						
4-Bromophenyl phenyl ether Cas No. 101-55-3	X		X	< 0.72						1	ug/L						
4-Chlorophenyl phenyl ether Cas No. 7005-72-3	X		X	< 0.74						I	ug/L						
Acenaphthene Cas No. 83-32-9	X		X	< 0.013						1	ug/L						
Acenaphthylene Cas No. 208-96-8	X		X	< 0.0032						I	ug/L						
Anthracene Cas No. 120-12-7	X		X	< 0.0075						1	ug/L						
Benzidine Cas No. 92-87-5	X		X	< 54						I	ug/L						
Benzo(a)anthracene Cas No. 56-55-3	X		X	< 0.0043						1	ug/L						
Benzo(a)pyrene Cas No. 50-32-8	X		X	< 0.0065						I	ug/L						

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	a. Test-ing Re-quired	b. Be-lieved Pre-sent	c. Be-lieved Ab-sent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
Benzo(ghi)perylene Cas No. 191-24-2	X		X	< 0.0054						1	ug/L						
Benzo(k)fluoranthene Cas No. 207-06-9	X		X	< 0.0075						1	ug/L						
Bis(2-chloroethoxy)methane Cas No. 111-91-1	X		X	< 0.91						1	ug/L						
Bis(2-chloroethyl) ether Cas No. 111-44-4	X		X	< 0.83						1	ug/L						
Bis(2-chloroisopropyl) ether Cas No. 108-60-1	X		X	< 0.73						1	ug/L						
Bis(2-ethylhexyl)phthalate Cas No. 117-81-7	X		X	< 1.30						1	ug/L						
Butyl benzyl phthalate Cas No. 85-68-7	X		X	< 0.98						1	ug/L						
Chrysene Cas No. 218-01-9	X		X	< 0.0065						1	ug/L						
Di-n-butyl phthalate Cas No. 84-74-2	X		X	< 0.88						1	ug/L						
Di-n-octyl phthalate Cas No. 117-84-0	X		X	< 0.75						1	ug/L						
Dibenzo(a,h)anthracene Cas No. 53-70-3	X		X	< 0.0065						1	ug/L						
Dibenzofuran Cas No. 132-64-9	X		X	< 0.73						1	ug/L						
Diethylphthalate Cas No. 84-66-2	X		X	< 1.40						1	ug/L						
Dimethylphthalate Cas No. 131-11-3	X		X	< 0.73						1	ug/L						
Fluoranthene Cas No. 206-44-0	X		X	< 0.0054						1	ug/L						
Fluorene Cas No. 86-73-7	X		X	< 0.0043						1	ug/L						
Hexachlorobenzene Cas No. 118-74-1	X		X	< 1.0						1	ug/L						
Hexachlorobutadiene Cas No. 87-68-3	X		X	< 1.0						1	ug/L						
Hexachlorocyclopentadiene Cas No. 77-47-4	X		X	< 0.43						1	ug/L						
Hexachloroethane Cas No. 67-72-1	X		X	< 1.1						1	ug/L						
Indeno(1,2,3-cd) Pyrene Cas No. 193-39-5	X		X	< 0.0043						1	ug/L						
Isophorone Cas No. 78-59-1	X		X	< 0.86						1	ug/L						
N-nitrosodi-n-propyl amine Cas No. 621-64-7	X		X	< 1.1						1	ug/L						
N-nitrosodimethyl amine Cas No. 62-75-9	X		X	< 0.0065						1	ug/L						
N-nitrosodiphenyl amine Cas No. 86-30-6	X		X	< 0.77						1	ug/L						
Naphthalene Cas No. 91-20-3	X		X	< 0.0065						1	ug/L						
Nitrobenzene Cas No. 98-95-3	X		X	< 0.85						1	ug/L						
Phenanthrene Cas No. 85-01-8	X		X	< 0.0075						1	ug/L						
Pyrene Cas No. 129-00-0	X		X	< 0.0054						1	ug/L						

EPA Identification Number *(copy from Item 1 of Form 1)* 110000493706 | Outfall Number 201

1. POLLUTANT	2. MARK (*X*)			2. EFFLUENT							3. UNITS *(specify if blank)*		4. INTAKE *(optional)*			5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)*	
	a. Test-ing Re-quired	b. Be-lieved Pre-sent	c. Be-lieved Ab-sent	a. Maximum Daily Values (1) Concentration	a. Maximum Daily Values (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. Maximum 30 Day Values *(if available)* (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. Long Term Average *(if available)* (2) Mass	d. No. of Analysis	a. Concentration	b. Mass	a. Long Term Average Value *(if available)* (1) Concentration	a. Long Term Average Value *(if available)* (2) Mass	b. No. of Analysis	a. Method	b. **Reporting** Limit
Styrene Cas No. 100-42-5	X		X	< 0.22						1	ug/L						
PESTICIDES																	
2,4-Dichlorophenoxy Acetic Acid Cas No. 94-75-7			X														
Alachlor Cas No. 15972-60-8			X														
Aldrin Cas No. 309-00-2			X														
Atrazine Cas No. 1912-24-9			X														
BHC-Alpha Cas No. 319-84-6			X														
BHC-Beta Cas No. 319-85-7			X														
BHC-Gamma (Lindane) Cas No. 58-89-9			X														
BHC-Delta Cas No. 319-86-8			X														
Chlordane Cas No. 57-74-9			X														
DDD Cas No. 72-54-8			X														
DDE Cas No. 72-55-9			X														
DDT Cas No. 50-29-3			X														
Dieldrin Cas No. 60-57-1			X														
Endosulfan Sulfate Cas No. 1031-07-8			X														
Endosulfan, Alpha Cas No. 959-98-8			X														
Endosulfan, Beta Cas No. 33213-65-9			X														
Endrin Cas No. 72-20-8			X														
Endrin Aldehyde Cas No. 7421-93-4			X														
Heptachlor Cas No. 76-44-8			X														
Heptachlor Epoxide Cas No. 1024-57-3			X														
Methoxychlor Cas No. 72-43-5			X														
Metolachlor Cas No. 51218-45-2			X														
Mirex Cas No. 2385-85-5			X														
Parathion ethyl Cas No. 56-38-2			X														
Parathion methyl Cas No. 56-38-2			X														
Simazine Cas No. 122-34-9			X														

EPA Identification Number *(copy from Item 1 of Form 1)* 110000493706 | Outfall Number 201

1. POLLUTANT	2. MARK (*X*) a. Test-ing Re-quired	b. Be-lieved Pre-sent	c. Be-lieved Ab-sent	2. EFFLUENT a. Maximum Daily Values (1) Concentration	a. (2) Mass	b. Maximum 30 Day Values *(if available)* (1) Concentration	b. (2) Mass	c. Long Term Average *(if available)* (1) Concentration	c. (2) Mass	d. No. of Analysis	3. UNITS *(specify if blank)* a. Concentration	b. Mass	4. INTAKE *(optional)* a. Long Term Average Value *(if available)* (1) Concentration	a. (2) Mass	b. No. of Analysis	5. ANALYTICAL METHOD *(list method used and detection limit achieved by lab.)* a. Method	b. **Reporting** Limit
PCB-1242 Cas No. 534469-21-9			X														
PCB-1254 Cas No. 11097-69-1			X														
PCB-1221 Cas No. 11104-28-2			X														
PCB-1232 Cas No. 11141-16-5			X														
PCB-1248 Cas No. 12672-29-6			X														
PCB-1260 Cas No. 11096-82-5			X														
PCB-1016 Cas No. 12674-11-2			X														
Toxaphene Cas No. 8001-35-2			X														
WHOLE EFFLUENT TOXICITY																	
Acute, Freshwater Organisms Cas No. I-1100			X														
Chronic Freshwater Organisms Cas No. I-1101			X														
ADDITIONAL ANALYSES																	
Chloroform		X		1.1	0.00026					1	ug/L	lb/day					

Outfall 201 Influent DMR/MMR Data

Influent 201

Monthly Averages only calculated if more than one result in a month.

Summary Values

Date	Flow	pH	Suspended Solids, Total	Oil & Grease (Avg)	Ammonia (as N)	Chloride	Nitrate	Arsenic, Total Rec	Mercury	Zinc, Total Rec	Boron, Total Rec	Selenium, Total Rec	Manganese , Total Rec
	MGD	SU	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	ng/L	mg/L	µg/L	µg/L	mg/L
Min (all data)	0.01	5.1	4.40	5.00	0.0	56.0	14.00	1.80	1390.00	0.048	580.00	0.360	0.0290
Max (all data)	0.43	8.8	128792.00	40.00	1220.0	10880.0	790000.00	2600.00	80200.00	20.000	190000.00	7300.00	7100.0000
Average (all data)	0.05	6.2	26359.85	5.45	391.6	3566.3	215603.62	139.63	15421.67	3.841	56629.79	1483.10	117.5951
Max Monthly Average	0.2	8.0	119025.50	16.67	937.3	7278.5	510000.00	1435.00	No MMA	11.900	180000.00	4700.00	3557.5000
No. of Results (all data)	103	97	102	97	173	97	97	97	24	97	97	97	97
No. of Monthly Avgs	48	48	48	48	48	48	47	48	0	48	48	48	48

Monthly Averages: Jan 2016 to Dec 2019

Jan-16	0.03	5.65	14780.00	6.90	265.00	3800.00	305.00	55.00	No MA	2.75	24500.00	4050.00	42.50
Feb-16	0.04	6.90	810.00	5.00	65.50	3450.00	No MA	50.50	No MA	0.79	15500.00	4700.00	27.85
Mar-16	0.04	6.27	18969.80	16.67	12.67	1686.67	181.67	24.93	No MA	0.78	11326.67	1380.00	18.00
Apr-16	0.04	6.60	754.80	5.00	5.00	1190.00	107.50	27.50	No MA	1.83	7750.00	260.00	4.95
May-16	0.03	6.50	25960.50	5.00	82.50	4700.00	370.00	46.80	No MA	0.71	30500.00	700.43	10.51
Jun-16	0.03	7.95	15984.00	5.00	129.67	2900.00	195.50	29.00	No MA	0.80	14650.00	1200.18	13.25
Jul-16	0.03	5.65	12020.00	5.00	415.00	6350.00	375000.00	115.00	No MA	2.20	16450.00	2900.00	36.50
Aug-16	0.03	6.55	< 25016.00	< 5.00	310.00	6150.00	340000.00	115.00	No MA	1.70	20500.00	3050.00	32.50
Sep-16	0.03	5.80	< 22844.00	< 5.00	560.00	3330.00	305000.00	130.00	No MA	2.75	21000.00	4150.00	31.00
Oct-16	0.03	6.05	< 1586.50	< 5.00	101.00	6950.00	295000.00	102.50	No MA	1.90	52500.00	1090.00	44.00
Nov-16	0.03	6.68	1454.00	5.00	74.00	5500.00	240000.00	130.00	No MA	1.25	46500.00	795.00	38.50
Dec-16	0.06	6.80	5300.00	5.00	50.15	2000.00	226500.00	49.00	No MA	0.52	12000.00	590.00	12.30
Jan-17	0.05	7.20	21892.00	5.00	47.35	744.00	53450.00	6.35	No MA	0.94	6290.00	168.50	5.95
Feb-17	0.04	5.70	65945.00	5.00	530.00	4750.00	250000.00	90.00	No MA	4.40	28500.00	1130.00	35.00
Mar-17	0.08	7.65	2298.00	5.00	24.00	940.00	80500.00	54.00	No MA	1.40	11100.00	165.00	3557.50
Apr-17	0.09	5.95	1022.00	5.00	16.53	3650.00	196666.67	84.00	No MA	1.85	46000.00	765.00	14.50
May-17	0.11	6.25	1262.00	5.00	9.00	4650.00	175000.00	100.50	No MA	1.20	42000.00	915.00	12.30
Jun-17	0.06	6.60	2679.00	5.00	60.00	3300.00	230000.00	96.50	No MA	2.00	29000.00	835.00	13.00
Jul-17	0.04	6.30	16970.00	5.00	164.00	2150.00	160500.00	50.50	No MA	4.90	17500.00	360.00	14.45
Aug-17	0.04	5.85	12799.00	5.00	260.00	4150.00	240000.00	79.00	No MA	3.95	31000.00	760.00	30.00
Sep-17	0.04	6.75	35963.00	5.00	340.00	4300.00	220000.00	43.50	No MA	2.70	22500.00	1150.00	24.00
Oct-17	0.03	7.65	5325.00	5.00	48.72	3100.00	150155.00	190.00	No MA	1.21	22000.00	855.00	10.05
Nov-17	0.04	8.00	52720.00	5.00	200.00	1086.50	355000.00	54.50	No MA	4.55	16000.00	655.00	24.00
Dec-17	0.06	6.65	2195.00	5.00	20.00	358.50	170000.00	74.00	No MA	2.70	12500.00	385.00	11.00
Jan-18	0.06	5.70	67054.00	5.00	335.00	1071.50	455000.00	59.50	No MA	6.80	33500.00	1110.00	30.00
Feb-18	0.09	7.05	1393.00	5.00	76.45	595.50	130000.00	71.50	No MA	1.61	19815.00	956.00	8.75
Mar-18	0.08	6.10	48202.00	5.00	235.00	1499.50	275000.00	43.50	No MA	10.35	24500.00	1100.00	22.00
Apr-18	0.06	6.00	1760.00	5.00	154.00	493.00	195000.00	130.50	No MA	4.00	84500.00	1800.00	16.50
May-18	0.04	5.45	25047.33	5.00	360.00	616.50	195000.00	220.00	No MA	4.65	68000.00	1600.00	20.00
Jun-18	0.04	5.80	6238.00	5.00	405.00	715.00	230000.00	158.50	No MA	3.85	67000.00	1550.00	26.00
Jul-18	0.03	5.80	29098.00	5.00	665.00	5657.50	210000.00	280.00	No MA	11.90	79000.00	4350.00	76.50
Aug-18	0.05	5.45	39687.00	5.00	495.00	581.00	180110.00	154.00	No MA	5.40	105000.00	2000.00	42.00
Sep-18	0.05	5.75	54176.00	5.00	610.00	7056.00	215000.00	131.50	No MA	4.95	135000.00	2050.00	44.50
Oct-18	0.23	5.95	57540.00	5.00	167.00	836.50	260000.00	42.50	No MA	2.50	66500.00	930.00	36.50
Nov-18	0.04	5.80	119025.50	5.00	460.00	1080.50	510000.00	45.50	No MA	4.65	42500.00	695.00	36.00
Dec-18	0.05	5.70	63398.00	5.00	640.00	4625.00	400000.00	82.50	No MA	5.75	106000.00	1450.00	40.50
Jan-19	0.07	6.55	41600.50	5.35	415.50	2201.50	212750.00	244.00	No MA	6.65	86500.00	1015.00	21.00
Feb-19	0.03	5.65	48095.00	5.00	291.07	6875.00	234500.00	221.50	No MA	8.60	120000.00	1050.00	27.50
Mar-19	0.05	5.95	7734.00	7.20	122.92	6722.00	204950.00	330.00	No MA	9.85	180000.00	1250.00	16.50
Apr-19	0.06	5.85	28916.00	5.00	750.50	6814.50	286100.00	82.00	No MA	5.30	140000.00	1600.00	22.00
May-19	0.06	5.70	93910.50	5.00	651.86	3162.00	278450.00	37.70	No MA	2.48	74000.00	975.00	861.00
Jun-19	0.06	5.65	70674.00	5.00	608.04	3361.00	219950.00	60.50	No MA	4.40	91500.00	1450.00	25.00
Jul-19	0.06	6.00	47182.50	5.00	412.00	7224.50	250600.00	1435.00	No MA	6.45	140000.00	1800.00	144.00
Aug-19	0.06	5.50	35440.50	5.00	151.33	4675.50	327400.00	185.00	No MA	4.10	100500.00	1300.00	21.50
Sep-19	0.04	5.70	7236.00	5.00	177.50	6698.50	224100.00	265.00	No MA	5.50	130000.00	2150.00	23.50
Oct-19	0.05	5.60	15091.35	5.00	560.00	7278.50	281000.00	260.00	No MA	4.70	130000.00	2500.00	24.50
Nov-19	0.05	6.95	14403.00	5.00	480.00	4920.50	313700.00	111.50	No MA	4.45	79000.00	1650.00	16.50
Dec-19	0.05	5.45	20416.00	5.00	937.31	6177.00	205550.00	310.00	No MA	7.25	80500.00	1900.00	28.50

Analytical Method Information

Method Information For Permit Required Sample Analyses

Parameter	Analytical Method	Reporting Limit	Units
Carbonaceous Biochemical Oxygen Demand (cBOD)	5210 B	1	mg/L
Escherichia coli (E-coli)	9221B	1	col/100 ml
Total Suspended Solids (TSS)	2540D	0.1	mg/L
Ammonia as N	4500 NH3 G	0.015	mg/L
Temperature	2550 B	0.1 sensitivity	°C
pH	4500-H^+ B	0.01 sensitivity	s.u.
Chloride	300.0	1	mg/L
Chlorine, Total Residual	4500-Cl D, E, or G	0.02	mg/L
Nitrate	300.0	0.5	mg/L
Oil and Grease (hexane)	(Hexane) 1664	1.5	mg/L
Sulfate (as SO4)	300.0	1	mg/L
Boron, Total	200.8	50	ug/L
Manganese, Total	200.8	1	ug/L
Arsenic, Total	200.8	1	ug/L
Cadmium, Total	200.8	1	ug/L
Chromium, Total	200.8	1	ug/L
Copper, Total	200.8	1	ug/L
Lead, Total	200.8	1	ug/L
Mercury, Total for non-sw locations	1631E	0.2	ng/L
Nickel, Total	201	1	ug/L
Selenium, Total	200.8	1	ug/L
Zinc, Total	200.8	0.2	ug/L

Method Information for Non-Permit Required Sample Analyses

Parameter	Analytical Method	Reporting Limit	
PART V. IDEM TABLE A.			
Carbonaceous Biochemical Oxygen Demand (cBOD)	5210 B	1	mg/L
Escherichia coli (E-coli)	SM 9223 B	1	MPN/100mL
Fecal Coliform	SM 9222 D	10	cfu/100mL
Chemical Oxygen Demand (COD)	EPA 410.4	10	mg/L
Dissolved Oxygen	4500-O G (probe)	0.1	mg/L
Total Dissolved Solids	EPA 160.1	20	mg/L
Total Organic Carbon (TOC)	SM 5310C	0.5	mg/L
Ammonia as N	EPA 350.1	0.1	mg/L
Temperature	2550 B	0.1	°C
Total Hardness	SM 2340 B	160	mg/L
pH	SM 4500 H+ B	2	S.U.
PART V. IDEM TABLE B.			
Bromide	EPA 300.0	0.5	mg/L
Chloride	EPA 300.0	1	mg/L
Chlorine, Total Residual	4500-Cl D, E, or G	0.02	mg/L
Color	SM 2120 B	5	Color Units (CU)
Fluoride	SM 4500-F	0.1	mg/L
Nitrate + Nitrite (as N)	EPA 353.2	0.1	mg/L
Nitrate	EPA 353.2	0.1	mg/L
Nitrite	EPA 353.2	0.1	mg/L
Nitrogen, Total Organic (as N)	Calc (TKN - Amm-N)		
Total Kjeldahl Nitrogen (Amm-N + Org-N)	EPA 351.2	0.5	mg/L
Nitrogen, Total (TKN+Nitrate+Nitrite)	Calc (NO2 + NO3 + TKN)	0.6	mg/L
Oil and Grease (hexane)	1664	1.5	mg/L
Phosphorus (as P), Total	EPA 365.1	0.2	mg/L
Sulfate (as SO4)	EPA 300.0	1	mg/L
Sulfide (as S)	SM 4500-S2	0.05	mg/L
Sulfite (as SO3)	SM 4500 SO3 B	1	mg/L
Surfactants (MBAS)	SM 5540C	0.2	mg/L
Aluminum, Total	EPA 200.8	0.2	mg/L
Barium, Total	EPA 200.8	0.005	mg/L
Boron, Total	EPA 200.8	0.02	mg/L
Cobalt, Total	EPA 200.8	0.003	mg/L
Iron, Total	EPA 200.8	0.5	mg/L
Magnesium, Total	EPA 200.8	0.5	mg/L
Molybdenum, Total	EPA 200.8	0.02	mg/L
Manganese, Total	EPA 200.8	0.002	mg/L
Tin, Total	EPA 200.8	0.02	mg/L
Titanium, Total	EPA 200.8	0.03	mg/L

Parameter	Analytical Method	Reporting Limit	
PART V. IDEM TABLE C. Priority Pollutant Metals, Cyanide, Phenols			
Antimony, Total	EPA 200.8	0.02	mg/L
Arsenic, Total	EPA 200.8	0.01	mg/L
Beryllium, Total	EPA 200.8	0.001	mg/L
Cadmium, Total	EPA 200.8	0.002	mg/L
Chromium, Total	EPA 200.8	0.003	mg/L
Chromium, Hexavalent (dissolved)	SM 3500-Cr B	0.01	mg/L
Copper, Total	EPA 200.8	0.01	mg/L
Lead, Total	EPA 200.8	0.0075	mg/L
Mercury, Total for non-sw locations	EPA 1631E	0.5	ng/L
Mercury, Total for sw locations	245.1	analysis pending	mg/L
Nickel, Total	EPA 200.8	0.01	mg/L
Selenium, Total	EPA 200.8	0.03	mg/L
Silver, Total	EPA 200.8	0.01	mg/L
Thallium, Total	EPA 200.8	0.05	mg/L
Vanadium	EPA 200.8	0.008	mg/L
Zinc, Total	EPA 200.8	0.02	mg/L
Cyanide, Free	EPA OIA 1677	2	ug/L
Cyanide, Total	SM 4500-CN	5	ug/L
Phenols, Total ("4AAP Phenolics")	EPA 420.4	10	ug/L
PART V. IDEM TABLE C. OTHER			
Bis (Chloromethyl) Ether	No longer required for Form 2C		
Dibutyl amine*	Test method not available		
Dimethylpropyl phenol*	Test method not available		
Tributyl tin oxide*	Test method not available		
Methylamine*	Test method not available		

Parameter	Analytical Method	Reporting Limit	
PART V. IDEM TABLE C. Volatile Compounds			
Acetaldehyde	EPA 8315A	50	ug/L
Formaldehyde	EPA 8315A	50	ug/L
Ethylene glycol	EPA 8015D	5	ug/L
Methanol	EPA 8015C	1	mg/L
Propylene glycol	EPA 8015D	5	ug/L
Methyl tert-butyl ether (MTBE)	EPA 624.1	5	ug/L
Xylene	EPA 624.1	5	ug/L
1,1,2,2-Tetrachloroethane	EPA 624.1	5	ug/L
1,1,2-Trichloroethane	EPA 624.1	5	ug/L
1,1,1-Trichloroethane	EPA 624.1	5	ug/L
1,1-Dichloroethane	EPA 624.1	5	ug/L
1,1-Dichloroethene	EPA 624.1	5	ug/L
1,2,4-Trimethylbenzene	EPA 624.1	5	ug/L
1,2-Dichloroethane	EPA 624.1	5	ug/L
1,2-Dichloroethylene, Trans	EPA 624.1	5	ug/L
1,2-Dichloropropane	EPA 624.1	5	ug/L
1,3,5-Trimethylbenzene	EPA 624.1	5	ug/L
1,3-Dichloropropane	EPA 624.1	5	ug/L
1,3-Dichloropropene, Cis	EPA 624.1	5	ug/L
1,3-Dichloropropene, Trans	EPA 624.1	5	ug/L
1,3-Dichloropropylene	EPA 624.1	5	ug/L
2-Butanone (Methyl Ethyl Ketone)	EPA 624.1	10	ug/L
2-Chloroethylvinyl Ether	EPA 624.1	10	ug/L
Acetone	EPA 624.1	50	ug/L
Acrolein	EPA 624.1	100	ug/L
Acrylonitrile	EPA 624.1	100	ug/L
Benzene	EPA 624.1	5	ug/L
Bromoform	EPA 624.1	5	ug/L
Carbon disulfide	EPA 624.1	10	ug/L
Carbon Tetrachloride	EPA 624.1	5	ug/L
Chlorobenzene	EPA 624.1	5	ug/L
Chlorodibromomethane	EPA 624.1	5	ug/L
Chloroethane	EPA 624.1	10	ug/L
Chloroform	EPA 624.1	2	ug/L
Dichlorobromomethane	EPA 624.1	5	ug/L
Dichlorodifluoromethane	EPA 624.1	No longer required for Form 2C	
Ethylbenzene	EPA 624.1	5	ug/L
Methyl Bromide (Bromomethane)	EPA 624.1	10	ug/L
Methyl Chloride (Chloromethane)	EPA 624.1	10	ug/L
Methylene Chloride	EPA 624.1	10	ug/L
Styrene	EPA 624.1	5	ug/L
Tetrachloroethene	EPA 624.1	5	ug/L
Trichloroethene	EPA 624.1	5	ug/L
Trichlorofluoromethane	EPA 624.1	No longer required for Form 2C	
Toluene	EPA 624.1	5	ug/L
Vinyl Chloride	EPA 624.1	2	ug/L

Parameter	Analytical Method	Reporting Limit	
PART V. IDEM TABLE C. Semi-Volatile Organic Acid Compounds			
2,4-Dichlorophenol	EPA 625.1	11	ug/L
2,4-Dimethylphenol	EPA 625.1	11	ug/L
2,4-Dinitrophenol	EPA 625.1	56	ug/L
2,4,6-Trichlorophenol	EPA 625.1	11	ug/L
2-Chlorophenol	EPA 625.1	11	ug/L
2-Nitrophenol	EPA 625.1	11	ug/L
4-Nitrophenol	EPA 625.1	56	ug/L
4,6-Dinitro-o-cresol (2-methyl-4,6-dinitrophenol)	EPA 625.1	28	ug/L
Benzoic Acid	EPA 625.1	56	ug/L
p-Chloro-m-cresol (4-chloro-3-methylphenol)	EPA 625.1	22	ug/L
Pentachlorophenol	EPA 625.1	56	ug/L
Phenol	EPA 625.1	11	ug/L

Parameter	Analytical Method	Reporting Limit	
PART V. IDEM TABLE C. Semi-Volatile Organic Base Compounds			
1,2,4-Trichlorobenzene	EPA 625.1	11	ug/L
1,2-Dichlorobenzene	EPA 625.1	11	ug/L
1,2-Diphenyl hydrazine (Azobenzene)	EPA 625.1	11	ug/L
1,3-Dichlorobenzene	EPA 625.1	11	ug/L
1,4-Dichlorobenzene	EPA 625.1	11	ug/L
2-Chloronaphthalene	EPA 625.1	11	ug/L
2-Methylnaphthalene	EPA 625.1	11	ug/L
4-Methylphenol	EPA 625.1	11	ug/L
2,4-Dinitrotoluene	EPA 625.1	11	ug/L
2,6-Dinitrotoluene	EPA 625.1	11	ug/L
3,3'-Dichlorobenzidine	EPA 625.1	54	ug/L
3,4-Benzofluoranthene (benzo [b] fluoranthene)	EPA 625.1	11	ug/L
4-Bromophenyl Phenyl Ether	EPA 625.1	11	ug/L
4-Chlorophenyl Phenyl Ether	EPA 625.1	11	ug/L
Acenaphthene	EPA 625.1	11	ug/L
Acenaphthylene	EPA 625.1	11	ug/L
Anthracene	EPA 625.1	11	ug/L
Benzidine	EPA 625.1	54	ug/L
Benzo (a) anthracene	EPA 625.1	11	ug/L
Benzo (a) pyrene	EPA 625.1	11	ug/L
Benzo (ghi) perylene	EPA 625.1	11	ug/L
Benzo (k) fluoranthene	EPA 625.1	11	ug/L
Bis (2-Chloroethoxy) Methane	EPA 625.1	11	ug/L
Bis (2-Chloroethyl) Ether	EPA 625.1	11	ug/L
Bis (2-Chloroisopropyl) Ether	EPA 625.1	11	ug/L
Bis (2-Ethylhexyl) Phthalate	EPA 625.1	11	ug/L
Butyl Benzyl Phthalate	EPA 625.1	11	ug/L
Chrysene	EPA 625.1	11	ug/L
Di-N-Butyl Phthalate	EPA 625.1	11	ug/L
Di-N-Octyl Phthalate	EPA 625.1	11	ug/L
Dibenzo (a,h) anthracene	EPA 625.1	11	ug/L
Dibenzofuran (CAS # 132-64-9)	EPA 625.1	11	ug/L
Diethyl Phthalate	EPA 625.1	11	ug/L
Dimethyl Phthalate	EPA 625.1	11	ug/L
Fluoranthene	EPA 625.1	11	ug/L
Fluorene	EPA 625.1	11	ug/L
Hexachlorobenzene	EPA 625.1	11	ug/L
Hexachlorobutadiene	EPA 625.1	11	ug/L
Hexachlorocyclopentadiene	EPA 625.1	11	ug/L
Hexachloroethane	EPA 625.1	11	ug/L
Indeno(1,2,3-cd) pyrene	EPA 625.1	11	ug/L
Isophorone	EPA 625.1	11	ug/L
N-Nitrosodi-N-propylamine	EPA 625.1	11	ug/L
N-Nitrosodimethylamine	EPA 625.1	11	ug/L
N-Nitrosodiphenylamine	EPA 625.1	11	ug/L
Naphthalene	EPA 625.1	11	ug/L
Nitrobenzene	EPA 625.1	11	ug/L
Phenanthrene	EPA 625.1	11	ug/L
Pyrene	EPA 625.1	11	ug/L

Form 2F Materials

Please print or type in the unshaded areas only

EPA I.D. NUMBER (*copy from Item 1 of Form 1*)
110000493706

Form Approved OMB No 2040-0086
Approval expires 5-31-92

FORM **2F** NPDES

EPA

United States Environmental Protection Agency

Application for Permit To Discharge Stormwater Discharges Associated with Industrial Activity

Paperwork Reduction Act Notice

Public reporting burden for this application is estimated to average 28.6 hours per application, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate, any other aspect of this collection of information, or suggestions for improving this form, including suggestions which may increase or reduce this burden to: Chief, Information Policy Branch, PM 223, U.S. Environmental Protection Agency, 401 M St., SW, Washington, DC 20460, or Director, Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503

I. OUTFALL LOCATION

For each outfall, list the latitude and longitude of its location to the nearest 15 seconds and the name of the receiving water.

A. OUTFALL NUMBER *(list)*	B. LATITUDE			C. LONGITUDE			D. RECEIVING WATER *(name)*
	1. DEG	2. MIN	3. SEC	1. DEG	2. MIN	3. SEC	
003S	N41	13	8.55	W87	0	20	Stalbaum Ditch
004S	N41	12	22	W87	1	38	Davis Ditch
005S	N41	12	31	W87	1	38	Davis Ditch
006S	N41	13	31	W87	1	36	Davis Ditch
007S	N41	13	17.46	W87	1	47.3	Davis Ditch

A. Are you now required by any Federal, State, or local authority to meet any implementation schedule for the construction, upgrading or operation of wastewater treatment equipment or practices or any other environmental programs which may affect the discharges described in this application? This includes, but is not limited to, permit conditions, administrative or enforcement orders, enforcement compliance schedule letters, stipulations, court orders, and grant or loan conditions.

1. Identification of Conditions, Agreements, Etc.	2. Affected Outfalls		3. Brief Description of Project	4. Final Compliance Date	
	number	source of discharge		a. req.	b. proj.

B. You may attach additional sheets describing any additional water pollution (or other environmental projects which may affect your discharges) you now have under way or which you plan. Indicate whether each program is now under way or planned, and indicate your actual or planned schedules for construction.

III. Site Drainage Map

Attach a site map showing topography (or indicating the outline of drainage areas served by the outfall(s) covered in the application if a topographic map is unavailable) depicting the facility including: each if its intake and discharge structures; the drainage area of each storm water outfall; paved areas and buildings within the drainage area of each storm water outfall, each known past or present areas used for outdoor storage or disposal of significant materials, each existing structural control measure to reduce pollutants in storm water runoff, materials loading and access areas, areas where pesticides, herbicides, soil conditioners and fertilizers are applied; each of its hazardous waste treatment, storage or disposal units (including each area not required to have a RCRA permit which is used for accumulating hazardous waste under 40 CFR 262.34); each well where fluids from the facility are injected underground; springs, and other surface water bodies which receive stormwater discharges from the facility. **See Figure RMS-DRAIN: Site Drainage Map**

Continued on Page 2

IV. Narrative Description of Pollutant Sources

A. For each outfall, provide an estimate of the area (include units) of surfaces (including paved areas and building roofs) drained to the outfall, and an estimate of the total surface area drained by the outfall.

Outfall Number	Area of Impervious Surface *(provide units)*	Total Area Drained *(provide units)*			
003S		1,400,000 sqft			
004S		245,000 sqft			
005S		290,000 sqft			
006S		46,500 sqft			
007S		2,520,000 sqft			

B. Provide a narrative description of significant materials that are currently or in the past three years have been treated, stored or disposed in a manner to allow exposure to storm water; method of treatment, storage, or disposal; past and present materials management practices employed in the last three years, to minimize contact by these materials with storm water runoff; materials loading and access areas; and the location, manner, and frequency in which pesticides, herbicides, soil conditioners, and fertilizers are applied.

There have been no significant materials that in the past three years have been treated, stored, or disposed of on-site in a manner to allow exposure to stormwater in the drainage areas of these stormwater outfalls.

Outfall 004 drainage area includes emergency spillway of Waste Disposal Area (WDA) Pond
Outfall 005 drainage area includes emergency spillway of Waste Disposal Area (WDA) Pond
Outfall 006 drainage area includes emergency spillway of Intake Settling Basin

C. For each outfall, provide the location and a description of existing structural and nonstructural control measures to reduce pollutants in storm water runoff; and a description of the treatment the storm water receives, including the schedule and type of maintenance for control and treatment measures and the ultimate disposal of any solid or fluid wastes other than by discharge.

Outfall Number	Treatment	List Codes from Table 2F-1
003S	Stormwater flows through vegetation down the capped sides of the closed landfill segments into perimeter ditches which feed the runoff pond. No stormwater treatment occurs.	4-A
004S/005S	Stormwater flows through wooded area northwest of WDA Pond under railroad tracks and perimeter road to Davis Ditch Outfalls 004S and 005S provide drainage from coal car railroad tracks exiting the plant and the perimeter security road. No stormwater treatment occurs.	4-A
006S	Stormwater flows through grassy area northeast of ISB along and under perimeter road to Davis Ditch. Outfall 006 provides drainage for a different section of the perimeter security road. No stormwater treatment occurs.	4-A
007S	Stormwater flows through gravel areas to an underground 36" pipe, no stormwater treatment occurs.	4-A

V. Nonstormwater Discharges

A. I certify under penalty of law that the outfall(s) covered by this application have been tested or evaluated for the presence of nonstormwater discharges, and that all nonstormwater discharges form these outfall(s) are identified in either an accompanying Form 2C or Form 2E application for the outfall.

Name and Official Title *type or print)*	Signature	Date Signed
Bertil Valenkamph - Director, Station Chemistry & Environmental Compliance	Bertil Valenkamph	3/25/2020

B. Provide a description of the method used, the date of any testing, and the onsite drainage points that were directly observed during a test.

A comprehensive site evaluation confirming the accuracy of the description of potential pollution sources and the effectiveness of the Stormwater Pollution Prevention Plan (SWPPP) is conducted annually as specified within the permit. Records of these inspections are maintained within the SWPPP.

VI. Significant Leaks or Spills

Provide existing information regarding the history of significant leaks or spills of toxic or hazardous pollutant at the facility in the last three years, including the approximate date and location of the spill or leak, and the type and amount of material released.

No significant leaks or spills of toxic or hazardous pollutants have occurred into the stormwater discharges at the Schahfer Generating Station in the last three years.

EPA ID Number *(Copy from Item I of Form 1)*
110000493706

VII. Discharge Information

A, B, C, & D: See instructions before proceeding. Complete one set of tables for each outfall. Annotate the outfall number in the space provided. Tables VII-A, VII-B, and VII-C are included on separate sheets numbered VII-1 and VII-2.

E. Potential discharges not covered by analysis - is any pollutant listed in Table 2F-2, 2F-3, 2F-4 a substance or a component of a substance which you currently use or manufacture as an intermediate or final product or byproduct?

[ ] Yes *(list all such pollutants below)* [X] No *(go to Section IX)*

Adequate information to assess potential stormwater pollutants is provided in the following:

Form 2C, Section V's

Form 2F, Pages VII-1 and VII-2

VIII. Biological Toxicity Testing Data

Do you have any knowledge or reason to believe that any biological test for acute or chronic toxicity has been made on any of your discharges or on a receiving water in relation to your discharge within the last 3 years?

[ ] Yes *(list all such pollutants below)* [X] No *(go to Section IX)*

IX. Contract Analysis Information

Were any of the analyses reported in Item V performed by a contract laboratory or consulting firm?

[X] Yes *(list the name, address, and telephone number of, and pollutants analyzed by, each such laboratory or firm below)* [ ] No *(go to Section X)*

A. Name	B. Address	C. Area Code & Phone No.	Pollutants Analyzed
Microbac Laboratories	250 West 84th Drive Merrillville IN 46410	(219)769-8378	All analytes.

X. Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. Name & Official Title *(type or print)*	B. Area Code & Phone No.
Bertil Valenkamph - Director Station Chemistry & Environmental Compliance	256-874-3 219-~~977~~-6265
C. Signature	**D. Date Signed**
Bertil Valenkamph	3/25/2020

Outfall 003S

EPA ID Number *(copy from Item I of Form 1)*
110000493706

Form Approved. OMB No. 2040-0086
Approval expires 5-31-92

VII. Discharge Information *(Continued from page 3 of Form 2F)*

Part A. You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

Pollutant and CAS Number *(if available)*	Maximum Values *(include units)*		Average Values *(include units)*		Number of Storm Events Sampled	Sources of Pollutants
	Grab Sample Taken During First 20 Minutes	Flow-Weighted Composite	Grab Sample Taken During First 20 Minutes	Flow-Weighted Composite		
Oil and Grease	Outfall 003S is surface water runoff from a perimeter storm water nextwork from the onsite restricted waste landfill. To date no discharge of Outfall 003S has been recorded.					
Biological Oxygen Demand (BOD5)						
Chemical Oxygen Demand (COD)						
Total Suspended Solids (TSS)						
Total Nitrogen						
Total Phosphorus						
pH	Minimum (grab)	Maximum (grab)	Minimum (comp)	Maximum (comp)		

Part B. List each pollutant that is limited in an effluent guideline which the facility is subject to or any pollutant listed in the facility's NPDES permit for its process wastewater (if the facility is operating under an existing NPDES permit). Complete one table for each outfall. See the instructions for additional details and requirements.

Pollutant and CAS Number *(if available)*	Maximum Values *(include units)*		Average Values *(include units)*		Number of Storm Events Sampled	Sources of Pollutants
	Grab Sample Taken During First 20 Minutes	Flow-Weighted Composite	Grab Sample Taken During First 20 Minutes	Flow-Weighted Composite		
Sulfate	Outfall 003S is surface water runoff from a perimeter storm water nextwork from the onsite restricted waste landfill. To date no discharge of Outfall 003S has been recorded.					
Arsenic, Total						
Chromium, Total						
Selenium, Total						
Zinc, Total						
Boron, Total						
Manganese, Total						
Mercury, Total						
Chloride, Total						
Ammonia, N Total						
Temperature						

Continued from the Front

Outfall 003S

Part C. List each pollutant shown in Tables 2F-2. 2F-3, and 2F-4 that you know or have reason to believe is present. See the instructions for additional details and requirements. Complete one table for each outfall.

Pollutant and CAS Number *(if available)*	Maximum Values *(include units)*		Average Values *(include units)*		Number of Storm Events Sampled	Units	Sources of Pollutants
	Grab Sample Taken During First 20 Minutes	Flow-Weighted Composite	Grab Sample Taken During First 20 Minutes	Flow-Weighted Composite			
Cadmium, Total	Outfall 003S is surface water runoff from a perimeter storm water nextwork from the onsite restricted waste landfill. To date no discharge of Outfall 003S has been recorded.						
Copper, Total							
Lead, Total							
Nickel, Total							
Organic N, Total							

Part D. Provide data for the storm event(s) which resulted in the maximum values for the flow weighted composite sample.

1. Date of Storm Event	2. Duration of Storm *(in minutes)*	3. Total rainfall during storm event *(in inches)*	4. Number of hours between beginning of storm meas-ured and end of previous measurable rain event	5. Maximum flow rate during rain event *(gallons/minute or specify units)*	6. Total flow from rain event *(gallons or specify units)*
2016	N/A	N/A	N/A	No Flow; Discharge valve from pond overflow is closed	
2017	N/A	N/A	N/A	No Flow; Discharge valve from pond overflow is closed	
2018	N/A	N/A	N/A	No Flow; Discharge valve from pond overflow is closed	
2019	N/A	N/A	N/A	No Flow; Discharge valve from pond overflow is closed	

9. Provide a description of the method of flow measurement or estimate.

The discharge from outfall is monitored by visual inspection and includes the internal perimeter ditches that feed the runoff pond which subsequently feeds Outfall 003S. When the runoff pond water level reaches a specific height it will flow through a culvert pipe as Outfall 003S. In general, the source of the discharge is precipitation; however, the actual release via the Outfall is not necessarily dictated by individual storm events. To date there has not been a discharge recorded at Outfall 003S.

Outfall 004S, 005S, and 006S

EPA ID Number *(copy from Item I of Form 1)*
110000493706

Form Approved. OMB No. 2040-0086
Approval expires 5-31-92

VII. Discharge Information *(Continued from page 3 of Form 2F)*

Part A. You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

Pollutant and CAS Number *(if available)*	Maximum Values *(include units)*		Average Values *(include units)*		Number of Storm Events Sampled	Sources of Pollutants
	Grab Sample Taken During First 20 Minutes	Flow-Weighted Composite	Grab Sample Taken During First 20 Minutes	Flow-Weighted Composite		
Oil and Grease	< 5.0 mg/L		< 5.0 mg/L		2	Outfalls 004S and 005S provide drainage from coal car tracks exiting the plant and ther perimeter security road. Outfall 006S provides drainage for a different section of the perimeter security road. Per the Permit, Outfall 004S discharge is representative of Outfalls 005S and 006S.
Biological Oxygen Demand (BOD5)						
Chemical Oxygen Demand (COD)						
Total Suspended Solids (TSS)	8.0 mg/L		6.3 mg/L		2	
Total Nitrogen						
Total Phosphorus						
pH	Minimum (grab) 7.4	Maximum (grab) 7.5	Minimum (comp)	Maximum (comp)	2	

Part B. List each pollutant that is limited in an effluent guideline which the facility is subject to or any pollutant listed in the facility's NPDES permit for its process wastewater (if the facility is operating under an existing NPDES permit). Complete one table for each outfall. See the instructions for additional details and requirements.

Pollutant and CAS Number *(if available)*	Maximum Values *(include units)*		Average Values *(include units)*		Number of Storm Events Sampled	Sources of Pollutants
	Grab Sample Taken During First 20 Minutes	Flow-Weighted Composite	Grab Sample Taken During First 20 Minutes	Flow-Weighted Composite		
Sulfate	62 mg/L		32.42 mg/L		2	Outfalls 004S and 005S provide drainage from coal car tracks exiting the plant and ther perimeter security road. Outfall 006S provides drainage for a different section of the perimeter security road. Per the Permit, Outfall 004S discharge is representative of Outfalls 005S and 006S.
Arsenic, Total	10 mg/L		5.01 mg/L		2	
Chromium, Total	< 0.001 mg/L		< 0.001 mg/L		2	
Selenium, Total	0.0016 mg/L		0.0013 mg/L		2	
Zinc, Total	0.015 mg/L		0.0175 mg/L		2	
Boron, Total	Data presented above is from Permit-required sampling from extreme precipitation events in 2018 and 2019. No additional discharge characterization data exists for Outfall 004S, 005S, or 006S at this time as the discharge is very intermittent and may only discharge during extreme rain events. These parameters are currently monitored at Outall 001 and/or Outfall 201 in the NPDES Permit.					
Manganese, Total						
Mercury, Total						
Chloride, Total						
Ammonia, N Total						
Temperature						

Continued from the Front

Outfall 004S, 005S, and 006S

Part C. List each pollutant shown in Tables 2F-2. 2F-3, and 2F-4 that you know or have reason to believe is present. See the instructions for additional details and requirements. Complete one table for each outfall.

Pollutant and CAS Number *(if available)*	Maximum Values *(include units)*		Average Values *(include units)*		Number of Storm Events Sampled	Sources of Pollutants
	Grab Sample Taken During First 20 Minutes	Flow-Weighted Composite	Grab Sample Taken During First 20 Minutes	Flow-Weighted Composite		
Cadmium, Total	< 0.001 mg/L		< 0.001 mg/L		2	Outfalls 004S and 005S provide drainage from coal car tracks exiting the plant and ther perimeter security road. Outfall 006S provides drainage for a different section of the perimeter security road.
Copper, Total	0.0011 mg/L		0.00105 mg/L		2	
Lead, Total	< 0.001 mg/L		< 0.001 mg/L		2	
Nickel, Total	< 0.001 mg/L		< 0.001 mg/L		2	
Organic N, Total	Data presented above is from Permit-required sampling from extreme precipitation events in 2018 and 2019. No additional discharge characterization data exists for Outfall 004S, 005S, or 006S at this time as the discharge is very intermittent and may only discharge during extreme rain events.					

Part D. Provide data for the storm event(s) which resulted in the maximum values for the flow weighted composite sample.

1. Date of Storm Event	2. Duration of Storm *(in minutes)*	3. Total rainfall during storm event *(in inches)*	4. Number of hours between beginning of storm meas-ured and end of previous measurable rain event	5. Maximum flow rate during rain event *(gallons/minute or specify units)*	6. Total flow from rain event *(gallons or specify units)*
06/15/16	128	0.17	336 hours	no discharge observed	
08/22/17	420	1.12	288 hours	no discharge observed	
11/30/18	69	0.19	< 75 hours	0.0315 MGD	
05/09/19	155	0.65	96 hours	0.0012 MGD	

9. Provide a description of the method of flow measurement or estimate.

The discharge from Outfalls 004S, 005S, and 006S are monitored by visual inspection.

Outfall 007S

EPA ID Number *(copy from Item I of Form 1)*
110000493706

Form Approved. OMB No. 2040-0086
Approval expires 5-31-92

VII. Discharge Information *(Continued from page 3 of Form 2F)*

Part A. You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

Pollutant and CAS Number *(if available)*	Maximum Values *(include units)*		Average Values *(include units)*		Number of Storm Events Sampled	Sources of Pollutants
	Grab Sample Taken During First 20 Minutes	Flow-Weighted Composite	Grab Sample Taken During First 20 Minutes	Flow-Weighted Composite		
Oil and Grease	< 5.0 mg/L		< 5.0 mg/L		4	Outfall 007S consists of roof drain runoff and stormwater collected from the area surrounding the generating facility building (except that which is related to the FGD construction - this is routed to 001).
Biological Oxygen Demand (BOD5)	TBD				1	
Chemical Oxygen Demand (COD)	TBD				1	
Total Suspended Solids (TSS)	84.4 mg/L		25 mg/L		4	
Total Nitrogen	TBD				1	
Total Phosphorus	TBD				1	
pH	Minimum (grab) 7.3	Maximum (grab) 7.7	Minimum (comp)	Maximum (comp)	4	

Part B. List each pollutant that is limited in an effluent guideline which the facility is subject to or any pollutant listed in the facility's NPDES permit for its process wastewater (if the facility is operating under an existing NPDES permit). Complete one table for each outfall. See the instructions for additional details and requirements. Note: Part A compounds are not repeated in Part B.

Pollutant and CAS Number *(if available)*	Maximum Values *(include units)*		Average Values *(include units)*		Number of Storm Events Sampled	Sources of Pollutants
	Grab Sample Taken During First 20 Minutes	Flow-Weighted Composite	Grab Sample Taken During First 20 Minutes	Flow-Weighted Composite		
Sulfate	59.7 mg/L		42.6 mg/L		4	Outfall 007S consists of roof drain runoff and stormwater collected from the area surrounding the generating facility building (except that which is related to the FGD construction - this is routed to 001).
Arsenic, Total	0.0023 mg/L		0.0015 mg/L		4	
Chromium, Total	0.011 mg/L		0.0041 mg/L		4	
Selenium, Total	0.0092 mg/L		0.003 mg/L		4	
Zinc, Total	0.42 mg/L		0.17 mg/L		4	
Boron, Total	TBD				1	
Manganese, Total	TBD				1	
Mercury, Total	TBD				1	
Chloride, Total	TBD				1	
Ammonia, N Total	TBD				1	
Temperature	TBD				1	

Outfall 007S

Part C. List each pollutant shown in Tables 2F-2. 2F-3, and 2F-4 that you know or have reason to believe is present. See the instructions for additional details and requirements. Complete one table for each outfall.

Pollutant and CAS Number *(if available)*	Maximum Values *(include units)*		Average Values *(include units)*		Number of Storm Events Sampled	Sources of Pollutants
	Grab Sample Taken During First 20 Minutes	Flow-Weighted Composite	Grab Sample Taken During First 20 Minutes	Flow-Weighted Composite		
Cadmium, Total	< 0.001 mg/L		< 0.00058 mg/L		4	Outfall 007S consists of roof drain runoff and stormwater collected from the area surrounding the generating facility building (except that which is related to the FGD construction - this is routed to 001).
Copper, Total	0.0077 mg/L		0.0034 mg/L		4	
Lead, Total	0.0048 mg/L		0.0017 mg/L		4	
Nickel, Total	0.004 mg/L		0.0023 mg/L		4	
Organic N, Total	TBD				1	

Part D. Provide data for the storm event(s) which resulted in the maximum values for the flow weighted composite sample.

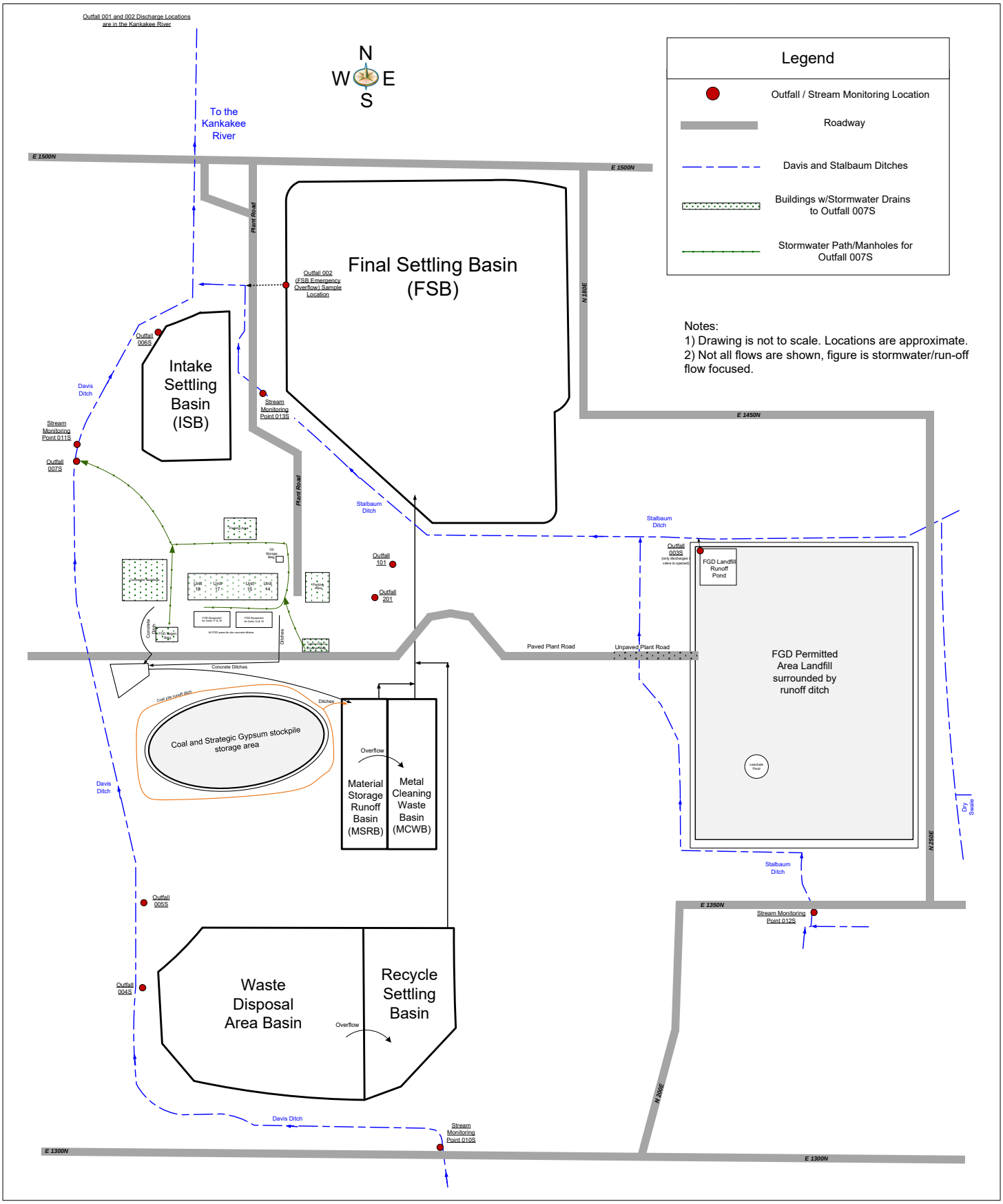
1. Date of Storm Event	2. Duration of Storm *(in minutes)*	3. Total rainfall during storm event *(in inches)*	4. Number of hours between beginning of storm measured and end of previous measurable rain event	6. Total flow from rain event *(gallons or specify units)*
06/15/16	128	0.17	336 hours	0.0976 MGD
08/22/17	420	1.12	288 hours	0.1048 MGD
08/20/18	60	0.21	83 hours	0.0111 MGD
05/09/19	155	0.65	96 hours	0.4918 MGD

9. Provide a description of the method of flow measurement or estimate.

Contractor measures the depth of the water & pipe width to calculate flow using an open channel flow equation. Time of discharge is measured to determine total volume.

Figure RMS-DRAIN: Site Drainage Map

R.M. Schahfer Generating Station NPDES Permit IN0053201



RAMBOLL

Stream Monitoring Locations (010S, 011S, 012S, 013S) Data

STREAM MONITORING LOCATION DATA

Stream Monitoring Sites	Location	Receiving Water	Date	Flow (MGD)	pH	TSS (mg/L)	Oil & Grease (mg/L)	Sulfate (mg/L)	Arsenic, total (mg/L)	Selenium, total (mg/L)	Nickel, total (mg/L)	Zinc, total (mg/L)	Cadmium, total (mg/L)	Lead, total (mg/L)	Chromium, total (mg/L)	Copper, total (mg/L)
010S	N 41 12' 5.22" W 87 0' 56.4"	Davis Ditch	6/15/2016	0.1094	7.6	10.0	< 5.00	45.20	0.0025	< 0.0009	0.0019	0.0100	< 0.00016	0.00051	0.00097	0.00093
			8/22/2017	0.3665	7.74	3.2	< 5.00	31.01	0.0018	< 0.0005	0.00086	0.00064	< 0.00015	0.00011	< 0.0005	0.0045
			8/20/2018	0.0106	7.6	2.0	< 5.00	37.34	0.0030	< 0.0010	0.0013	0.0049	< 0.001	< 0.001	< 0.001	< 0.001
			5/9/2019	0.4139	7.7	4.8	< 5.00	45.57	0.0012	< 0.0010	0.0013	0.0082	< 0.001	< 0.001	< 0.001	< 0.001
			max	**0.4139**	**7.74 (max) / 7.6 (min)**	**10.0**	**< 5.00**	**45.57**	**0.003**	**< 0.0010**	**0.0019**	**0.01**	**< 0.0010**	**0.00051**	**0.00097**	**0.0045**
			avg	**0.2251**	**7.7**	**5.0**	**< 5.00**	**39.78**	**0.0021**	**< 0.0008**	**0.0013**	**0.0059**	**< 0.0006**	**0.00066**	**0.00087**	**0.0019**
011S	N 41 13' 19.21" W 87 1' 47.3"	Davis Ditch	6/15/2016	0.2916	7.6	10.4	< 5.00	39.10	0.0016	< 0.0009	0.0026	0.13	< 0.00016	0.00021	0.014	0.00068
			8/22/2017	0.5938	7.7	9.2	< 5.00	75.99	0.0012	0.00053	0.0012	0.11	< 0.00015	0.0013	0.00055	0.0055
			8/20/2018	0.0337	7.6	8.0	< 5.00	97.64	0.0024	< 0.001	0.0014	0.028	< 0.001	< 0.001	< 0.001	< 0.001
			5/9/2019	0.3696	7.25	15.2	< 5.00	74.69	0.0015	< 0.001	0.0015	0.059	< 0.001	< 0.001	< 0.001	0.0013
			max	**0.5938**	**7.7 (max) / 7.25 (min)**	**15.2**	**< 5.00**	**97.64**	**0.0024**	**0.00053**	**0.0026**	**0.13**	**< 0.0010**	**0.0013**	**0.014**	**0.0055**
			avg	**0.322175**	**7.5375**	**10.7**	**< 5.00**	**71.86**	**0.0017**	**0.00085**	**0.0017**	**0.082**	**< 0.0006**	**0.00088**	**0.0041**	**0.0021**
012S	N 41 12' 29.88" W 87 0' 3.9"	Stalbaum Ditch	6/15/2016	0.2751	7.3	3.2	< 5.00	67.4	0.0023	< 0.00086	0.0021	0.0086	< 0.00016	< 0.00016	0.00067	0.00041
			8/22/2017	0.1325	7.61	6.8	< 5.00	49.48	0.002	< 0.0005	0.0014	0.0014	< 0.00015	0.00015	< 0.0005	0.00042
			8/20/2018	0.0424	7.4	3.2	< 5.00	48.84	0.0028	< 0.001	0.0013	0.0047	< 0.001	< 0.001	< 0.001	< 0.001
			5/9/2019	0.5737	7.6	0.4	< 5.00	50.53	< 0.001	< 0.001	0.0012	0.0027	< 0.001	< 0.001	< 0.001	< 0.001
			max	**0.5737**	**7.61 (max) / 7.3 (min)**	**6.8**	**< 5.00**	**67.4**	**0.0028**	**< 0.001**	**0.0021**	**0.0086**	**< 0.0010**	**0.00015**	**0.00067**	**0.00042**
			avg	**0.255925**	**7.4775**	**3.4**	**< 5.00**	**54.06**	**0.0020**	**< 0.00084**	**0.0015**	**0.00435**	**< 0.0006**	**0.00058**	**0.00079**	**0.00071**
013S	N 41 13' 24.52" W 87 1' 21.3"	Stalbaum Ditch	6/15/2016	0.0692	7.4	3.6	< 5.00	276.00	0.0084	< 0.00086	0.0019	0.015	< 0.00016	0.00033	0.0015	0.00057
			8/22/2017	0.1202	7.62	7.6	< 5.00	105.18	0.0035	< 0.0005	0.00071	< 0.0002	< 0.00015	0.00006	< 0.0005	< 0.0003
			8/20/2018	0.0106	7.7	6.4	< 5.00	126.48	0.0051	< 0.001	0.0011	0.018	< 0.001	< 0.001	< 0.001	0.0013
			5/9/2019	0.0044	7.4	< 1.0	< 5.00	402.50	0.0016	< 0.001	< 0.001	0.0021	< 0.001	< 0.001	< 0.001	< 0.001
			max	**0.1202**	**7.7 (max) / 7.4 (min)**	**7.6**	**< 5.00**	**402.50**	**0.0084**	**< 0.001**	**0.0019**	**0.018**	**< 0.001**	**0.00033**	**0.0015**	**0.0013**
			avg	**0.0511**	**7.53**	**4.65**	**< 5.00**	**227.54**	**0.0047**	**< 0.00084**	**0.00118**	**0.0088**	**< 0.0006**	**0.00060**	**0.0010**	**0.00079**

Note: For parameter data sets containing detections and non-detections, all results were used in the calculation of the long term average, but only detections were used to determine the maximum statistics. Instances in which maximum detections were manually populated are shown in blue text.

Attachment 1: Listing of Water Treatment Additives

Attachment 1. Water Treatment Additive Listing

Additive Name	Supplier	Injection Points	Purpose
Sodium Hypochlorite	Rowe	U17, U18 Cooling Tower Basin	Algaecide and biocide
Nalco 90005	Nalco	U14, U15, U17, U18 Cooling Tower	Algaecide and biocide
Sulfuric Acid	Wilson	U14, U15, U17, U18 Cooling Tower	pH control
Mixed Oxidant	MIOX	U14, U15 Cooling Tower	Algaecide and biocide
3D Trasar 3DT198	Nalco	U14, U17, U18 Condenser	Cooling Tower treatment
Nalco 7385	Nalco	U14, U15, U17, U18 Cooling Tower	Scale inhibitor
AGS Plus DBA	Solutia	FGD specific	FGD process additive
Nalco 7408	Nalco	RO units, Feedw ater Ion Exchange Unit, Wastewater	Boiler chlorine scavenger
Perma Treat PC-191T	Nalco	Reverse Osmosis system	Boiler antiscalant
Nalco 8735	Nalco	RO systems	RO system pH stabilizer
Trasar Trac 109	Nalco	FGD, Boiler, RO, and cooling towers	Cooling Tower corrosion inhibitor
Nalco PermaClean PC-11	Nalco	RO systems	RO system biocide
Nalco 7468	Nalco	Cooling towers	Cooling tower Antifoam (used in conjunction with Nalco 73550)
Ammonium Hydroxide	Wilson	North of Unit 14, 17	Boiler pH control
Citric Acid (anhydrous)	Wilson	Unit 14, 15 basement	RO system maintenance
Sodium Hydroxide	Rowe	Unit 14 basement	pH control
Ferric Chloride	PVS Chemical	14 / 15 FGD WWTP	Wastewater treatment chemical
Hydrated Lime	Mississippi Lime	14 / 15 FGD WWTP	Wastewater treatment chemical
Hydrochloric Acid	PVS Chemical	14 / 15 FGD WWTP	Wastewater treatment pH control
Nalmet 1689	Nalco	14 / 15 FGD WWTP	Wastewater treatment chemical
Nalclear 7763	Nalco	14 / 15 FGD WWTP	Wastewater treatment chemical
CL5828	ChemTreat	Circ Water System	Cooling Water Treatment Dispersant
CL206	ChemTreat	Circ Water System	Cooling Water and Reserve Osmosis
CL4125	ChemTreat	Circ Water System	Cooling Water Treatment
CL4704	ChemTreat	Circ Water System	Cooling Water Treatment
CL1370	ChemTreat	Circ Water System	Cooling Water Treatment
RL9005	ChemTreat	U14/15/17/18 RO Systems	Reverse Osmosis Treatment
P8200L	ChemTreat	Circ Water System	Metal Precipitant
FCT42	ChemTreat	U14/15/17/18 Coal Feeders	Fuel Additive
CL2840	ChemTreat	Circ Water System	Closed System Treatment
PE2505	Suez	Circ Water System	Corrosion/scale inhibitor
3DT138	NALCO	Circ Water System	Water Chemistry control
CL5450	ChemTreat	Circ Water System	Cooling Water Treatment
2877	NALCO	Recycle Basin	Algaecide
3DT337	NALCO	U14/17/18 Condensers	Corrosion control
RL124	ChemTreat	U14/15/17/18 RO Systems	Dechlorination
AZ8100	Suez	U14/17/18 Condensers	Corrosion control
CT1300	Suez	U14/15/17/18 CTs	Algaecide
RL9007	ChemTreat	U14/15/17/18 CTs	Corrosion/scale inhibitor
BL1304	ChemTreat	U14/17 RO Systems	pH control

Attachment 2: 316(b) Cooling Water Intake Structure Updates

COOLING WATER INTAKE STRUCTURE REQUIREMENTS §122.21(R)(2) – (R)(8) 2020 NPDES PERMIT APPLICATION UPDATES

Project name	**NiSource: Schahfer NPDES Permit Renewal Support**
Project no.	**1690015757**
Version	**Original**
Date	**February 28, 2020**
Prepared by	**Ramboll US Corporation**

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1. Introduction

Facility Background

The R. M. Schahfer Generating Station (RMS) is permitted to draw from an intake on the Kankakee River in Wheatfield, Jasper County, Indiana pursuant to National Pollutant Discharge Elimination System (NPDES) Permit No. IN0053201. RMS has four coal-fired boilers (Units 14, 15, 17, and 18) which began operating in 1976 when Unit 14 came online followed by Unit 15 (1979), Unit 17 (1983) and Unit 18 (1986). All four units feature close-cycle cooling via a single multi-cell mechanical draft cooling tower per unit.

Makeup water for the recirculating water system comes from the Kankakee River via Davis Ditch through a single cooling water intake structure (CWIS). The CWIS is located on Davis Ditch approximately two miles north of the plant. Makeup water is drawn through CWIS by a set of three circulating water pumps, each with a capacity of 20,000 gallons per minute (gpm); however, only two of the pumps can be operated together at any one time, thus the maximum Design Intake Flow (DIF) for RMS is approximately 40,000 gpm (57.6 MGD). Nonetheless, the maximum intake flow registered by RMS is 39.0 MGD.

Makeup water is pulled into the service water pump house through a pair of steel bar trash racks then into two separate bays, each containing one traveling screen with stainless steel mesh panels. From the CWIS, makeup water travels via underground pipe to the Intake Basin (IB). Water from the IB is pumped into the plants to be used as cooling tower makeup water, as well as makeup water to the recycle line, and to provide water to the boilers and the Flue-Gas Desulfurization (FGD) equipment. After passing through the plant processes, all water is routed to the Final Setting Basin (FB) located on the north side of the plant. The FB contains a primary outfall to the Kankakee River (Outfall 001) and an emergency outfall to the Davis Ditch.

Regulatory Applicability

The United States Environmental Protection Agency (USEPA) promulgated the Clean Water Act (CWA) Section 316(b) Rule (316(b) Rule) for existing facilities in August 2014, under Title 40 of the Code of the Federal Register (CFR) Parts 122 and 125, as part of the National Pollutant Discharge Elimination System (NPDES) program. Under the 316(b) Rule, which became effective on October 14, 2014, applicable facilities with cooling water intake structures (CWISs) are required to locate, design, and operate their CWIS to minimize adverse environmental impact (AEI) from impingement and entrainment mortality. In accordance with the 316(b) Rule, existing facilities that withdraw greater than a Design Intake Flow (DIF) of 2 million gallons per day (MGD) of water from “waters of the U.S.” and utilize greater than 25 percent of the water withdrawn for cooling purposes are subject to the rule requirements under the NPDES Permit Program.

As per 40 CFR 122.21(r)(1)(ii), existing facilities are required to provide cooling water intake information to the regulatory authority related to the intake and source water. As an existing facility with surface water intakes withdrawing greater than 2 MGD based on cumulative design intake flow, but withdrawing less than 125 MGD based on cumulative actual intake flow, and more than 25 percent of the actual intake flow used exclusively for cooling purposes, RMS must address the required information published in 40 CFR Part 122.21(r)(2) through (r)(8). Corresponding federal regulation citations include:

- Physical Information for Source Water (§122.21(r)(2))
- Physical description of CWIS (§122.21(r)(3))
- Biological Information for Source Water (§122.21(r)(4))

- Cooling Water System Data (§122.21(r)(5))
- Impingement Mortality BTA Demonstration (§122.21(r)(6))
- Entrainment Performance Studies (§122.21(r)(7))
- Operational Status (§122.21(r)(8))

Pursuant to 40 CFR 125.95(a)(1), existing facilities whose currently effective permit expires after July 14, 2018 are required to submit the information required in applicable sections of 40 CFR 122.21(r) when applying for a subsequent permit. This information was originally submitted to the Indiana Department of Environmental Management (IDEM) in March 2015 in the report titled "Schahfer Generating Station NPDES Permit Application Submittal Requirements §122.21(r)(2) – (r)(8)" authored by Golder Associates, Inc (referred to herein as the March 2015 CWIS Report).

After the initial submission of the 40 CFR 122.21(r) permit application studies, the permittee may request to reduce the information required, if conditions at the facility and in the waterbody remain substantially unchanged since the previous application so long as the relevant previously submitted information remains representative of current source water, intake structure, cooling water system, and operating conditions. Per federal regulations detailed in 40 CFR 125.94(c), the owner or operator of a facility is required to submit its request for reduced cooling water intake structure and waterbody application information to the Director at least two years and six months prior to the expiration of its NPDES permit. RMS did not request reduced application information, however based on technical review select conditions detailed in the March 2015 CWIS Report continue to be substantially unchanged. This short form report serves as a supplement to the March 2015 CWIS Report (included as Appendix 1) and provides updates for applicable conditions.

2. Source Water Physical Data [40 CFR §122.21(r)(2)]

The description and water quality regime of the Kankakee River has not been modified since the March 2015 CWIS Report. See Appendix 1, Section 2.

3. Cooling water Intake Structure Data [40 CFR §122.21(r)(3)]

The cooling water intake structure configuration has not been modified since the March 2015 CWIS Report. See Appendix 1, Section 3.

4. Source Water baseline Biological Characterization Data [40 CFR §122.21(r)(4)]

No previous impingement or entrainment studies have been performed at RMS; therefore, historic plant impingement and entrainment is not available for this section.

To assess substantially changed conditions from the information submitted in the March 2015 CWIS Report, Ramboll conducted a review of publicly-available information from published and online sources. Rule guidance documents, including the U.S. Fish and Wildlife Service (USFWS)/National Marine Fisheries Service (NMFS) Biological Opinion, as well as USEPA and USFWS online resources/databases, were utilized to guide this data search.

The extensive electrofishing surveys within Indiana portions of the main branch of the Kankakee performed by Price and Robertson[1] in 2001 continues to be the most recent, representative reference of species and relative abundance in the vicinity of the cooling water intake structure.

Since March 2015 CWIS Report, the Indiana Department of Natural Resources (IDNR) has updated the available Endangered, Threatened and Rare Species list. This list has been expanded from the March 2015 CWIS Report to include Jasper and neighboring counties, La Porte and Porter.

Table 1. Threatened and Endangered (T&E) Species with Potential to Impact [A]

County	Aquatic Life	Species Name	Common Name	T&E Status [B]
La Porte	Mussel	Lymnaea stagnalis	Swamp Lymnaea	SSC
Jasper / Porter	Mussel	Plethobasus cyphyus	Sheepnose	LE, SE
Porter	Mussel	Venustaconcha ellipsiformis	Ellipse	SSC
La Porte / Porter	Fish	Acipenser fulvescens	Lake Sturgeon	SE
La Porte	Fish	Ichthyomyzon fossor	Northern Brook Lamprey	SE
Jasper / La Porte	Fish	Moxostoma valenciennesi	Greater Redhorse	SE
La Porte/ Porter	Fish	Rhinichthys cataractae	Longnose Dace	SSC
La Porte	Amphibian	Acris blanchardi	Blanchard's Cricket Frog	SSC
Jasper / Porter	Amphibian	Ambystoma laterale	Blue-spotted Salamander	SSC
Jasper	Amphibian	Cryptobranchus alleganiensis	Eastern Hellbender	SE
La Porte / Porter	Amphibian	Hemidactylium scutatum	Four-toed Salamander	SSC
Jasper	Amphibian	Lithobates blairi	Plains Leopard Frog	SE
La Porte / Porter	Amphibian	Necturus maculosus	Common mudpuppy	SSC

NOTES:

(A): Indiana Department of Natural Resources (May 9, 2019): County Endangered, Threatened and Rare Species List (Jasper, La Porte, and Porter County); https://www.in.gov/dnr/naturepreserve/4666.htm

(B): LE: Federally Endangered; SE: State Endangers; SSC: State Special Concern

5. Cooling Water System Data [40 CFR §122.21(r)(5)]

The RMS operates a recirculating water closed-cycle cooling system, only withdrawing water from the Kankakee River as makeup water, with a maximum intake of 39 MGD. For the period 2008 through 2014, average daily intake flow was 26.2 MGD (Table 2).

The actual intake volumes associated with the RMS CWIS are reported annually to the Indiana Department of Natural Resources (IDNR) as a Significant Water Withdrawal Facility (SWWF). Surface water withdrawal rates are identified under Registration No. 37-01145-EP as Intake 1. Monthly intake volumes from 2016, 2017, and 2018 are summarized in Table 1.

[1] Price and Robertson. 2005. Fishery, Habitat, and Recreational Use Surveys for the Kankakee River, Indiana. Indiana Department of Natural Resources – Division of Fish and Wildlife Final Report – Workplans #200766, #202766. 31 pp.

Table 2. RMS Intake Volume

Month/Year	Day per Month	Intake Volume (1,000 gals per month)	Average Intake Volume (MGD)	Annual Average
Jan-15	31	636401	20.53	
Feb-15	28	644517	23.02	
Mar-15	31	500451	16.14	
Apr-15	30	602534	20.08	
May-15	31	570162	18.39	
Jun-15	30	753237	25.11	
Jul-15	31	1047509	33.79	22.03 (2015)
Aug-15	31	1006353	32.46	
Sep-15	30	913923	30.46	
Oct-15	31	594264	19.17	
Nov-15	30	451809	15.06	
Dec-15	31	313880	10.13	
Jan-16	31	308880	9.96	
Feb-16	29	466810	16.10	
Mar-16	31	362980	11.71	
Apr-16	30	379320	12.64	
May-16	31	700840	22.61	
Jun-16	30	725590	24.19	
Jul-16	31	817933	26.38	18.79 (2016)
Aug-16	31	468780	15.12	
Sep-16	30	831340	27.71	
Oct-16	31	735230	23.72	
Nov-16	30	614620	20.49	
Dec-16	31	459200	14.81	
Jan-17	31	643062	20.74	
Feb-17	28	578302	20.65	
Mar-17	31	648458	20.92	
Apr-17	30	725041	24.17	
May-17	31	623927	20.13	
Jun-17	30	666956	22.23	
Jul-17	31	973910	31.42	20.26 (2017)
Aug-17	31	786027	25.36	
Sep-17	30	491610	16.39	
Oct-17	31	303430	9.79	
Nov-17	30	488651	16.29	
Dec-17	31	466239	15.04	
Jan-18	31	653358	21.08	
Feb-18	28	439007	15.68	24.56 (2018)
Mar-18	31	464079	14.97	

Month/Year	Day per Month	Intake Volume (1,000 gals per month)	Average Intake Volume (MGD)	Annual Average
Apr-18	30	565346	18.84	
May-18	31	767792	24.77	
Jun-18	30	932382	31.08	
Jul-18	31	1010795	32.61	
Aug-18	31	1081148	34.88	
Sep-18	30	865822	28.86	
Oct-18	31	724876	23.38	
Nov-18	30	715841	23.86	
Dec-18	31	766261	24.72	
Jan-19	31	669582	21.60	
Feb-19	28	463301	16.55	
Mar-19	31	813127	26.23	
Apr-19	30	665709	22.19	
May-19	31	866541	27.95	
Jun-19	30	703959	23.47	22.93 (2019)
Jul-19	31	665828	21.48	
Aug-19	31	884732	28.54	
Sep-19	30	838733	27.96	
Oct-19	31	692020	22.32	
Nov-19	30	543954	18.13	
Dec-19	31	582696	18.80	

The actual intake flow (AIF) is defined as the average volume of water withdrawn on an annual basis by the cooling water intake structures over the past three years. The maximum observed intake flow and AIF are summarized in Table 2 below with the corresponding through-screen velocity (TSV).

Table 3. Calculated TSV

Design Intake Flow, MGD =	**39.00**	**TSV @ DIF, fps =**	**0.39**
Actual Intake Flow (2015-2017), MGD =	20.36	**TSV @ 2017 AIF, fps =**	0.20
Actual Intake Flow (2016-2018), MGD =	21.20	**TSV @ 2018 AIF, fps =**	0.21
Actual Intake Flow (2017-2019), MGD =	22.58	**TSV @ 2019 AIF, fps =**	0.23

6. Chosen Method of Compliance with Impingement Mortality Standard [40 CFR §122.21(r)(6)]

The RMS will continue to comply with the Impingement Mortality Standard by maintaining an AIF of less than 0.50 fps. Compliance monitoring will continue via monitoring and reporting daily intake flow.

7. Entrainment Performance Studies [40 CFR §122.21(r)(7)]

No entrainment performance studies have been conducted at RMS.

8. Operational Status [40 CFR §122.21(r)(8)]

RMS is equipped with four coal-fired base-load units and two gas-fired simple cycle peaking units that came on-line over an 11-year period ending in 1986. Individual unit characteristics from the 2018 NIPSCO Integrated Resource Plan (IRP) are shown in Table 3.

Table 4 RMS Individual Unit Characteristics

	Unit 14	Unit 15	Unit 17	Unit 18	Unit 16A	Unit 16B
NET Output						
Min (MW)	290	250	125	125	----	----
Max (MW)	431	472	361	361	78	77
Boiler	Babcock & Wilcox	Foster Wheeler	Combustion Engineering	Combustion Engineering	----	----
Burners	10 Cyclone	6 Pulverizers	6 Pulverizers	6 Pulverizers	----	----
Main Fuel	Coal	Coal	Coal	Coal	Gas	Gas
Turbine	Westinghouse	General Electric	Westinghouse	Westinghouse	Westinghouse	Westinghouse
Frame	BB44R	G2	BB243	BB243	D501	D501
In-Service	1976	1979	1983	1986	1979	1979

The 2018 IRP identified the preferred retire path which included the retirements of Schahfer Units 14, 15, 17, 18. NIPSCO's short term action plan covering the period 2019 to 2022 is focused mainly on initiating the planning process for the retirement of the Schahfer 14, 15, 17, 18 units and beginning the procurement of replacement resources. In this period, NIPSCO will make the required notifications to MISO, NERC and other relevant organizations of its intention to retire the Schahfer coal units by the end of 2023. NIPSCO will also identify and implement reliability and transmission upgrades resulting from the retirements of the units.

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-25-12
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	))))	Order No. 202-25-13

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 25
Schahfer CCR Part A Demonstration
Addendum

Northern Indiana Public Service Company LLC
R.M. Schahfer Generating Station
Wheatfield, Indiana

Demonstration of Site-Specific Alternative Deadline to Initiate Closure of CCR Surface Impoundment Due to Permanent Cessation of Coal-Fired Boilers by a Date Certain - Addendum 2

Pursuant to 40 CFR Part 257.103(f)(2)

Submitted to:

Northern Indiana Public Service Company LLC
801 East 86th Avenue
Merrillville, IN 46410

Submitted by:

Golder Associates USA Inc.
10 Al Paul Lane, Suite 103,
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August 2022

NiSource continues to advance efforts under the Your Energy, Your Future initiative a holistic, customer-centric strategic priority aimed at identifying and driving decarbonization pathways that meets the needs of both people and the environment. NiSource's environmental and sustainability performance, include the following goals:

- ✓ 100% coal-free generation mix by 2026-2028
- ✓ 90% reduction of scope 1 greenhouse gas emissions by 2030, with a 58% reduction already accomplished
- ✓ 50% reduction in methane emissions from main and service lines by 2025, with a 42% reduction already accomplished
- ✓ 99% reduction in air emissions (nitrogen oxides, sulfur dioxide, mercury), by 2030
- ✓ 99% reduction in water withdrawals by 2030

NIPSCO - Leaving things better – YOUR ENERGY, YOUR FUTURE

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1.0 INTRODUCTION

Northern Indiana Public Service Company LLC (NIPSCO) submitted the Demonstration of Site-Specific Alternative Deadline to Initiate Closure of CCR Surface Impoundment Due to Permanent Cessation of Coal-Fired Boilers by a Date Certain (hereinafter Demonstration) to the United States Environmental Protection Agency (EPA) on October 30, 2020. The Demonstration was prepared by Golder Associates USA Inc., *a member of WSP* (Golder) in collaboration with and on behalf of NIPSCO for the R. M. Schahfer Generating Station, Wheatfield, Indiana (RMSGS, Figure 1) to meet the requirements of 40 CFR § 257.103(f)(2). Due to a lack of alternative disposal options on- and off-Site for the high-volume waste streams generated by RMSGS, the Demonstration substantiates the basis for continued receipt and management of coal combustion residuals (CCR) and/or non-CCR influent in the Waste Disposal Area (WDA, Figure 2). The WDA is the only currently available management option on- and off-Site for several (e.g., currently up to 4.1 million gallons per day) influent waste streams until coal-fired generation and production of the residual CCR and non-CCR wastes related to typical power plant operation, shutdown, and closure processes end. Furthermore, the Demonstration outlines an alternative closure schedule for RMSGS' single remaining operational CCR surface impoundment beyond the otherwise mandatory April 11, 2021, cease receipt and initiate closure deadline.

Following an informal review of the October 2020 Demonstration and November 23, 2020 discussions with EPA Headquarters representatives about their interpretation of 40 CFR § 257.103(f)(2) regulatory requirements and their expectations regarding Demonstration content, Golder/NIPSCO prepared and on November 30, 2020 NIPSCO submitted the Demonstration of Site-Specific Alternative Deadline to Initiate Closure of CCR Surface Impoundment Due to Permanent Cessation of Coal-Fired Boilers by a Date Certain - Addendum 1 (hereinafter Demonstration Addendum 1). In accordance with EPA Headquarters feedback, Demonstration Addendum 1 provides additional CCR Rule groundwater monitoring and corrective action information for other RMSGS CCR Rule regulated management units besides the WDA, updated the existing closure plan, and offered greater detail in an enhanced WDA closure schedule.

Both the Demonstration and Demonstration Addendum 1 anticipated a permanent cessation of coal-fired generation and the initiation of post-operational waste generation and management activities in May 2023. The scheduled cessation of generation was predicated on two key assumptions. First, operating until then would meet existing grid reliability-related electricity supply needs in accordance with the requirements of and commitments to the Midcontinent Independent System Operator (MISO). Second, the schedule of NIPSCO's transition from primarily coal-fired to renewable generation capacity would be sufficient to meet ongoing NIPSCO and MISO electricity demands. However, and as discussed in greater detail in Section 1.2, after preparation of the Demonstration and Demonstration Addendum #1, events outside the control of MISO and NIPSCO occurred. These unforeseen conditions require continued RMSGS coal-fired generation until December 31, 2025. By extension, the cessation of discharge to and initiation of closure of the WDA will follow in approximately six more months. Accordingly, and in accordance with discussions during April-May 2022 between representatives of EPA Headquarters and NIPSCO, on behalf of NIPSCO, Golder has prepared a second Addendum to the Demonstration.

This Demonstration of Site-Specific Alternative Deadline to Initiate Closure of CCR Surface Impoundment Due to Permanent Cessation of Coal-Fired Boilers by a Date Certain - Addendum 2 (Demonstration Addendum 2), provides the new date of permanent cessation of coal-fired boilers at the RMSGS and NIPSCO's continued commitment to cease operation and complete closure the WDA no later than October 17, 2028, as stipulated in 257.103(f)(2)(iv)(B). Furthermore, to meet the requirements of 40 CFR § 257.103(f)(2), Demonstration Addendum 2 supplies information updated since November 2020 (i.e., the date Demonstration Addendum 1 was prepared)

with respect to groundwater monitoring and corrective action activities at RMSGS. Specifically, in accordance with 40 CFR §257.103(f)(2) and the August 28, 2020, preamble to the proposed rulemaking, Demonstration Addendum 2 in concert with the Demonstration and Demonstration Addendum 1:

- address all applicable Part A regulatory requirements
- demonstrate that qualifying criteria had been met
- justifies the new cessation of coal-fired boiler operations date, and
- provides the following updated information:
  - a recent re-evaluation of alternative disposal capacity options and availability
  - progress toward closure since November 30, 2020
  - WDA-specific and other RMSGS CCR management units' geologic/hydrogeologic groundwater monitoring compliance data
  - closure plan schedule as required by 40 CFR §257.102(b) and a narrative with justification for a new cease receipt of waste and amended WDA closure activities timeframe, and
  - NIPSCO recertification of RMSGS facility wide CCR Rule compliance

As explained and justified herein, cessation of coal-fired generation at RMSGS will now be December 31, 2025, providing nearly three years to a) complete boiler shutdown processes, some of which are expected to generate significant volumes of CCR and non-CCR waste streams, b) reduce and/or eliminate other ongoing influent streams, c) optimize the closure plan and gain regulatory agency approval for the WDA closure approach, and d) complete closure construction. Following cease receipt of WDA waste streams (Q2 2026), NIPSCO estimates a timeframe of approximately two and a half years to achieve final closure of the WDA including the professional engineer's certification, thereby achieving final closure by September 17, 2028, and meeting the 40 CFR § 257.103(f)(2) deadline of October 17, 2028.

This Demonstration Addendum 2 in combination with remaining applicable sections of the Demonstration (Golder, October 2020) and Demonstration Addendum 1 (Golder, November 2020) meet the requirements of 40 CFR § 257.103(f)(2).

1.1 Background

NIPSCO had been planning for a no later than 2023 retirement of all four coal units (Units 14, 15, 17, 18) at the Schahfer generating station. NIPSCO's preferred resource plan pointed to the retirement of the coal units at the Schahfer Generating Station and the development and completion of a portfolio of renewable wind and solar projects to replace the energy and capacity needs that the station provides NIPSCO and its customers. NIPSCO conducts an Integrate Resource Plan (IRP) every three years to outline the roadmap for future energy needs over the next 20 years. The completion of three wind projects along with a number of transmission system upgrades allowed NIPSCO to retire Units 14 and 15 in 2021, almost 2 years earlier than the planned 2023 retirement. Any delays to the construction progress of the renewable projects significantly impact NIPSCO's ability to sufficiently meet resource adequacy obligations and reliably serve customers. Therefore, NIPSCO must continue to operate RMSGS until the end of 2025 when permanent shutdown of coal-fired electricity generation is scheduled. Until shutdown, RMSGS' ongoing coal-fired generation and associated waste stream management activities are, in turn, dependent upon continued operation of the WDA. Consistent with the objective to reduce its reliance on multiple unlined surface impoundments for waste stream management, NIPSCO is currently in the procurement

(i.e., bid and contractor selection) process, a key initial stage in closure of the Material Storage Runoff Basin (MSRB), Metal Cleaning Waste Basin (MCWB), and Drying Area (collectively monitored and referred to as the Multi-Cell Unit (MCU)). As a precursor step in advance of the mandatory April 11, 2021, cease receipt date, NIPSCO ceased discharging influent to these impoundments by October 31, 2020, leaving only the WDA as the remaining operational CCR surface impoundment.

Until Q2 2026 and as shown on the coal-fired cessation, boiler shutdown and impoundment closure timeline, (see Sections 1.4 and 2.4, and Figure 3), the Demonstration, Demonstration Addendum 1, and Demonstration Addendum 2 substantiate the need for receipt and management of CCR and/or non-CCR waste streams by the WDA due to a lack of alternative disposal options on- and off-Site.

In anticipation of and in planning for the reduction of influent waste streams to the WDA and final closure by September 17, 2028, NIPSCO has or is currently engaging in several activities, including:

- The wastewater piping re-direct project was completed in October 2020, resulting in cessation of waste stream discharges to the MCU. CCR waste streams were redirected to the WDA and non-CCR waste streams were redirected to other on-Site waste management units
- A 2019-20 detailed assessment of WDA solids (i.e., ash) content including the presence and type of CCR, relative thickness, and location/extent, the results of which were summarized in a report prepared to support closure design initiatives
- Preparation of and negotiations regarding a beneficial reuse permitting application is ongoing with Indiana Department of Environmental Management (IDEM). Approval of the permit application would allow NIPSCO to excavate and beneficially reuse 250,000 cubic yards or more of WDA bottom ash as a) a protective layer above the landfill geomembrane composite liner and, b) as a landfill final cover drainage layer, instead of virgin natural resources (i.e., native sand) from off-Site. If approved, the amount of remaining material in the WDA would be significantly less, allowing for a faster closure by removal timeframe
- Cessation of coal-fired generation and completion of boiler shutdown/decommissioning activities, and thus, permanent elimination of those directly produced and resulting waste streams by the end of Q2 2026
- Completion of closure activities for the MCU by Q4 2025 and, as part of this action, elimination of CCR-impacted dewatering streams as influent to the WDA by Q2 2026, and
- Conceptual planning for a second wastewater piping re-direct project which would eliminate current (or remaining post-generation) boiler room sump and yard drain stormwater flows to the WDA by the end of Q2 2026

1.2 NIPSCO's Role in Midcontinent Independent System Operations and NIPSCO's Generation Transition Plan

NIPSCO, as a member of MISO, has resource adequacy obligations to MISO, of which RMSGS is a critical element of how NIPSCO meets these obligations. MISO is an Independent System Operator (ISO) or Regional Transmission Organization (RTO) ensuring the reliable delivery of electricity in the United States and Canada to 42 million consumers. ISOs and RTOs are organizations formed with the approval of the Federal Energy Regulatory Commission (FERC) to coordinate, control, and monitor the use of the electric transmission system by utilities, generators, and marketers. ISOs and RTOs operating in North America manage the systems that serve two-thirds of the customers in the U.S. and over half the population of Canada. MISO approved NIPSCO's plan to

retire RMSGS in 2023 but that was only one step in a highly complex process to enable the retirement and replacement of generation assets. On the state regulatory front, NIPSCO secured Indiana Utility Regulatory Commission (IURC) approval in December 2019 of an electric base rate case, to support its generation strategy, with new depreciation schedules related to the early retirement of coal-fired generation. In addition, NIPSCO is also executing on a number of required transmission system upgrades that need to be completed prior to the retirement of RMSGS.

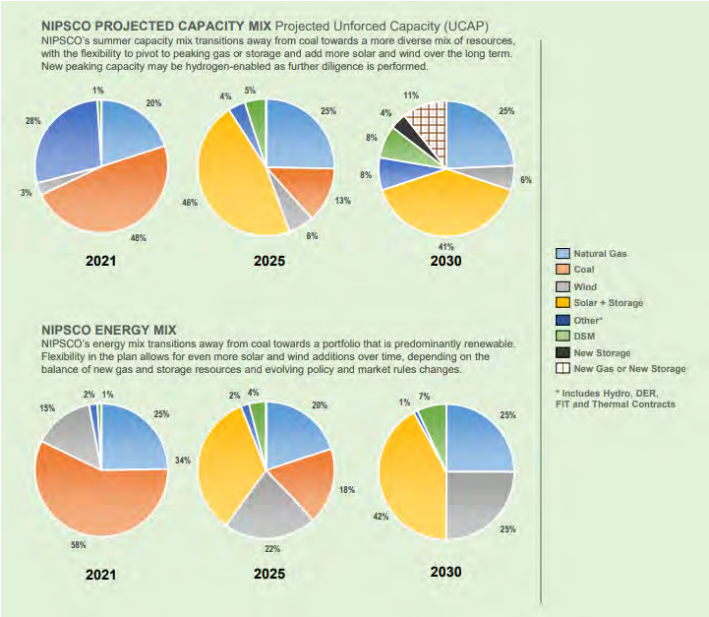
1.2.1 Background On NIPSCO's Generation Transition

As a public utility in the state of Indiana, NIPSCO conducts an Integrated Resource Plan, known as an IRP, every three years to outline the roadmap for future energy needs over the next 20 years. Analysis in 2016 and 2018 demonstrated that considering maintenance, environmental compliance, and economic pressures facing the coal generating portfolio, coal unit retirement was the most compelling economic alternative for customers. Furthermore, the analysis pointed to a portfolio of primarily renewable resources (wind, solar and solar plus storage) as being the most economic alternative for customers with estimated savings of $4B as compared to maintaining the existing coal fleet and will drive a 90% reduction in CO2 emissions by 2030 (based on 2005 levels).[1]

Accordingly, NIPSCO's generation transition strategy called for the retirement of the coal fleet over a ten-year period, starting with the retirement of the Schahfer coal units in 2023 and Michigan City Unit 12 in 2028. In order to replace the capacity at Schahfer, NIPSCO has acquired a mix renewable wind and solar projects through a combination of NIPSCO ownership (JVs with Tax Equity Partners) and Power Purchase Agreements (PPAs).

NIPSCO has been planning for a no later than 2023 retirement of all four coal units (Units 14, 15, 17, 18) at the Schahfer generating station. The completion of three wind projects along with a number of transmission system upgrades allowed NIPSCO to retire Units 14 and 15 in 2021, almost 2 years earlier than the planned 2023 retirement. The retirement of the remaining coal units at the Schahfer Generating Station is contingent on the development and completion of the remaining portfolio of renewable projects to replace the energy and capacity of Units 17 and 18. By 2025, the NIPSCO portfolio is expected to transition from coal dominant portfolio to a solar dominant portfolio with over 46% of its capacity coming from solar resources and providing 34% of its customers energy requirements.

[1] NIPSCO has sold in the past, and in the future may sell, the Renewable Energy Credits from its renewable generation to a third party because this helps keep our energy more affordable for our customers.



1.2.2 Maintaining System Reliability

As noted above, NIPSCO participates within the MISO market. MISO is responsible for coordinating the reliable operation of the energy system in collaboration with the various market participants. One of the ways it effectuates this responsibility is by ensuring there are enough capacity resources plus contingency reserves to meet customers energy needs at all times. For NIPSCO, part of its Resource Adequacy obligation to MISO is that it has capacity resources and reserves to cover its own customer's annual peak demand plus reserves. Currently, this must be demonstrated to MISO annually. Furthermore, as a vertically integrated utility, NIPSCO is also required by rules and statute in Indiana to have capacity resources to economically and reliably serve its customer's energy needs.

With a 2025 retirement of the RMSGS coal units, solar resources will become one of the primary ways in which NIPSCO will meet its capacity and reliability obligations to MISO and reliably serve its customers.

1.2.3 Solar Supply Chain Issues

There are a range of external factors creating uncertainty around the availability of key input material necessary to place solar projects in-service in the US. Currently, these key issues are:

- Department of Commerce (DOC) Investigation into antidumping and countervailing duties anti circumvention petition filed by a domestic solar manufacturer
- Uyghur Forced Labor Prevention Act and Forced Labor Withhold Release Order
- Section 201 Tariffs, and
- General global supply chain and labor availability issues

The issue of most significance is the decision from the U.S. DOC announcing that it will move forward with an investigation into the petition filed by a domestic solar manufacturer. The combination of the DOC investigation and the other issues virtually eliminated solar panel imports and other key components required to build solar

projects in the U.S. starting in March 2022. A significant number of solar projects have been delayed or canceled.[2] As NIPSCO is in the midst of a transition to a solar dominant portfolio, its projects are not immune to the effects of these issues. There is currently uncertainty around the timing of completion for NIPSCO's planned portfolio of projects. NIPSCO has received several notices of potential Force Majeure from developers in connection with solar panel availability, thus project delays are anticipated. The uncertainty surrounding the completion timing of the renewable projects created the potential risk that NIPSCO would not have the resources available to meet its capacity/energy obligations.

1.2.4 The Antidumping and Countervailing Duties Anti Circumvention Petition And DOC Investigation

On February 8, 2022, Auxin Solar Inc., a domestic manufacturer of solar modules, filed a petition requesting that the DOC initiate a circumvention investigation into whether imports of certain parts and components imported from Cambodia, Malaysia, Thailand, or Vietnam are circumventing antidumping and countervailing duty orders from China. On March 25, 2022, the DOC announced it would move forward with a circumvention investigation that could have wide ranging effects on the companies that import or rely on solar imports in the United States. For context, the countries subject to the investigation accounted for more than 85% of U.S. solar panel imports in the fourth quarter of 2021.

If the DOC issues an affirmative preliminary circumvention determination, importers will be required to pay antidumping and countervailing duties (tariffs) on certain parts and components that entered the U.S. on or after March 31, 2022. The amounts of tariffs being contemplated under the petition range from 19% to 525%. Regulations require the DOC to issue a preliminary determination by August 29, 2022, and a final determination by January 19, 2023.

It is important to note that the tariffs determinations will be based on individual manufacturers and the countries where the panels are manufactured, therefore should tariffs be imposed as result of this investigation, the impact will have to be assessed on a project-by-project basis. This could create further uncertainty on the timeline based on the individual circumstances of each project.

On June 6th, 2022, President Biden took Executive Action with the focus on spurring domestic solar production, including a 24-month suspension of anti-circumvention tariffs on modules, invoking the Defense Production Act to accelerate the production of clean energy technologies, eliminating back-dated tariffs, and employing federal procurement to increase domestic manufacturing. The Executive Action and 24-month tariff suspension are a positive development as they provide some level of certainty regarding in-flight solar projects. However, they do not fully mitigate the project delays and supply chain and labor issues facing solar project development. Solar panel imports essentially ceased in March 2022 at the onset of the DOC investigation, and it will take some time for imports to recover to previous levels.

1.2.5 Implications for NIPSCO Capacity Position and MISO Obligations

The high level of uncertainty surrounding the supply of solar panels and timely completion of the renewables projects creates a significant risk for NIPSCO to reliably meet its capacity/energy obligations for MISO and our customers. Any delays to the completion dates of the anticipated portfolio of solar projects will impact NIPSCO's

[2] Utility Dive, "Supply-chain squeeze: Solar, storage industries grapple with delays, price spikes as demand continues to grow," March 31, 2022, https://www.utilitydive.com/news/solar-storage-delays-price-supplychain/620537/.

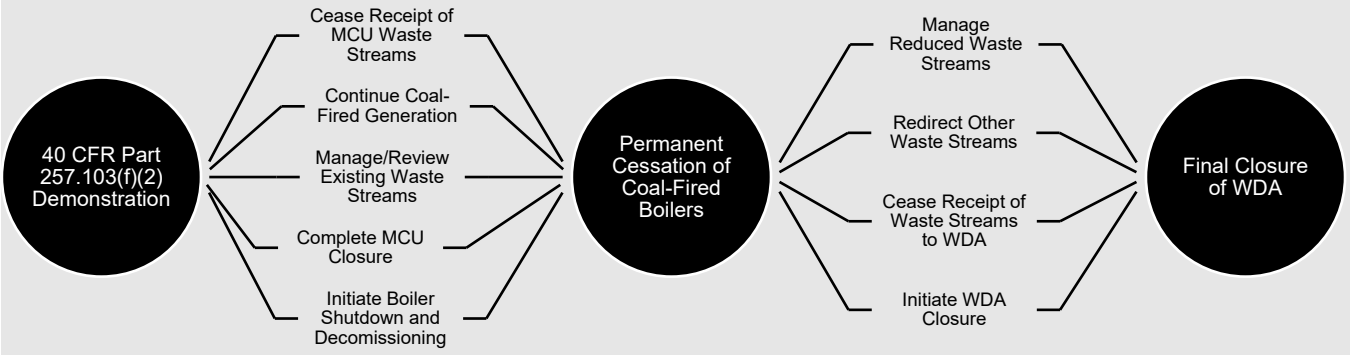
capacity position and its ability to meet its Resource Adequacy obligations to MISO. This challenge becomes acute should the remaining coal units at RMSGS (Units 17 and 18) retire as originally anticipated in May 2023.

NIPSCO is moving forward with two solar projects already under construction – Dunns Bridge I and Indiana Crossroads Solar (INCR) – and extending the operating life of RMSGS Units 17 and 18 to close the capacity gap to a more manageable level, which could then be addressed through a combination of other mitigations.

1.3 Planned Cessation of Operations

In 2020 MISO approved NIPSCO's plan to retire RMSGS in 2023; however, increasing regional electric demand, decreasing non-renewable production capacity, and unforeseen regulatory and supply chain issues which are delaying production-critical renewable generation projects have impacted MISO's previous assumptions. This, in turn, requires that RMSGS's coal-fired retirement be delayed until the end of 2025. As summarized in the embedded figure below, waste generation activities, individually and collectively, impact and require continued use of the WDA, the Site's only remaining active CCR Rule-regulated surface impoundment, for the next several years. The embedded figure below summarizes the planned reduction of influent waste stream activities to achieve cessation of the coal-fired boilers and permanent closure of the WDA.

Planned Cessation of WDA Operations



In the Demonstration and an annual progress report completed in October 2021 and considered in Demonstration Addendum 2, NIPSCO/Golder identified and evaluated discharge flows into the WDA on a waste stream-specific basis for on- and off-Site treatment and disposal alternatives. Future annual progress reports will be produced following the same waste stream-by-waste stream basis. Most of these discharge flows are high in volume yet based on sampling of ash and the saturated zone within the WDA, confirmed to be low in relative contaminant loading (i.e., concentrations of 40 CFR § 257 Appendix III and IV constituents). As a practical matter, reduction, or permanent elimination of waste streams, particularly those of significant volume, will be NIPSCO's primary focus, corresponding largely with cessation of coal-fired generation and completion of boiler shutdown activities. Initiated in October 2021, NIPSCO achieved significant reductions in influent volume (cessation of Units 14 and 15) and by the end of Q2 2026, will ultimately eliminate waste stream discharges to the WDA.

These and related activities with specific focus on the WDA are discussed in Section 2.4 and depicted on the facility closure timeline provided therein (Figure 3).

1.4 Demonstration Approach and Contents

The approach to and preparation of the Demonstration, Demonstration Addendum 1, and Demonstration Addendum 2 are based on the final CCR Rule Part A regulations as found in 40 CFR § 257.103(f)(2). The Demonstration and Addenda have been prepared to address all applicable regulatory requirements, demonstrate that qualifying criteria have been met, and provide an evaluation of alternative disposal capacity options and availability, a risk mitigation plan for continued operation, facility-wide CCR compliance certification, WDA-specific groundwater monitoring compliance data, and a 30% design closure plan with narrative.

Following this Introduction, Section 2.0 summarizes key information about the WDA including:

- overview of CCR and non-CCR wastes managed by the WDA, including source and flow volume tabulated on a waste stream-specific basis and depicted on a facility water flow diagram
- high-level summary of the historical and current CCR groundwater monitoring programs, including current CCR Rule monitoring phase, and
- description of the sequence of cessation of coal-fired generation, boiler shutdown activities, reduction/elimination of all waste streams into the CCR Unit, and planned closure, including a Gantt chart that depicts key actions and milestones (Figure 3)

Section 3.0 provides an identification and evaluation of existing alternative disposal options for influent into the WDA.

Section 4.0 addresses the continued operation risk mitigation plan, which remains largely unchanged since the submittal of the Demonstration in October 2020.

Section 5.0 provides information relative to CCR Rule regulatory compliance, with emphasis on groundwater monitoring and response requirements, including:

- recertification of RMSGS' compliance with all applicable 40 CFR § 257.60-107 requirements, signed by an authorized representative of NIPSCO
- figure showing groundwater monitoring well locations in relation to the CCR Units
- well construction diagrams and drilling logs for monitoring wells installed since 2020
- potentiometric surface maps characterizing the direction of groundwater flow accounting for seasonal variations
- tabulated groundwater monitoring data for each monitoring well for each CCR Rule monitoring event
- corrective measures assessment required in accordance with 40 CFR § 257.96
- progress reports on remedy selection and design and the report of final remedy selection required at 40 CFR § 257.97(a)
- most recent structural stability assessment performed pursuant to 40 CFR § 257.73(d), and
- most recent safety factor assessment performed pursuant to 40 CFR § 257.73(e)

Section 6.0 provides the current closure plan, a narrative that explains and justifies the date by which RMSGS will cease receipt into the WDA in order to meet the Q2 2026 closure construction start schedule date and construction completion date of September 17, 2028, design plans, and a timeline of key milestones and planned activities occurring between the development of WDA Final Closure Construction Plans (Q2 2024) and Closure Certification (Q3 2028).

Section 7.0 discusses the owner/operator compliance responsibilities NIPSCO LLC will fulfill subsequent to the Demonstration's submission to EPA and Section 8.0 provides the attestation of Golder, the preparer of the Demonstration, as to its accuracy and conclusions regarding the availability of no alternative disposal capacity, followed by Section 9.0 which provides references used in the preparation of the document. Supporting tables, figures, and appendices follow the Demonstration text.

2.0 DESCRIPTION OF CCR UNIT

This section of the Demonstration provides unit-specific details about the WDA including an explanation and summary of the source, type, and volumes of waste streams managed in the WDA; an overview of the CCR Rule-required groundwater monitoring well network and monitoring phases; and a discussion of key activities related to reduction of influent and other actions to be taken prior to cessation of waste receipt and final closure.

2.1 Overview of Waste Streams Managed

As noted, the WDA receives both CCR and non-CCR waste streams. At the time of this Demonstration, NIPSCO provided waste stream data including point source category descriptions (40 CFR § 423.11), a Facility Water Flow Diagram, and estimated average daily flows. This information was reviewed and updated for the purposes of the October 2021 annual progress report and preparation of Demonstration Addendum 2. The point source categories (RMSGS color-coding) and associated RMSGS designations for the waste streams managed at the WDA include:

- Low Volume Waste pursuant to 40 CFR § 423.11(b) ◆
  - Unit 14 Boiler Room Sump (Non-CCR)
  - Unit 15 Boiler Room Sump (Non-CCR)
  - Yard Drain (Non-CCR)
- Flue Gas Desulfurization (FGD) Wastewater pursuant to 40 CFR § 423.11(n) ◆
  - Unit 17/18 FGD Filter Building North Sump (CCR)
  - Unit 17/18 FGD Filter Building South Sump (CCR)
- Ash Transport Water pursuant to 40 CFR § 423.11(p) ◆
  - Unit 17 Bottom Ash Sluice (CCR)
  - Unit 18 Bottom Ash Sluice (CCR)
- Combustion Residual Leachate pursuant to 40 CFR § 423.11(r) ◆
  - MCU Closure Dewatering (CCR)[3]

[3] Development of the closure plan for the Multi-Cell Unit (MCU, [Material Storage Runoff Basin, Metal Cleaning Waste Basin, and Drying Area]), estimates that dewatering activities will generate a waste stream of approximately 1.42 MGD for a duration of approximately six months.

The waste stream from Units 14 and 15 Boiler Room Sumps include boiler drains and some other service water systems collected in the 14 or 15 sumps inside the main building. These waste streams are pumped through sump pumps to the WDA. The Yard Drain waste stream is from an outdoor sump that collects outdoor drainage water, as well as some water that comes from the Unit 14 boiler and some other service systems. This waste stream is pumped through sump pumps to the WDA. The waste stream from 17/18 FGD Filter Building North/South Sumps includes wastewater and slurry from the FGD process that cannot be filtered. This waste stream is pumped through either the North or South sump pumps inside FGD to the WDA. These waste streams were redirected to the WDA as part of the MCU wastewater piping re-direct project and in anticipation of closure of the MCU. The waste stream from Units 17 and 18 Bottom Ash Sluice includes bottom ash (or slag) that must be removed from the bottom holding tank of the boiler. Service water is used as a sluicing medium to transport the ash from the holding tank (bottom ash hopper), through pumps inside the main building to the WDA.

In addition to the above streams, NIPSCO's MCU closure application, which is currently undergoing IDEM review, includes the removal of interstitial water (i.e., dewatering) and discharge of this project specific CCR waste stream to the WDA. The selected remedial contractor may use well points or other dewatering equipment to extract the interstitial water, allowing excavation of the ash from within the MCU. The water may be pumped into the abandoned Unit 15 sluice line that runs parallel and to the west of the MCU and discharges in the northwest corner of the WDA. Dewatering and discharge to the WDA in compliance with the facility's NPDES permit is currently scheduled to begin in Q4 2023 and be required for virtually the duration of the closure project.

Following cessation of coal-fired generation, requisite Units 14, 15, 17, and 18 boiler decommissioning activities are expected to also generate Unit-specific washdown streams of approximately 3.5 to 5.0 million gallons per Unit, per decommissioning event. Given the existing RMSGS wastewater piping layout, discharge of these streams will be directed to the WDA prior to its cease receipt date and initiation of closure construction activities.

Based on the data provided by NIPSCO LLC, the embedded table below summarizes the estimated average daily flows managed during normal operation of the WDA until cessation of the coal-fired boilers. At the time of preparation of this Demonstration Addendum 2 the measurable reduction in Site-wide generation of CCR and non-CCR waste streams resulting from boiler shutdowns of Units 14 and 15 could not be definitively quantified due to the absence of flow metering capacity in individual feed and discharge lines. However, in determination of alternative capacity and reliance for the operation of the WDA, the combined estimated average daily waste stream flow of 5.04 MGD reported in the Demonstration (i.e., October 2020) from Units 14 and 15, has been removed from the combined total waste stream flow considered in this Demonstration Addendum. Note that such an approach assumes an instantaneous and maximum waste stream flow reduction (and does not account for the compulsory boiler washdown flow from Units' decommissioning) and is, as a result, considered a conservative compacity demand-based approach to this update. Therefore, due to ongoing Site operations and maintenance activities (e.g., boiler room sump dewatering for both shut down and active Units, stormwater collection and management), volumes of individual CCR and non-CCR effluent being discharged to the WDA are estimated to be between 0.34 MGD and 1.42 MGD, with a combined estimated daily flow of 4.1 MGD. At this time, the washdown generated waste streams are only projections based on NIPSCO LLC's experience performing similar activities and are, therefore, not included in the combined waste stream summary.

WDA Managed Waste Stream Flows

Description	Estimated Average Daily Flow (MGD)	Category
Unit 14 Boiler Room Sump Cessation 10/2021	~~2.88~~	Non-CCR
Unit 15 Boiler Room Sump Cessation 10/2021	~~2.16~~	Non-CCR
Yard Drain	0.86	Non-CCR
Unit 17/18 FGD Filter Building North Sump	0.55	CCR
Unit 17/18 FGD Filter Building South Sump	0.55	CCR
Unit 17 Bottom Ash Sluice	0.34	CCR
Unit 18 Bottom Ash Sluice	0.34	CCR
Combined Sub-Total Waste Steam	**2.64**	
MCU Closure Dewatering	1.42	CCR
Combined Total Waste Steam	**4.06**	

2.2 CCR Rule Groundwater Monitoring

Starting in 2016, following the installation of a groundwater monitoring system certified by a qualified professional engineer to be consistent with the design and construction requirements of 40 CFR § 257.91, and throughout calendar year 2017, Golder collected background groundwater samples and performed Detection Monitoring around the WDA pursuant to the requirements of 40 CFR § 257.94. The monitoring system initially consisted of two background and six downgradient monitoring wells. In 2018, Golder performed the first and second Assessment Monitoring sampling events pursuant to the requirements of 40 CFR § 257.95, following which, ten additional downgradient monitoring wells (including six monitoring wells on the property boundary) were installed. In 2019, consistent with evolution of the Conceptual Site Model (CSM), nine additional downgradient monitoring wells (including five additional monitoring wells on the property boundary) were installed. In 2020, two additional background monitoring wells were installed on the southern property boundary. Based upon groundwater monitoring results collected pursuant to the CCR Rule to date, corrective measures program requirements are neither required nor have they been implemented at this CCR Unit. The current monitoring well network is summarized in the embedded table below and shown on Figure 4.

Well Installation Purpose	Well ID
Background Monitoring Wells	GAMW03, GAMW03B, GAMW-68, and GAMW-68B
Downgradient Monitoring Wells	GAMW01, GAMW01B, GAMW12, GAMW12B, GAMW13, GAMW13B, GAMW14, and GAMW14B

Well Installation Purpose	Well ID
Assessment Monitoring Wells	GAMW51, GAMW51B, GAMW59, GAMW59B, GAMW60, and GAMW60B
Property Boundary Wells	GAMW42, GAMW42B, GAMW42C, GAMW43, GAMW43B, GAMW44, GAMW44B, GAMW57, GAMW57B, GAMW58, and GAMW58B

2.3 Cessation of Operation and Closure

Because of the design and operation of the generating station and as a result of other compliance-driven projects completed ahead of the CCR Rule Part A revisions, virtually all remaining flows into the WDA are high-volume waste streams, limiting available alternatives for their management prior to cessation of coal-fired generation by the end of Q4 2025. Reduction in current waste stream inflows, cease receipt of all influent, and initiation of closure of the WDA are linked inextricably to several other major activities being undertaken as elements of RMSGS' ongoing closure and decommissioning plans including, but not limited to:

- Permanent cessation of all coal-fired generation and, thus, permanent elimination of those directly produced waste streams
- completion of boiler shutdown/decommissioning activities and, following such, permanent elimination of the resulting waste streams
- redirect of other non-CCR waste streams, and
- dewatering and closure of other CCR surface impoundments in accordance with IDEM approvals

NIPSCO will reduce influent into the WDA and the need for management on- or off-Site due to the Q4 2025 permanent elimination of high-volume waste streams following the cessation of coal-fired generation and the closure of the MCU, also scheduled to be completed no later than Q4 2025. Following the cessation of coal-fired generation, NIPSCO will systematically implement a final boiler shutdown and washdown process, which will potentially produce both CCR and non-CCR waste streams on a boiler-by-boiler basis. As each boiler is shut down and cleaned prior to demolition, these waste streams (washdown streams referenced in Section 2.2) will also be permanently eliminated as influents to the WDA.

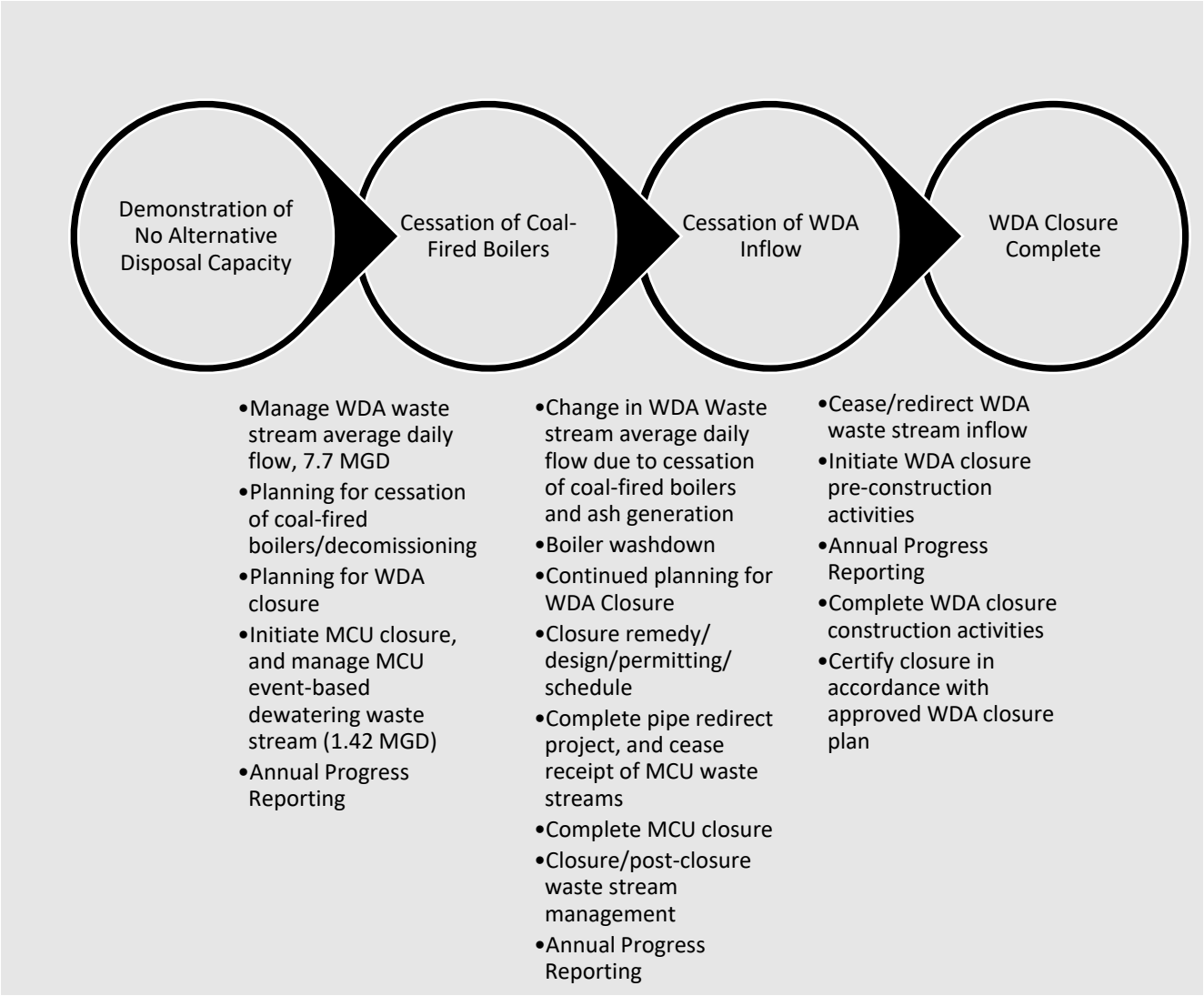
Initiated in October 2021 NIPSCO achieved significant reductions in influent volume (cessation of Units 14 and 15) and current waste materials inventory, and by the end of Q2 2026 ultimately eliminate discharges to the WDA by completing the following actions:

- Late 2021 through 2022 – shutdown, cleaning, and washdown of the former boilers and ancillary equipment in anticipation of plant demolition, permanently eliminating these waste streams
- 2023 (pending acceptance by IDEM) – contingent upon regulatory approval of a CCR beneficial reuse proposal, NIPSCO will begin to permanently remove 250,000 cubic yards or more of bottom ash currently in the WDA, substituting it for virgin materials as a geomembrane liner protectant and drainage underlayment in the final cover system for the on-Site landfill

- Late 2025 – redirect other non-CCR waste steams to other surface impoundments, permanently eliminating these waste streams
- Late 2025 – completion of dewatering activities associated with the MCU closure and permanent elimination of this waste stream
- End 2025 – cessation of coal-fired generation, followed by permanent elimination of bottom ash and sluice water waste streams, and
- Early 2026 – shutdown, cleaning, and washdown of the former boilers and ancillary equipment in anticipation of plant demolition, permanently eliminating these waste streams

The following schematic of operation and closure activities outlines the process NIPSCO will follow to decrease reliance on the WDA, achieve systematic reduction/elimination of influent waste streams, and complete final closure of the CCR Unit by September 17, 2028. A detailed timeline for these concurrent and sequential activities is presented in the embedded figure below.

Operation and Closure Activities



3.0 EVALUATION OF ALTERNATIVE DISPOSAL CAPACITY, 257.103(f)(2)(v)(A)

40 CFR §257.103(f)(2) outlines specific conditions that must be met to qualify for continued operation and alternative deadlines to initiate closure of the WDA, without consideration of increase in costs or inconvenience to NIPSCO. Pursuant to 40 CFR §257.103(f)(2)(v)(A) the options considered to evaluate the availability of existing alternative disposal capacity for CCR and non-CCR waste streams both on and off-site that are currently managed in the WDA are documented in the Demonstration and the Part A Demonstration Annual Progress Report #01-21 (Golder 2021, Appendix A). The Annual Progress Report, which documents a continued lack of alternative capacity both on-Site and off-Site, was certified by a professional engineer in October 2021. The next Annual Progress Report will be completed and similarly certified in October 2022.

4.0 CONTINUED OPERATION RISK MITIGATION PLAN, 257.103(f)(2)(v)(B)

In the event a release from the WDA is detected in groundwater during continued operation of the CCR Unit, 40 CFR § 257.103(f)(2)(v)(B) requires a plan to expedite and maintain the containment of any contaminant plume generated by the release. The Demonstration described the risk mitigation plan in detail. There have been no changes to the risk mitigation plan since the submittal of the Demonstration in October 2020. In short, the risk mitigation plan includes use of the existing downgradient Detection Monitoring and Assessment Monitoring wells to extract groundwater and contain the plume on a temporary basis with the discharge being directed back into the WDA. This initial response is intended only as a temporary method to contain the plume generated by the release until the release can be more fully assessed and a full-scale pump-and-treat system could be designed and constructed as needed. The full-scale pump-and-treat system would be constructed to contain the release and would consist of newly installed extraction wells, following which the extracted groundwater would be pumped to a new treatment facility located to the northwest of the WDA. Treatment technologies selected and other design parameters would be established based on the COC(s) requiring a response action.

5.0 CCR RULE REGULATORY COMPLIANCE, 257.103(f)(2)(v)(C)

This section of the Demonstration Addendum 2 provides description and documentation of all 40 CFR §257 requirements completed since the submittal of the Demonstration in October 2020 and Demonstration Addendum 1 in November 2020.

5.1 Certification of Facility Status

In accordance with 40 CFR §257.103(f)(2)(iii), this section of the Demonstration Addendum 2 substantiates compliance with all other applicable requirements of 40 CFR §257. RMSGS includes three waste management areas subject to CCR Rule regulation (see Figure 2), two of which NIPSCO will continue to operate for the foreseeable future and one of which is slated for closure in the near term. These include the WDA, which is the primary focus of this Demonstration; Landfill Phases V, VI, and VII; and the Material Storage Runoff Basin (MSRB), Metal Cleaning Waste Basin (MCWB), and Drying Area (DA), collectively the Multi-Cell Unit (MCU).

On October 30, 2020 NIPSCO certified that the entire facility complies with the applicable requirements of the CCR Rule (Appendix D of the 2020 Demonstration). NIPSCO has completed a recertification indicating that the entire facility still complies with the applicable requirements of the CCR Rule (Appendix B). Since October 2020, the following additional independent certifications have been completed by a qualified professional engineer in accordance with the content and schedule requirements of the CCR Rule:

- Periodic inspection report §257.83(b)(2) and §257.84(b)(2) (only applicable to the WDA and the Landfill)
- Groundwater system certifications §257.91(f) (applicable to all CCR Units)
- Assessment of corrective measures addendum §257.96(a) (only applicable to the MCU)
- ASDs for the Landfill Phases V and VI, Detection Monitoring §257.94(e)(2), and the WDA, Assessment Monitoring §257.95(c)(3)

5.1.1 Monitoring System Design

Since the submittal of the Demonstration and Demonstration Addendum, Golder installed an additional well pair (GAMW68 and GAMW68B) south of the WDA and three additional piezometers designated GAMW65B, GAMW66B, and GAMW67B to the north of the existing groundwater network. These piezometers were installed to further assess groundwater flow direction northwest of the WDA. No changes were made to the monitoring well

networks of the MCU or Landfill Phases V, VI, and VII. In 2022, Golder on behalf of NIPSCO, prepared the Groundwater Monitoring System Design Manual Revision 4.0 (GMSDM Revision 4, Golder 2022) to provide recently discovered historical information regarding the role and construction of the slurry trench cores and their impacts on hydraulic conditions at the Site. The report reaffirms Golder's understanding of the appropriate design and construction of the groundwater monitoring system based on this recently discovered historical information. Based on the GMSDM Revision 4, NIPSCO's professional engineer, recertified the groundwater monitoring systems in May 2022 (Appendix C). A summary of the well networks for all three CCR Units is provided below.

WDA	
Background Monitoring Wells	GAMW03, GAMW03B, GAMW68, and GAMW68B
Downgradient Monitoring Wells	GAMW01, GAMW01B, GAMW12, GAMW12B, GAMW13, GAMW13B, GAMW14, and GAMW14B
Assessment Monitoring Wells	GAMW42, GAMW42B, GAMW42C, GAMW43, GAMW43B, GAMW44, GAMW44B, GAMW51, GAMW51B, GAMW57, GAMW57B, GAMW58, GAMW58B, GAMW59, GAMW59B, GAMW60, and GAMW60B
Piezometers (non-CCR Monitoring Wells)	GAMW02, GAMW05, GAMW65B, GAMW66B, and GAMW67

Drying Area, MSRB, MCWB (i.e., MCU)	
Background Monitoring Wells	GAMW04, GAMW07, GAMW07B, GAMW15, and GAMW15B
Downgradient Monitoring Wells	GAMW08, GAMW08B, GAMW09, GAMW09B, GAMW16R, GAMW16BR, GAMW17, GAMW17B, GAMW17B, GAMW18, and GAMW18B
Assessment Monitoring Wells	GAMW46, GAMW46B, GAMW52, GAMW52B, GAMW53, GAMW53B, GAMW54, GAMW54B, GAMW55R, GAMW55B, GAMW56, and GAMW56B
Piezometers (non-CCR Monitoring Wells)	GAMW06, GAMW63B, and GAMW64B

Landfill Phases V, VI, and VII	
Background Monitoring Well	GAMW20, GAMW24, GAMW24B, GAMW25, and GAMW25B
Downgradient Monitoring Well	GAMW26, GAMW26B, GAMW27, GAMW27B, GAMW38, GAMW38B, GAMW39, GAMW39B, GAMW40, GAMW40B, GAMW41, GAMW41B
Piezometers (non-CCR Monitoring Wells)	MW-1S/1D, MW-2S/2D, WM-3S/3D, MW-4S/4D, MW-5S/5D, MW-6S/6D, MW-7S/7D, MW-8S/8D, MW-9S/9D, MW-10S/10D, MW-11S/11D, MW-12S/12D, MW-13S/13D, MW-14S/14D, GAMW10, GAMW11, GAPIEZ07, GAMW20B, GAMW29/29B, GAMW30/30B, GAMW31/31B, GAMW32/32B, GAMW33/33B, GAMW34/34B, GAMW35B, GAMW36/36B, GAMW37B, GAMW48/48B, GAMW49/49B, GAMW50/50B

A summary of the well construction information is provided in Table 1 and a summary of the dates and purpose of installation is provided in Table 2. The additional boring and well construction logs are provided in Appendix D. The monitoring well locations are shown in Figure 4.

5.2 Groundwater Monitoring Results

Starting in July 2016 on behalf of NIPSCO, in accordance with the requirements of the CCR Rule Golder has performed monitoring of each well in the CCR groundwater monitoring network on at least a semi-annual basis. The monitoring well network is described above in Section 5.1.1 and shown in Figure 4. A compilation of all groundwater data collected as part of the CCR program since October 2020 is provided in Appendix E. The most recent annual reports (2021 Annual Report, submitted January 2021) for the WDA, MCU, and Landfill Phases V, VI, and VII are provided in Appendix F.

5.2.1 WDA Monitoring Program Status

As reported in the Demonstration, background groundwater samples were collected between July 2016 and August 2017, as required by 40 CFR §257.94. Golder collected the first Detection Monitoring groundwater samples in October 2017 and identified statistically significant increases (SSIs). Based on these results, NIPSCO established an Assessment Monitoring program in January 2018.

Golder performed the first Assessment Monitoring event in March 2018. The results from the first five Assessment Monitoring events were reported in the Demonstration. Golder performed the fifth Assessment Monitoring event in April/May 2020 and the statistical analysis in September 2020 and concluded that the only constituents demonstrating an apparent statistically significant level (SSL) are molybdenum and lithium in GAMW51B. A summary of the groundwater protection standards (GWPS) is provided in Table 3. The results of the April/May 2020 sampling event are similar to historical data. Golder recertified the previously submitted alternative source demonstration (ASD) in December 2020 (Appendix G).

Golder performed the sixth Assessment Monitoring event in October 2020 and the statistical evaluation in February 2021 and identified SSLs for molybdenum and lithium in well GAMW51B and molybdenum in GAMW-60B. As described in the Demonstration, GAMW60B was installed downgradient of GAMW51/51B in 2019 to further assess the nature and extent of groundwater quality further downgradient of the WDA. The October 2020 Assessment Monitoring event was the fourth round of sampling at this location, and therefore, was the first event for which SSLs were calculated. As these results are consistent with the primary lines of evidence presented in the June 2020 ASD, this ASD was recertified in May 2021 (Appendix H).

Golder performed the seventh Assessment Monitoring event in April 2021 and the statistical evaluation of the resulting data in August 2021 and identified SSLs for molybdenum and lithium in well GAMW51B and molybdenum in GAMW60B. As these results were consistent with the previous Assessment Monitoring event, the ASD was recertified November 2021 (Appendix I). Golder performed the eighth Assessment Monitoring event in September 2021 and the statistical evaluation in January 2022 and again identified SSLs for molybdenum and lithium in well GAMW51B and molybdenum in GAMW60B. As these results were consistent with the previous Assessment Monitoring event, the ASD was recertified April 2022 (Appendix J). Golder performed the ninth Assessment Monitoring event in April/May 2022 and is currently awaiting receipt of data from the analytical laboratory.

A summary of the dates and purposes of each monitoring event is presented in Table 4 and a complete compilation of all analytical data is provided in Appendix E.

5.2.2 MCU Monitoring Program Status

As reported in the Demonstration Addendum 1, background groundwater samples were collected between July 2016 and August 2017, as required by 40 CFR §257.94. Golder collected the first Detection Monitoring groundwater samples in October 2017 and identified SSIs. Based on these results, NIPSCO established an Assessment Monitoring program in January 2018.

Golder performed the first Assessment Monitoring event in March 2018 and completed the Assessment of Corrective Measures (ACM) in 2019 (see Section 5.3). The results from the first five Assessment Monitoring events were reported in the Demonstration. Golder performed the fifth Assessment Monitoring event in April/May 2020 and the statistical analysis in September 2020 and the results confirmed the SSL for cobalt at GAMW08. A summary of the GWPS is provided in Table 3. Golder performed the sixth Assessment Monitoring event in October 2020 and the statistical analysis in February 2021. Golder performed the seventh Assessment Monitoring event in April 2021 and the statistical analysis in August 2021. Golder performed the eighth Assessment Monitoring event in September/October 2021 and the statistical analysis in January 2022. The results of the sixth, seventh, and eighth Assessment Monitoring events confirmed the SSL for cobalt in GAMW08. Golder performed the ninth Assessment Monitoring event in April/May 2022 and are currently awaiting receipt of data from the analytical laboratory.

A summary of the dates and purposes of each monitoring event is presented in Table 4 and a complete compilation of all analytical data is provided in Appendix E.

5.2.3 Landfill Monitoring Program Status

As reported in the Demonstration Addendum 1, background groundwater samples were collected between July 2016 and August 2017, as required by 40 CFR §257.94. Golder collected the first Detection Monitoring groundwater samples in October 2017 and identified SSIs. Golder identified a potential alternative source that could explain the SSIs and prepared an ASD. A qualified Indiana-licensed professional engineer certified the ASD in April 2018. The ASD supports the findings that the SSIs determined in January 2018 do not result from a release from the CCR Unit. The key supporting lines of evidence described in the ASD indicate that the closed, non-CCR Rule regulated phases of the landfill (i.e., Phases I and II) are the source of the SSIs. Therefore, no further action (i.e., Assessment Monitoring) is warranted, and Phases V and VI will remain in Detection Monitoring. The results from the first seven Detection Monitoring events were reported in the Demonstration Addendum 1. Golder performed the seventh Detection Monitoring event in September 2020 and recertified the ASD in March 2021 (Appendix K).

Golder performed the eighth and nineth Detection Monitoring events in April and September 2021. Consistent with the previous evaluations, Golder identified a potential alternative source that explained the SSIs. The ASD was recertified in October 2021 (Appendix L) and March 2022 (Appendix M). Golder performed the ninth Assessment Monitoring event in April/May 2022 and are currently awaiting receipt of data from the analytical laboratory.

A summary of the dates and purposes of each monitoring event is presented in Table 4 and a complete compilation of all analytical data is provided in Appendix E.

5.3 Corrective Measures Assessment

Based upon groundwater monitoring results collected pursuant to the CCR Rule to date, NIPSCO is only currently required to complete an Assessment of Corrective Measures (ACM) for the MCU. The ACM was completed and posted to the NIPSCO's CCR Website in 2019. The first Addendum to the ACM was completed in November

2020. Both the ACM and the ACM Addendum were included in the Demonstration Addendum 1. A second ACM Addendum was completed in July 2021. The ACM Addendum #2 incorporates an enhanced final cap design in all corrective measure alternatives. The certified ACM Addendum #2 is included in Appendix N. A third ACM Addendum was completed in March 2022. The ACM Addendum #3 includes ACM revisions in response to site conditions, evolving state regulatory agency (i.e., IDEM) requests/requirements, and changing Federal (i.e., EPA) regulation and policy interpretations. The ACM Addendum #3 further refines remedial alternatives based on the single cobalt SSL. The certified ACM Addendum #3 is included in Appendix O. Neither the WDA, which is in Assessment Monitoring being performed consistent with 40 CFR §257.95, nor the Landfill, which remains in Detection Monitoring pursuant to 40 CFR §257.94, is subject to the ACM requirement.

5.4 Remedy Selection

Based upon groundwater monitoring results collected pursuant to the CCR Rule to date, NIPSCO is currently required to complete remedy selection requirements pursuant to 40 CFR §257.97 or 257.98 for only the MCU. Neither the WDA, which is in Assessment Monitoring being performed consistent with 40 CFR §257.95, nor the Landfill, which remains in Detection Monitoring pursuant to 40 CFR §257.94, is subject to the remedy selection requirement.

NIPSCO is currently performing a more detailed evaluation and comparison of the four potential groundwater corrective measures identified in the ACM Addendum #3. That detailed evaluation includes the development of conceptual designs and preparation of engineering cost estimates for each of the potential groundwater corrective measures. On August 3, 2022 NIPSCO received notification of IDEM's approval of the MCU closure application. NIPSCO is now in the early stages of a public comment period and is awaiting substantive public comments on the draft IDEM approval. Following final approval by IDEM on the proposed closure approach, with which the groundwater corrective measure must be aligned, NIPSCO will select a groundwater remedy. In the interim, Golder will continue the remedy evaluation process, will schedule a public meeting on groundwater corrective measure(s), and will complete semi-annual progress reports. The semi-annual progress reports completed since the submittal of the Demonstration Addendum 1 are included in Appendix P.

5.5 Structural Stability Assessment

Golder completed the initial Structural Stability and Safety Factor Assessment for the WDA in October 2016 as required by 40 CFR §257.73(d) and 40 CFR §257.73(e) (Appendix L of the Demonstration). The most recent certified annual inspection report (Annual RCRA CCR Unit Inspection Report Waste Disposal Area - Surface Impoundment, December 2021) is attached in Appendix Q. As required by 40 CFR §257.83(b)(1), the WDA has been visually inspected annually for structural stability. This assessment concludes that based on information provided by NIPSCO and on Golder's on-site visual inspection, the overall condition of the WDA is acceptable. The assessment was certified by a qualified professional engineer licensed in the State of Indiana on December 31, 2021. Neither the MCU nor the Landfill are subject to the structural stability assessment requirements (40 CFR §257.73(d)).

5.6 Safety Factor Assessment

Golder completed the initial Structural Stability and Safety Factor Assessment for the WDA in October 2016 as required by 40 CFR §257.83(b)(1). The Safety Factor Assessment is provided in Appendix L of the Demonstration and was certified by a qualified professional engineer licensed in the State of Indiana on October 5, 2016. Neither the MCU nor the Landfill are subject to the safety factor assessment requirement (40 CFR §257.73(e)).

6.0 CLOSURE PLAN, 257.103(f)(2)(v)(D)

As discussed in Sections 1.4 and 2.4 above, NIPSCO has outlined a planned cessation of operation and closure plan for the Site. The current reliance on the WDA is tied to the ongoing generating activities and dewatering and closure of other CCR surface impoundments with a period of sequential cessation of waste streams from Q1 2021 until Q2 2026. Cessation of coal-fired generation is scheduled by the end of Q4 2025 and closure of the MCU is also scheduled to be completed no later than Q4 2025, reducing the reliance on the WDA due to the elimination of these waste streams. Following the cessation of coal-fired generation, NIPSCO will systematically shut down the boilers, which will produce an action-specific need for the WDA due to cessation washdown streams forecasted until Q2 2026. Identification and redirection of other waste streams, currently forecasted between Q4 2025 and Q2 of 2026, will be completed prior to final cease receipt of WDA streams (Q2 2026). WDA closure construction is scheduled to begin in Q2 2026 and will be completed prior to October 17, 2028.

On the behalf of NIPSCO, Golder completed a CCR Closure Plan Update (Version #5) which addresses the requirements of 40 CFR §257.102(b) *Criteria for conducting the closure or retrofit of CCR units*. The plan describes the WDA CCR Unit, and provides a closure remedy, steps required to close the CCR Unit, design plans and a schedule for closure. The plan calls for closure of the impoundment by removal of the CCR. A copy of the latest Closure Plan Schedule is included as Figure 3.

The final cease receipt of waste streams to the WDA is scheduled to occur in Q2 2026 providing sufficient time for planned cessation of operations reliant on inflow to the WDA and allowing for the forecasted sequence and schedule of closure activities within the regulatory closure deadline.

7.0 OPERATOR RESPONSIBILITY

As addressed in this section, after preparation of the Demonstration and submittal on or before November 30, 2020, additional requirements must be met by NIPSCO relative to the 40 CFR §257.102(f)(2) regulations. In addition to compliance with requirements as outlined in 40 CFR §257.103(f)(2)(vi), following submission of the Demonstration to U. S. EPA NIPSCO will comply with the recordkeeping requirements specified in §257.105(i), the notification requirements specified in §257.106(i), and the internet posting requirements in §257.107(i), as applicable and as detailed below.

In accordance with the requirements of 40 CFR §257.103(f)(2)(viii), NIPSCO will upon submission of the Demonstration Addendum 2 prepare and place in the RMSGS operating record and on its publicly accessible CCR internet site a new notification of intent to comply with the site-specific alternative to initiation of closure due to permanent cessation of a coal-fired boiler(s) by a date certain. This notification will include a reference to the submission date along with a copy of the Demonstration.

Pursuant to the requirements of 40 CFR §257.103(f)(2)(ix), upon receipt from EPA of its decision as described in §257.103(f)(3) NIPSCO will place a copy of the approved or denied decision in the RMSGS operating record and the NIPSCO publicly accessible CCR internet site. In addition, NIPSCO will prepare a notification of the availability of the EPA decision.

Per the requirements of 40 CFR §257.103(f)(2)(x), NIPSCO will prepare an annual progress report documenting continued lack of alternative capacity and progress towards the closure of the WDA. Successful completion of the progress report will be documented by its placement in the RMSGS operating record. NIPSCO will also prepare a notification of the availability of the annual progress report and place a copy of the report on the NIPSCO publicly available CCR internet site. The next annual progress report will be completed in October 2022.

8.0 CLOSING

It is Golder's opinion that the information contained the October 2020 Demonstration, November 2020 Demonstration Addendum 1, and August 2022 Demonstration Addendum 2 is true, accurate and has been prepared in accordance with good engineering practices and that the documentation provided for continued operation and alternative deadlines to initiate closure of the WDA, without consideration of increase in costs or inconvenience to NIPSCO, in accordance with §257.103(f)(2), demonstrates that there is presently no existing alternative disposal capacity on- or off-Site that could accept the flow currently being impounded in the WDA at RMSGS.

9.0 REFERENCES

Golder Associates (2016a), NIPSCO R. M. Schahfer Generating Station, Hazard Potential Classification Assessment and Visual Inspection Report – RCRA CCR Units, Pursuant to 40 CFR § 257.73, September 2016.

Golder Associates (2016b), NIPSCO R. M. Schahfer Generating Station, CCR Surface Impoundment Inflow Design Flood Control System Plan, Pursuant to 40 CFR § 257.82, October 2016.

Golder Associates (2017), NIPSCO R. M. Schahfer Generating Station, CCR Groundwater Monitoring Program Implementation Manual, October 2017.

Golder Associates (2019), NIPSCO R. M. Schahfer Generating Station, CCR Assessment of Corrective Measures, April 2019.

Golder Associates (2020), NIPSCO R. M. Schahfer Generating Station, CCR Assessment of Corrective Measures – Addendum, November 2020.

Golder Associates (2022), NIPSCO R. M. Schahfer Generating Station, CCR Groundwater Monitoring System Design Manual Revision 4.0, May 2022.

Golder Associates (2020a), Alternative Source Demonstration- Waste Disposal Area, June 2020.

Indiana Department of Environmental Management, Virtual File Cabinet document #82673058, Variance determination, NIPSCO, R.M. Schahfer Generating Station, correspondence dated January 11, 2019.

NiSource Environmental, Indiana Department of Environmental Management NIPSCO Request for a Variance Pursuant to Ind. Code 13-14-8-8 From a Deadline in the Coal Combustion Residuals Rule, R.M. Schahfer Generating Station, correspondence dated December 20, 2018.

NiSource Environmental, Indiana Department of Environmental Management NIPSCO Request for a Variance Pursuant to Ind. Code 13-14-8-8 From a Deadline in the Coal Combustion Residuals Rule, R.M. Schahfer Generating Station, correspondence dated December 3, 2018.

Table 1 Monitoring Well Construction Details
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

CCR Unit	Monitoring Well ID	Ground Surface Elevation (ft-amsl)	Total Borehole Depth (ft)	Top of Casing Elevation (ft-amsl)	Sounded Well Depth (ft-btoc)	Well Material	Screen Length (ft)	Screen Depth		Screen Elevation		
								Top (ft-bgs)	Bottom (ft-bgs)	Top (ft-amsl)	Middle (ft-amsl)	Bottom (ft-amsl)
WDA	GAMW01	664.90	15.00	668.19	18.86	2" Sch 40 PVC	10.00	5.00	15.00	659.90	654.90	649.90
	GAMW01B	665.20	36.00	667.87	37.80	2" Sch 40 PVC	10.00	26.00	36.00	639.20	634.20	629.20
	GAMW02	666.08	15.00	669.57	19.00	2" Sch 40 PVC	10.00	5.00	15.00	661.08	656.08	651.08
	GAMW03	665.14	15.00	668.77	18.30	2" Sch 40 PVC	10.00	5.00	15.00	660.14	655.14	650.14
	GAMW03B	665.29	35.00	668.16	37.79	2" Sch 40 PVC	10.00	25.00	35.00	640.29	635.29	630.29
	GAMW05	666.69	17.00	669.75	20.01	2" Sch 40 PVC	10.00	7.00	17.00	659.69	654.69	649.69
	GAMW12	664.35	15.00	667.29	18.17	2" Sch 40 PVC	10.00	5.00	15.00	659.35	654.35	649.35
	GAMW12B	664.23	35.00	666.81	37.82	2" Sch 40 PVC	10.00	25.00	35.00	639.23	634.23	629.23
	GAMW13	664.31	15.00	667.24	18.45	2" Sch 40 PVC	10.00	5.00	15.00	659.31	654.31	649.31
	GAMW13B	664.23	35.00	667.12	38.86	2" Sch 40 PVC	10.00	25.00	35.00	639.23	634.23	629.23
	GAMW14	664.76	15.00	667.96	18.43	2" Sch 40 PVC	10.00	5.00	15.00	659.76	654.76	649.76
	GAMW14B	664.62	35.00	667.94	39.19	2" Sch 40 PVC	10.00	25.00	35.00	639.62	634.62	629.62
	GAMW42	663.12	15.00	665.80	17.97	2" Sch 40 PVC	10.00	5.00	15.00	658.12	653.12	648.12
	GAMW42B	663.15	36.00	665.66	36.70	2" Sch 40 PVC	10.00	26.00	36.00	637.15	632.15	627.15
	GAMW42C	663.20	50.00	666.28	52.91	2" Sch 40 PVC	10.00	40.00	50.00	623.20	618.20	613.20
	GAMW43	663.14	15.00	665.59	16.29	2" Sch 40 PVC	10.00	5.00	15.00	658.14	653.14	648.14
	GAMW43B	663.12	26.00	665.53	32.28	2" Sch 40 PVC	10.00	16.00	26.00	647.12	642.12	637.12
	GAMW44	664.11	15.00	666.31	16.02	2" Sch 40 PVC	10.00	5.00	15.00	659.11	654.11	649.11
	GAMW44B	664.11	36.00	666.25	38.82	2" Sch 40 PVC	10.00	26.00	36.00	638.11	633.11	628.11
	GAMW51	666.15	15.00	668.77	18.58	2" Sch 40 PVC	10.00	5.00	15.00	661.15	656.15	651.15
	GAMW51B	666.03	37.00	668.79	39.99	2" Sch 40 PVC	10.00	27.00	37.00	639.03	634.03	629.03
	GAMW57	670.46	15.00	672.97	25.55	2" Sch 40 PVC	10.00	5.00	15.00	665.46	660.46	655.46
	GAMW57B	670.45	45.00	672.88	47.45	2" Sch 40 PVC	10.00	35.00	45.00	635.45	630.45	625.45
	GAMW58	664.99	15.00	667.54	17.58	2" Sch 40 PVC	10.00	5.00	15.00	659.99	654.99	649.99
	GAMW58B	664.88	35.00	667.59	37.81	2" Sch 40 PVC	10.00	25.00	35.00	639.88	634.88	629.88
	GAMW59	665.93	15.00	668.49	17.22	2" Sch 40 PVC	10.00	5.00	15.00	660.93	655.93	650.93
	GAMW59B	665.95	40.00	668.55	42.38	2" Sch 40 PVC	10.00	30.00	40.00	635.95	630.95	625.95
	GAMW60	665.08	15.00	667.50	17.39	2" Sch 40 PVC	10.00	5.00	15.00	660.08	655.08	650.08
	GAMW60B	665.06	40.00	667.50	42.59	2" Sch 40 PVC	10.00	30.00	40.00	635.06	630.06	625.06
	GAMW65B	665.45	35.00	668.67	37.95	2" Sch 40 PVC	10.00	25.00	35.00	640.45	635.45	630.45
	GAMW66B	669.20	44.00	672.99	47.80	2" Sch 40 PVC	10.00	34.00	44.00	635.20	630.20	625.20
	GAMW67B	664.65	40.50	667.97	43.75	2" Sch 40 PVC	10.00	30.50	40.50	634.15	629.15	624.15
	GAMW68	665.93	17.00	665.53	17.03	2" Sch 40 PVC	10.00	7.00	17.00	658.93	653.93	648.93
	GAMW68B	666.00	34.50	665.72	34.78	2" Sch 40 PVC	10.00	24.50	34.50	641.50	636.50	631.50
MSRB, MCWB, and Drying Area	GAMW04	665.81	15.00	669.21	17.86	2" Sch 40 PVC	10.00	5.00	15.00	660.81	655.81	650.81
	GAMW06	667.50	15.00	670.81	18.82	2" Sch 40 PVC	10.00	5.00	15.00	662.50	657.50	652.50
	GAMW07	666.55	15.00	669.89	18.89	2" Sch 40 PVC	10.00	5.00	15.00	661.55	656.55	651.55
	GAMW07B	666.83	40.00	669.39	42.40	2" Sch 40 PVC	10.00	30.00	40.00	636.83	631.83	626.83
	GAMW08	665.95	15.00	669.66	18.78	2" Sch 40 PVC	10.00	5.00	15.00	660.95	655.95	650.95
	GAMW08B	665.92	36.00	668.47	38.79	2" Sch 40 PVC	10.00	26.00	36.00	639.92	634.92	629.92
	GAMW09	665.10	15.00	668.99	18.48	2" Sch 40 PVC	10.00	5.00	15.00	660.10	655.10	650.10
	GAMW09B	665.35	35.00	668.29	37.42	2" Sch 40 PVC	10.00	25.00	35.00	640.35	635.35	630.35
	GAMW15	665.01	15.00	668.25	18.71	2" Sch 40 PVC	10.00	5.00	15.00	660.01	655.01	650.01
	GAMW15B	665.14	35.00	668.05	38.86	2" Sch 40 PVC	10.00	25.00	35.00	640.14	635.14	630.14
	GAMW16*	665.20	15.00	668.37	18.20	2" Sch 40 PVC	10.00	5.00	15.00	660.20	655.20	650.20
	GAMW16R	664.35	20.00	667.17	21.75	2" Sch 40 PVC	10.00	10.00	20.00	654.35	649.35	644.35
	GAMW16B*	665.16	35.00	667.76	40.13	2" Sch 40 PVC	10.00	25.00	35.00	640.16	635.16	630.16
	GAMW16BR	664.39	40.00	667.32	42.45	2" Sch 40 PVC	10.00	30.00	40.00	634.39	629.39	624.39
	GAMW17	668.81	15.00	671.93	18.00	2" Sch 40 PVC	10.00	5.00	15.00	663.81	658.81	653.81
	GAMW17B	668.86	35.00	670.60	40.34	2" Sch 40 PVC	10.00	25.00	35.00	643.86	638.86	633.86
	GAMW18	666.04	15.00	669.07	18.51	2" Sch 40 PVC	10.00	5.00	15.00	661.04	656.04	651.04
	GAMW18B	665.94	35.00	668.47	35.89	2" Sch 40 PVC	10.00	25.00	35.00	640.94	635.94	630.94
	GAMW46	661.99	15.00	664.80	17.50	2" Sch 40 PVC	10.00	5.00	15.00	656.99	651.99	646.99
	GAMW46B	661.98	32.00	664.79	33.00	2" Sch 40 PVC	10.00	22.00	32.00	639.98	634.98	629.98
	GAMW52	664.07	15.00	666.79	18.50	2" Sch 40 PVC	10.00	5.00	15.00	659.07	654.07	649.07
	GAMW52B	664.50	37.00	666.90	39.34	2" Sch 40 PVC	10.00	27.00	37.00	637.50	632.50	627.50
	GAMW53	664.68	15.00	667.24	17.49	2" Sch 40 PVC	10.00	5.00	15.00	659.68	654.68	649.68
	GAMW53B	664.62	36.00	667.29	40.10	2" Sch 40 PVC	10.00	26.00	36.00	638.62	633.62	628.62
	GAMW54	663.87	15.00	666.37	15.46	2" Sch 40 PVC	10.00	5.00	15.00	658.87	653.87	648.87
	GAMW54B	663.98	32.00	666.47	36.41	2" Sch 40 PVC	10.00	22.00	32.00	641.98	636.98	631.98
	GAMW55*	665.06	15.00	667.64	18.68	2" Sch 40 PVC	10.00	5.00	15.00	660.06	655.06	650.06
	GAMW55R	665.36	15.00	667.71	16.31	2" Sch 40 PVC	10.00	5.00	15.00	660.36	655.36	650.36
	GAMW55B	665.18	35.00	667.53	37.60	2" Sch 40 PVC	10.00	25.00	35.00	640.18	635.18	630.18
	GAMW56	665.43	15.00	667.91	15.56	2" Sch 40 PVC	10.00	5.00	15.00	660.43	655.43	650.43
	GAMW56B	665.33	35.00	667.82	36.84	2" Sch 40 PVC	10.00	25.00	35.00	640.33	635.33	630.33
	GAMW63B	666.31	33.00	668.74	35.43	2" Sch 40 PVC	10.00	23.00	33.00	643.31	638.31	633.31
	GAMW64B	664.42	31.00	666.83	33.26	2" Sch 40 PVC	10.00	21.00	31.00	643.42	638.42	633.42

Table 1 Monitoring Well Construction Details
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

CCR Unit	Monitoring Well ID	Ground Surface Elevation (ft-amsl)	Total Borehole Depth (ft)	Top of Casing Elevation (ft-amsl)	Sounded Well Depth (ft-btoc)	Well Material	Screen Length (ft)	Screen Depth		Screen Elevation		
								Top (ft-bgs)	Bottom (ft-bgs)	Top (ft-amsl)	Middle (ft-amsl)	Bottom (ft-amsl)
Landfill Phase V, Phase VI, and Phase VII	GAMW20	664.61	16.00	667.21	18.95	2" Sch 40 PVC	10.00	6.00	16.00	658.61	653.61	648.61
	GAMW20B	664.48	35.00	667.40	18.22	2" Sch 40 PVC	10.00	25.00	35.00	639.48	634.48	629.48
	GAMW21*	666.60	18.00	668.38	20.36	2" Sch 40 PVC	10.00	8.00	18.00	658.60	653.60	648.60
	GAMW21B*	666.66	37.00	669.37	36.34	2" Sch 40 PVC	10.00	27.00	37.00	639.66	634.66	629.66
	GAMW22*	666.33	18.00	668.64	20.38	2" Sch 40 PVC	13.00	5.00	18.00	661.33	654.83	648.33
	GAMW22B*	666.39	37.00	669.38	37.13	2" Sch 40 PVC	10.00	27.00	37.00	639.39	634.39	629.39
	GAMW23*	667.02	19.00	668.34	20.30	2" Sch 40 PVC	14.00	5.00	19.00	662.02	655.02	648.02
	GAMW23B*	667.03	38.00	670.02	37.92	2" Sch 40 PVC	10.00	28.00	38.00	639.03	634.03	629.03
	GAMW24	662.09	16.00	665.46	20.31	2" Sch 40 PVC	10.00	6.00	16.00	656.09	651.09	646.09
	GAMW24B	662.13	31.00	665.43	35.38	2" Sch 40 PVC	10.00	21.00	31.00	641.13	636.13	631.13
	GAMW25	665.26	16.00	668.07	19.43	2" Sch 40 PVC	10.00	6.00	16.00	659.26	654.26	649.26
	GAMW25B	665.26	35.00	667.97	37.00	2" Sch 40 PVC	10.00	25.00	35.00	640.26	635.26	630.26
	GAMW26	664.89	16.00	667.83	20.00	2" Sch 40 PVC	10.00	6.00	16.00	658.89	653.89	648.89
	GAMW26B	664.91	33.00	667.76	37.08	2" Sch 40 PVC	10.00	23.00	33.00	641.91	636.91	631.91
	GAMW27	662.68	16.00	665.57	20.00	2" Sch 40 PVC	10.00	6.00	16.00	656.68	651.68	646.68
	GAMW27B	662.65	31.00	665.52	34.73	2" Sch 40 PVC	10.00	21.00	31.00	641.65	636.65	631.65
	GAMW28*	662.24	16.00	665.56	20.15	2" Sch 40 PVC	10.00	6.00	16.00	656.24	651.24	646.24
	GAMW28B*	662.32	29.00	665.62	32.92	2" Sch 40 PVC	10.00	19.00	29.00	643.32	638.32	633.32
	GAMW29	666.58	16.00	669.48	20.39	2" Sch 40 PVC	10.00	6.00	16.00	660.58	655.58	650.58
	GAMW29B	666.64	36.00	669.43	40.52	2" Sch 40 PVC	10.00	26.00	36.00	640.64	635.64	630.64
	GAMW30	664.27	16.00	666.92	20.40	2" Sch 40 PVC	10.00	6.00	16.00	658.27	653.27	648.27
	GAMW30B	664.27	32.00	666.96	35.49	2" Sch 40 PVC	10.00	22.00	32.00	642.27	637.27	632.27
	GAMW31	662.68	16.00	665.39	19.26	2" Sch 40 PVC	10.00	6.00	16.00	656.68	651.68	646.68
	GAMW31B	662.69	30.00	665.40	32.10	2" Sch 40 PVC	10.00	20.00	30.00	642.69	637.69	632.69
	GAMW32	665.44	18.00	668.09	21.07	2" Sch 40 PVC	10.00	8.00	18.00	657.44	652.44	647.44
	GAMW32B	665.53	34.00	668.25	36.93	2" Sch 40 PVC	10.00	24.00	34.00	641.53	636.53	631.53
	GAMW33	662.63	16.00	665.24	20.33	2" Sch 40 PVC	10.00	6.00	16.00	656.63	651.63	646.63
	GAMW33B	662.43	31.00	665.25	35.35	2" Sch 40 PVC	10.00	21.00	31.00	641.43	636.43	631.43
	GAMW34	661.78	16.00	664.83	20.28	2" Sch 40 PVC	10.00	6.00	16.00	655.78	650.78	645.78
	GAMW34B	661.65	29.00	664.84	30.48	2" Sch 40 PVC	10.00	19.00	29.00	642.65	637.65	632.65
	GAMW35B	661.78	24.00	664.61	26.66	2" Sch 40 PVC	10.00	14.00	24.00	647.78	642.78	637.78
	GAMW36	662.24	16.00	664.97	20.28	2" Sch 40 PVC	10.00	6.00	16.00	656.24	651.24	646.24
	GAMW36B	662.35	25.50	665.04	35.33	2" Sch 40 PVC	1.00	24.50	25.50	637.85	637.35	636.85
	GAMW37B	662.68	25.00	665.36	27.78	2" Sch 40 PVC	10.00	15.00	25.00	647.68	642.68	637.68
	GAMW38	660.93	15.00	663.29	17.97	2" Sch 40 PVC	10.00	5.00	15.00	655.93	650.93	645.93
	GAMW38B	660.81	29.50	663.31	32.00	2" Sch 40 PVC	10.00	19.50	29.50	641.31	636.31	631.31
	GAMW39	661.04	15.00	663.53	17.95	2" Sch 40 PVC	10.00	5.00	15.00	656.04	651.04	646.04
	GAMW39B	660.96	29.50	663.49	31.15	2" Sch 40 PVC	10.00	19.50	29.50	641.46	636.46	631.46
	GAMW40	664.11	15.00	666.56	19.94	2" Sch 40 PVC	10.00	5.00	15.00	659.11	654.11	649.11
	GAMW40B	664.05	31.50	666.40	35.16	2" Sch 40 PVC	10.00	21.50	31.50	642.55	637.55	632.55
	GAMW41	660.09	15.00	662.43	16.40	2" Sch 40 PVC	10.00	5.00	15.00	655.09	650.09	645.09
	GAMW41B	660.08	27.00	662.17	30.04	2" Sch 40 PVC	10.00	17.00	27.00	643.08	638.08	633.08
	GAMW48	660.81	15.00	663.38	17.00	2" Sch 40 PVC	10.00	5.00	15.00	655.81	650.81	645.81
	GAMW48B	660.44	30.00	663.33	32.30	2" Sch 40 PVC	10.00	20.00	30.00	640.44	635.44	630.44
	GAMW49	662.00	15.00	664.64	14.18	2" Sch 40 PVC	10.00	5.00	15.00	657.00	652.00	647.00
	GAMW49B	662.12	33.00	664.52	34.82	2" Sch 40 PVC	10.00	23.00	33.00	639.12	634.12	629.12
	GAMW50	662.52	15.00	665.17	19.60	2" Sch 40 PVC	10.00	5.00	15.00	657.52	652.52	647.52
	GAMW50B	662.28	31.00	664.90	31.79	2" Sch 40 PVC	10.00	21.00	31.00	641.28	636.28	631.28
	GAMW10	663.99	15.00	667.83	18.75	2" Sch 40 PVC	10.00	5.00	15.00	658.99	653.99	648.99
	GAMW11	663.60	15.00	667.17	19.18	2" Sch 40 PVC	10.00	5.00	15.00	658.60	653.60	648.60
	MW-1D	666.36	NA	668.86	33.68	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-1S	666.43	NA	668.81	19.52	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA

Table 1 Monitoring Well Construction Details
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

CCR Unit	Monitoring Well ID	Ground Surface Elevation (ft-amsl)	Total Borehole Depth (ft)	Top of Casing Elevation (ft-amsl)	Sounded Well Depth (ft-btoc)	Well Material	Screen Length (ft)	Screen Depth		Screen Elevation		
								Top (ft-bgs)	Bottom (ft-bgs)	Top (ft-amsl)	Middle (ft-amsl)	Bottom (ft-amsl)
LANDFILL Phase V, Phase VI and Phase VII	MW-2S	662.10	NA	664.10	11.96	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-3D	664.84	NA	667.58	29.75	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-3S	664.82	NA	667.58	18.41	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-4D	664.13	NA	666.56	33.24	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-4S	664.26	NA	666.90	17.51	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-5D	662.75	NA	664.37	31.00	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-5S	662.72	NA	664.29	16.19	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-6D	661.79	NA	664.64	33.29	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-6S	662.01	NA	664.61	19.06	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-7D	662.01	NA	664.72	32.91	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-7S	661.99	NA	664.80	16.33	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-8D	661.34	NA	663.52	35.42	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-8S	661.42	NA	663.75	18.04	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-9D	661.84	NA	662.68	39.20	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-9S	661.83	NA	662.42	19.53	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-10D	662.20	NA	663.18	31.22	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-10S	661.95	NA	662.53	14.68	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-11D	661.51	NA	663.57	32.86	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-11S	661.46	NA	663.25	17.18	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-12D	661.58	NA	663.60	32.75	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-12S	661.54	NA	663.48	16.83	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-13D	662.03	NA	664.80	32.52	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-13S	662.22	NA	664.67	17.90	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-14D	662.64	NA	665.41	33.20	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-14S	662.57	NA	665.24	17.72	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	GAPIEZ07	665.15	15.00	668.77	18.91	2" Sch 40 PVC	10.00	5.00	15.00	660.15	655.15	650.15

Notes:

ft-bgs = Feet below ground surface

ft-amsl = Feet above mean sea level

ft-btoc = Feet below top of casing

WDA = Waste Disposal Area

MSRB = Material Storage Runoff Basin

MCWB = Metal Cleaning Waste Basin

No highlight indicates well is not part of the CCR monitoring program, however, water levels are measured in these wells to supplement groundwater contour maps.

Yellow highlight indicates a CCR background well

Green highlight indicates a CCR downgradient well

2" Sch 40 PVC = Two-inch diameter well, constructed of schedule 40 polyvinyl chloride materials

Survey elevations for new wells obtained from Marbach, Brady, and Weaver survey, June 2016, August 2018, June 2019, June 2020, and October 2020

*Decommissioned monitoring well.

Prepared by: DFSC
Checked by: KMC
Reviewed by: MAH

Table 2: Monitoring Well Installation Date and Purpose
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

CCR Unit	Well Purpose	Monitoring Well ID	Installation Date	Decommission Date (If Applicable)	Basis For Action
Waste Disposal Area	Background Monitoring Well	GAMW-03	6/27/2015	-	Installed for groundwater quality monitoring[1]
		GAMW-03B	5/24/2016	-	
		GAMW-68	8/27/2020	-	
		GAMW-68B	8/27/2020	-	
	Downgradient Monitoring Well	GAMW-01	6/26/2015	-	Installed for groundwater quality monitoring[1]
		GAMW-12	5/23/2016	-	
		GAMW-13	5/24/2016	-	
		GAMW-13B	5/23/2016	-	
		GAMW-14	5/23/2016	-	
		GAMW-14B	5/23/2016	-	
		GAMW-01B	7/31/2018	-	Installed to characterize the nature and extent of a potential release[2]
		GAMW-12B	7/31/2018	-	
		GAMW-51	7/25/2018	-	
		GAMW-51B	7/25/2018	-	
		GAMW-42	7/24/2018	-	Installed to monitor groundwater quality at the property boundary[3]
		GAMW-42B	7/24/2018	-	
		GAMW-42C	6/8/2019	-	
		GAMW-43	5/16/2018	-	
		GAMW-43B	5/16/2018	-	
		GAMW-44	5/16/2018	-	
		GAMW-44B	5/16/2018	-	
		GAMW-57	6/7/2019	-	
		GAMW-57B	6/7/2019	-	
		GAMW-58	6/6/2019	-	
		GAMW-58B	6/6/2019	-	
		GAMW-59	6/8/2019	-	Installed to characterize the nature and extent of a potential release[2]
		GAMW-59B	6/6/2019	-	
		GAMW-60	6/8/2019	-	
		GAMW-60B	6/4/2019	-	
Material Storage Runoff Basin, Metal Cleaning Waste Basin, and Drying Area	Background Monitoring Well	GAMW-04	6/27/2015	-	Installed for groundwater quality monitoring[1]
		GAMW-07	6/29/2015	-	
		GAMW-15	5/25/2016	-	
		GAMW-15B	5/24/2016	-	
		GAMW-07B	7/25/2018	-	Installed to provide additional groundwater quality data
	Downgradient Monitoring Well	GAMW-08	6/28/2015	-	Installed for groundwater quality monitoring[1]
		GAMW-09	6/28/2015	-	
		GAMW-09B	5/24/2016	-	
		GAMW-16	5/26/2016	NA	Removed during construction activities[5]
		GAMW-16R	9/23/2020	-	Installed to replace GAMW-16[5]
		GAMW-16B	5/25/2016	9/22/2020	Decommissioned due to construction activities[6]
		GAMW-16BR	9/22/2020	-	Installed to replace GAMW-16B[6]
		GAMW-17	5/25/2016	-	Installed for groundwater quality monitoring[1]
		GAMW-17B	5/25/2016	-	
		GAMW-18	5/24/2016	-	
		GAMW-08B	7/25/2018	-	Installed to characterize the nature and extent of a potential release[2]
		GAMW-18B	7/26/2018	-	
		GAMW-52	7/30/2018	-	
		GAMW-52B	7/30/2018	-	
		GAMW-53	7/30/2018	-	
		GAMW-53B	7/30/2018	-	
		GAMW-54	7/30/2018	-	
		GAMW-54B	7/27/2018	-	
		GAMW-55	7/26/2018	6/8/2019	Decommissioned due to well casing damage[4]
		GAMW-55R	6/8/2019	-	Installed to replace GAMW-55[4]
		GAMW-55B	7/26/2018	-	Installed to characterize the nature and extent of a potential release[2]
		GAMW-56	7/27/2018	-	
		GAMW-56B	7/27/2018	-	
		GAMW-46	5/15/2018	-	Installed to monitor groundwater quality at the property boundary[3]
		GAMW-46B	5/15/2018	-	

Table 2: Monitoring Well Installation Date and Purpose
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

CCR Unit	Well Purpose	Monitoring Well ID	Installation Date	Decommission Date (If Applicable)	Basis For Action
LANDFILL Phase V, Phase VI, and Phase VII	Background Monitoring Well	GAMW-20	5/27/2016	-	Installed for Groundwater Quality Monitoring[1]
		GAMW-24	9/26/2016	-	
		GAMW-24B	9/26/2016	-	
		GAMW-25	10/4/2016	-	
		GAMW-25B	10/5/2016	-	
	Downgradient Monitoring Well	GAMW-21	5/31/2016	4/5/2018	Abandoned due to Landfill Construction Activities[2]
		GAMW-21B	5/31/2016	4/5/2018	
		GAMW-22	5/31/2016	4/5/2018	
		GAMW-22B	6/2/2016	4/5/2018	
		GAMW-23	6/2/2016	4/6/2018	
		GAMW-23B	6/2/2016	4/6/2018	
		GAMW-28	9/29/2016	4/6/2018	
		GAMW-28B	9/29/2016	4/6/2018	
		GAMW-26	10/4/2016	-	Installed for Groundwater Quality Monitoring[1]
		GAMW-26B	10/4/2016	-	
		GAMW-27	10/3/2016	-	
		GAMW-27B	10/4/2016	-	
		GAMW-38	4/4/2018	-	Installed to Replace Abandoned Well[3]
		GAMW-38B	4/3/2018	-	
		GAMW-39	4/4/2018	-	
		GAMW-39B	4/4/2018	-	
		GAMW-40	4/5/2018	-	
		GAMW-40B	4/4/2018	-	
		GAMW-41	5/17/2018	-	
		GAMW-41B	5/17/2018	-	

1) Per 40 CFR §257.93, Golder collected eight rounds of background data prior to October 17, 2017, excluding wells GAMW-68 and GAMW-68B.

2) Per 40 CFR §257.95(g)(1)(i) Rule requirements, Golder collected additional data to further characterize the nature and extent of potential groundwater impacts.

3) Per 40 CFR §257.95(g)(1)(iii), Golder collected data to monitor groundwater quality in the direction of flow at the property boundary.

4) Golder field personnel were unable to collect a groundwater sample from monitoring well GAMW-55 during the April 2019 Assessment Monitoring sampling event due to surface damage (i.e., tubing above the permanent pump was pinched at less than 10 feet below ground surface). The well was replaced with GAMW-55R in June 2019.

5) Monitoring well GAMW-16 was completely removed during construction excavation activities in 2020. No decommissioning was required. The well was replaced with GAMW-16R in September 2020.

6) Monitoring well GAMW-16B was decommissioned during construction activities in 2020. The well was replaced with GAMW-16BR in September 2020.

NA= Not applicable

Prepared by: KMC
Checked by: DFSC
Reviewed by: MAH

Table 3: Unit-Specific Groundwater Protection Standards
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

CCR Unit	Analyte	MCL (mg/L)	GWPS (mg/L)[2]	GWPS (mg/L)[3]
Waste Disposal Area	Antimony	0.006	0.006	0.006
	Arsenic	0.01	0.015	0.018
	Barium	2	2	2
	Beryllium	0.004	0.004	0.004
	Cadmium	0.005	0.005	0.005
	Chromium	0.1	0.1	0.1
	Cobalt[1]	0.006	0.015	0.015
	Fluoride	4	4	4
	Lead[1]	0.015	0.015	0.015
	Lithium[1]	0.04	0.04	0.04
	Mercury	0.002	0.002	0.002
	Molybdenum[1]	0.1	0.1	0.1
	Radium 226+228	5	5	5
	Selenium	0.05	0.05	0.05
	Thallium	0.002	0.002	0.002
MSRB, MCWB, and Drying Area	Antimony	0.006	0.006	0.006
	Arsenic	0.01	0.078	0.091
	Barium	2	2	2
	Beryllium	0.004	0.004	0.004
	Cadmium	0.005	0.005	0.005
	Chromium	0.1	0.1	0.1
	Cobalt[1]	0.006	0.01	0.01
	Fluoride	4	4	4
	Lead[1]	0.015	0.015	0.015
	Lithium[1]	0.04	0.04	0.04
	Mercury	0.002	0.002	0.002
	Molybdenum[1]	0.1	0.1	0.1
	Radium 226+228	5	5	5
	Selenium	0.05	0.05	0.05
	Thallium	0.002	0.002	0.002

Notes:
MCL= Environmental Protection Agency Maximum Contaminant Level
GWPS= Groundwater Protection Standard
mg/L= milligrams per liter

1) As of August 29, 2018, these four constituents have health-based standards that can be used when calculating the GWPS, these health-based standards are not MCLs but are provided in the MCL column.
2) GWPS calculated in August 2018.
3) GWPS calculated in March 2020.

Prepared by: KMC
Checked by: DFSC
Reviewed by: JSP

Table 4: Dates and Purposes of Each Monitoring Event
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Well Purpose	Monitoring Well ID	Sample Event #15	Sample Event #16	Sample Event #17
Purpose of Sample		Semi-Annual Assessment Monitoring	Annual Assessment Monitoring	Semi-Annual Assessment Monitoring
Sample Parameters		Appendix III and Appendix IV	Appendix III and Appendix IV	Appendix III and detected Appendix IV
WDA Background Monitoring Well	GAMW03	10/22/2020	4/14/2021	9/17/2021
	GAMW03B	10/22/2020	4/15/2021	9/17/2021
	GAMW68	10/29/2020	4/22/2021	9/17/2021
	GAMW68B	10/29/2020	4/22/2021	9/17/2021
WDA Downgradient Monitoring Well	GAMW01	10/21/2020	4/14/2021	9/16/2021
	GAMW01B	10/21/2020	4/14/2021	9/16/2021
	GAMW12	10/20/2020	4/15/2021	9/16/2021
	GAMW12B	10/20/2020	4/15/2021	9/16/2021
	GAMW13	10/20/2020	4/19/2021	9/17/2021
	GAMW13B	10/20/2020	4/19/2021	9/17/2021
	GAMW14	10/20/2020	4/19/2021	9/17/2021
	GAMW14B	10/20/2020	4/19/2021	9/17/2021
	GAMW42	10/15/2020	4/23/2021	9/14/2021
	GAMW42B	10/15/2020	4/23/2021	9/14/2021
	GAMW42C	10/15/2020	4/23/2021	9/15/2021
	GAMW43	10/15/2020	4/23/2021	9/14/2021
	GAMW43B	10/16/2020	4/27/2021	9/14/2021
	GAMW44	10/16/2020	4/27/2021	9/15/2021
	GAMW44B	10/16/2020	4/27/2021	9/15/2021
	GAMW51	10/27/2020	4/21/2021	9/29/2021
	GAMW51B	10/27/2020	4/21/2021	9/29/2021
	GAMW57	10/16/2020	4/23/2021	9/15/2021
	GAMW57B	10/16/2020	4/23/2021	9/15/2021
	GAMW58	10/19/2020	4/23/2021	9/15/2021
	GAMW58B	10/19/2020	4/23/2021	9/15/2021
	GAMW59	10/28/2020	4/21/2021	9/29/2021
	GAMW59B	10/28/2020	4/22/2021	9/29/2021
	GAMW60	10/28/2020	4/21/2021	9/24/2021
	GAMW60B	10/28/2020	4/21/2021	9/24/2021
Total Number of Samples		29	29	29

Table 4: Dates and Purposes of Each Monitoring Event
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Well Purpose	Monitoring Well ID	Sample Event #15	Sample Event #16	Sample Event #17
Purpose of Sample		**Semi-Annual Assessment Monitoring**	**Annual Assessment Monitoring**	**Semi-Annual Assessment Monitoring**
Sample Parameters		**Appendix III and Detected Appendix IV**	**Appendix III and Appendix IV**	**Appendix III and Detected Appendix IV**
MSRB, MCWB, and Drying Area Background Monitoring Well	GAMW-04	10/22/2020	4/15/2021	9/23/2021
	GAMW-07	10/27/2020	4/16/2021	9/21/2021
	GAMW-07B	10/27/2020	4/16/2021	9/23/2021
	GAMW-15	10/27/2020	4/16/2021	9/22/2021
	GAMW-15B	10/27/2020	4/16/2021	9/22/2021
MSRB, MCWB, and Drying Area Downgradient Monitoring Well	GAMW-08	10/26/2020	4/22/2021	9/24/2021
	GAMW-08B	10/23/2020	4/22/2021	9/24/2021
	GAMW-09	10/23/2020	4/20/2021	9/23/2021
	GAMW-09B	10/23/2020	4/20/2021	9/23/2021
	GAMW-16R	10/29/2020	4/22/2021	9/21/2021
	GAMW-16BR	10/26/2020	4/22/2021	9/21/2021
	GAMW-17	10/26/2020	4/14/2021	9/22/2021
	GAMW-17B	10/26/2020	4/14/2021	9/22/2021
	GAMW-18	10/23/2020	4/20/2021	9/16/2021
	GAMW-18B	10/23/2020	4/21/2021	9/17/2021
	GAMW-46	10/19/2020	4/27/2021	9/15/2021
	GAMW-46B	10/19/2020	4/27/2021	9/15/2021
	GAMW-52	10/22/2020	4/16/2021	9/30/2021
	GAMW-52B	10/23/2020	4/16/2021	9/30/2021
	GAMW-53	10/23/2020	4/16/2021	9/30/2021
	GAMW-53B	10/23/2020	4/16/2021	9/30/2021
	GAMW-54	10/23/2020	4/19/2021	10/1/2021
	GAMW-54B	10/23/2020	4/19/2021	10/1/2021
	GAMW-55R	10/28/2020	4/20/2021	10/1/2021
	GAMW-55B	10/28/2020	4/20/2021	10/1/2021
	GAMW-56	10/28/2020	4/20/2021	10/4/2021
	GAMW-56B	10/28/2020	4/21/2021	10/4/2021
Total Number of Samples		27	27	27

Table 4: Dates and Purposes of Each Monitoring Event
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

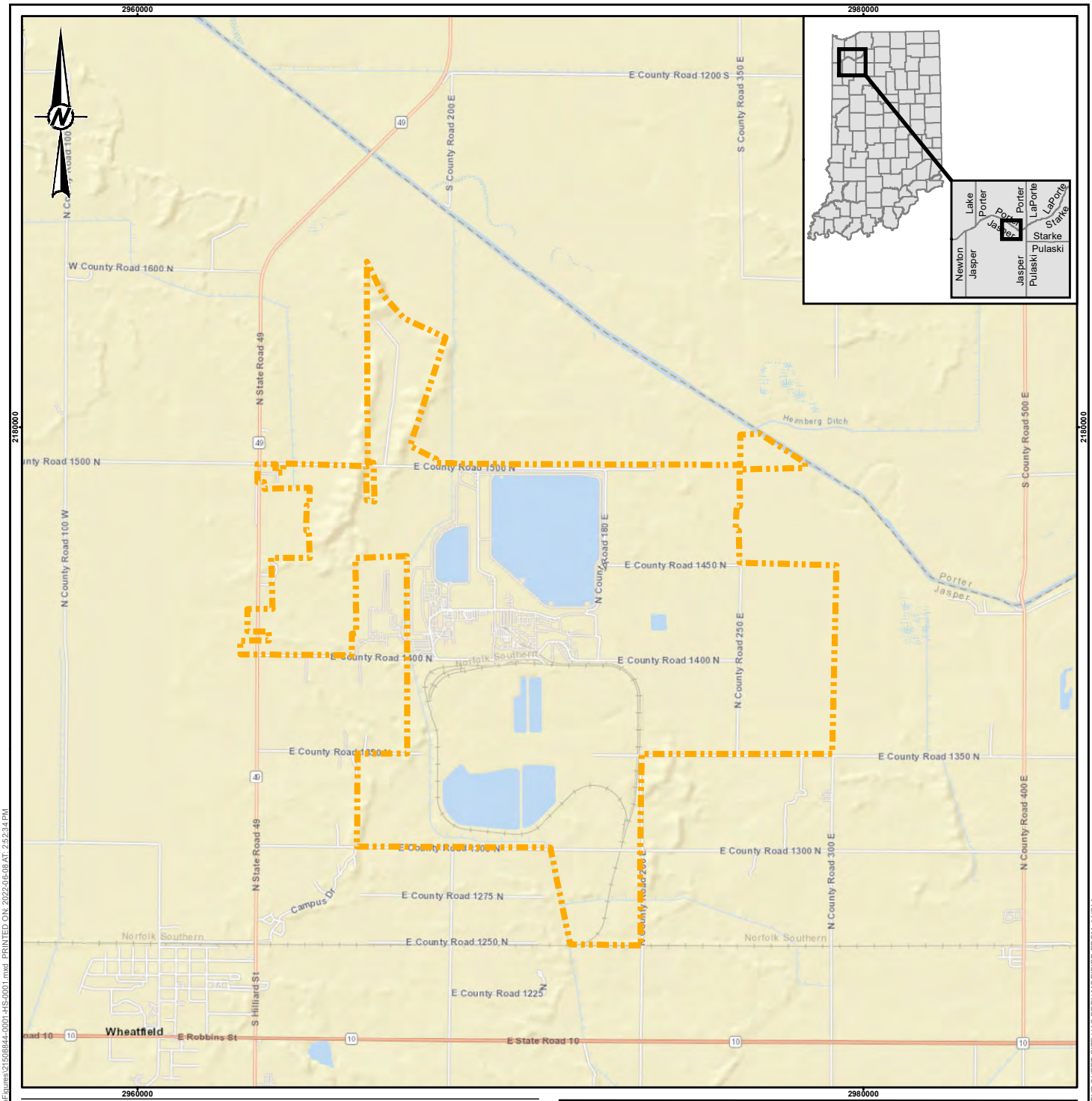
Well Purpose	Monitoring Well ID	Sample Event #15	Sample Event #16	Sample Event #17
Purpose of Sample		**Detection Monitoring**	**Detection Monitoring**	**Detection Monitoring**
Sample Parameters		**Appendix III**	**Appendix III**	**Appendix III**
Landfill Background Monitoring Well	GAMW-20	9/16/2020	4/12/2021	9/13/2021
	GAMW-24	9/15/2020	4/12/2021	9/13/2021
	GAMW-24B	9/15/2020	4/13/2021	9/13/2021
	GAMW-25	9/15/2020	4/12/2021	9/10/2021
	GAMW-25B	9/16/2020	4/12/2021	9/10/2021
Landfill Downgradient Monitoring Well	GAMW-26	9/16/2020	4/12/2021	9/10/2021
	GAMW-26B	9/16/2020	4/12/2021	9/10/2021
	GAMW-27	9/17/2020	4/13/2021	9/10/2021
	GAMW-27B	9/17/2020	4/13/2021	9/13/2021
	GAMW-38	9/17/2020	4/13/2021	9/11/2021
	GAMW-38B	9/17/2020	4/13/2021	9/11/2021
	GAMW-39	9/17/2020	4/13/2021	9/11/2021
	GAMW-39B	9/17/2020	4/13/2021	9/11/2021
	GAMW-40	9/17/2020	4/14/2021	9/13/2021
	GAMW-40B	9/21/2020	4/14/2021	9/13/2021
	GAMW-41	9/21/2020	4/14/2021	9/13/2021
	GAMW-41B	9/21/2020	4/13/2021	9/13/2021
Total Number of Samples		17	17	17

Notes:
Sample counts do not include QC/QA samples.

(1) Sample events #1-14 were completed prior to October 2020. The purpose, sample parameters, and sample dates are included in the Demonstration or Demonstration Addendum.

(2) Semi-annual assessment monitoring parameters did not include radium.

Prepared by: KMC
Checked by: DFSC
Reviewed by: MAH



LEGEND

Approximate Property Line

0 0.75 1.5

1 " = 0.75 mi Miles

REFERENCE(S)

SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

PART A DEMONSTRATION
R. M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

SITE LOCATION MAP

CONSULTANT

WSP GOLDER

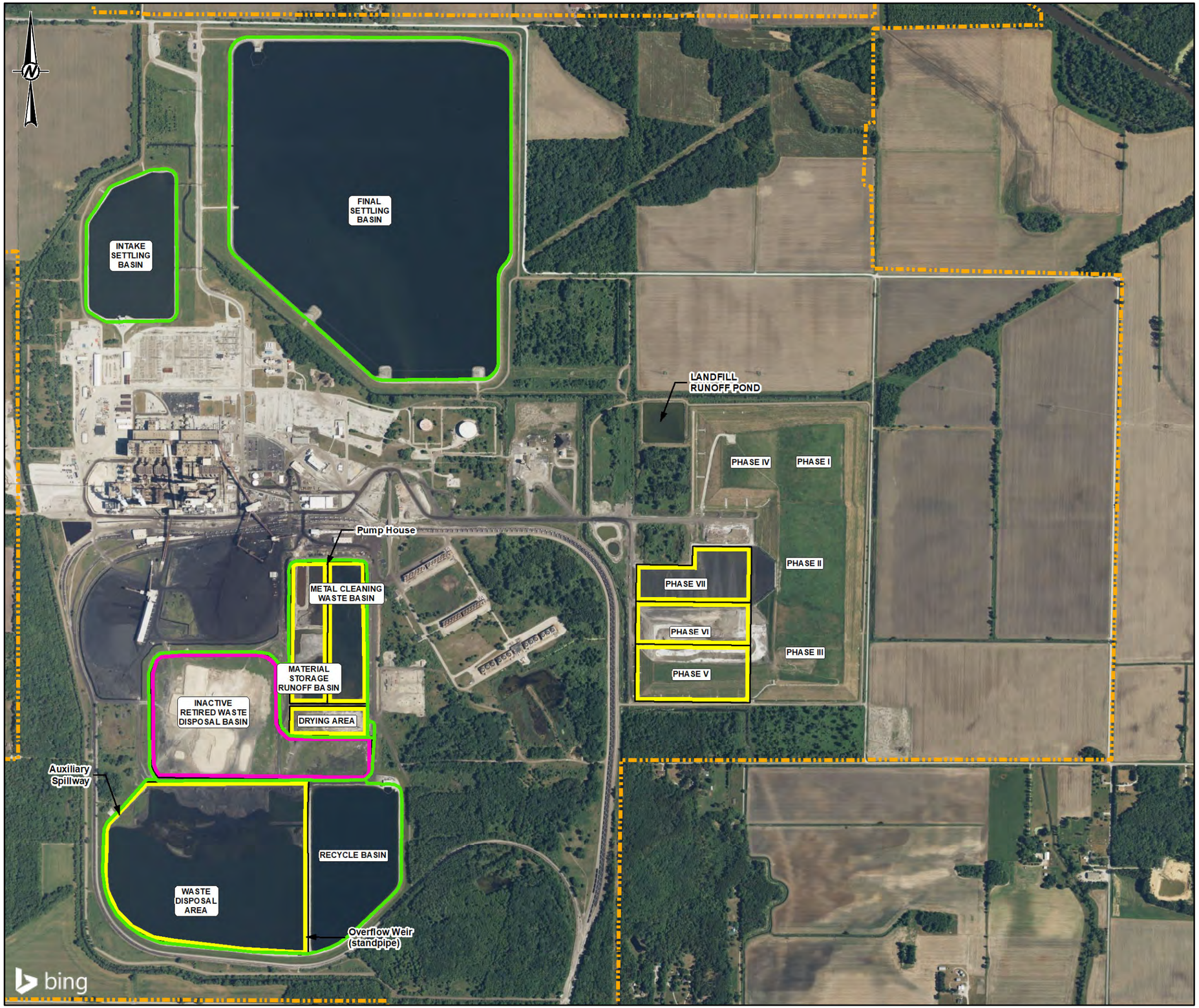
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PREPARED	SHL
REVIEWED	JSP
APPROVED	MAH

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

0 1 in



LEGEND

- Slurry Wall
- CCR Units
- Approximate Extent of Inactive Retired Waste Disposal Basin
- Approximate Property Line

0 1,000 2,000

Feet

NOTE(S)

REFERENCE(S)

1. © 2022 MICROSOFT CORPORATION © 2022 MAXAR ©CNES (2022) DISTRIBUTION AIRBUS DS

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

FACILITY SITE PLAN

CONSULTANT

WSP GOLDER

YYYY-MM-DD	2022-06-08
DESIGNED	TH
PREPARED	SHL
REVIEWED	DFSC
APPROVED	MAH

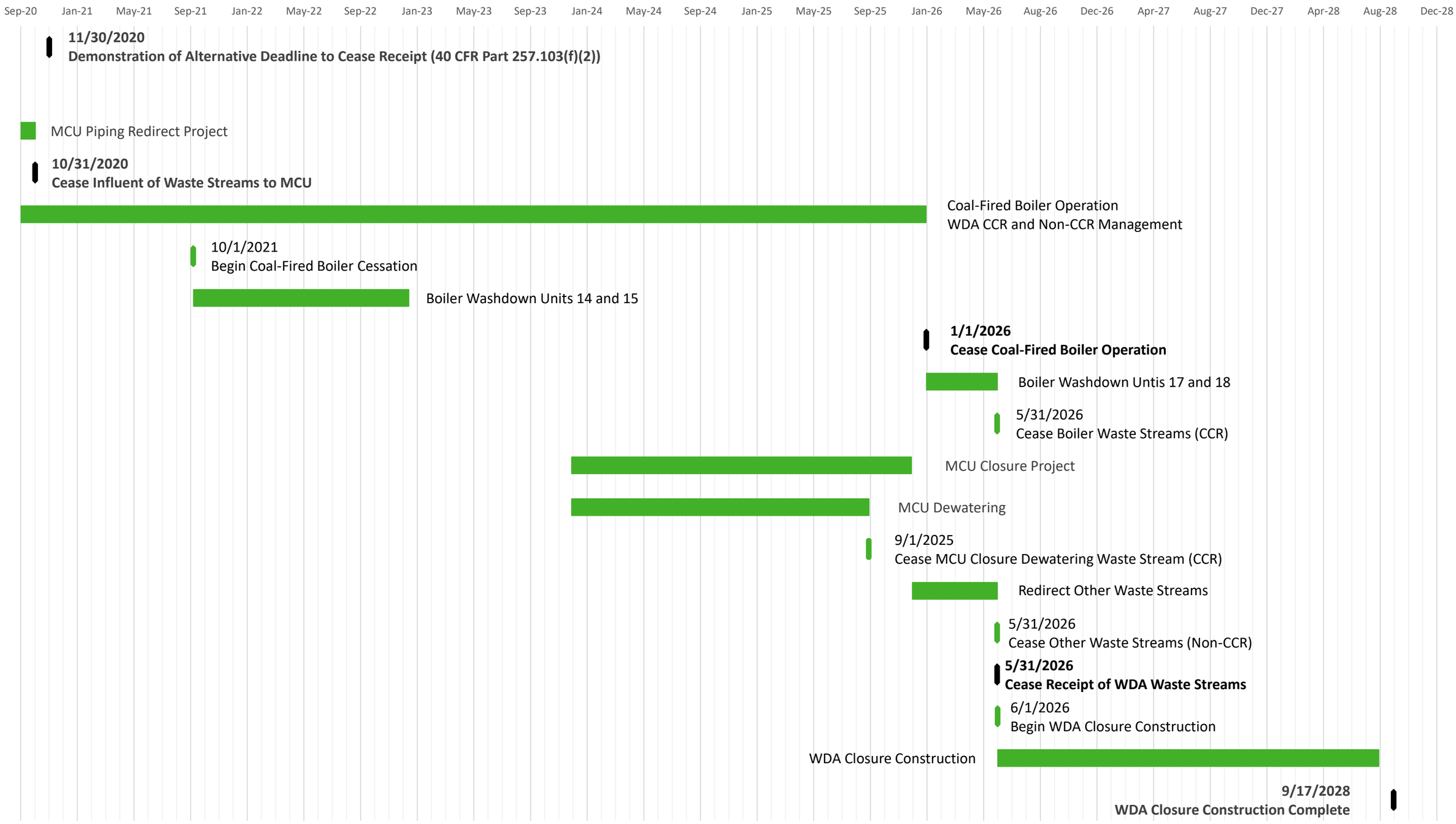
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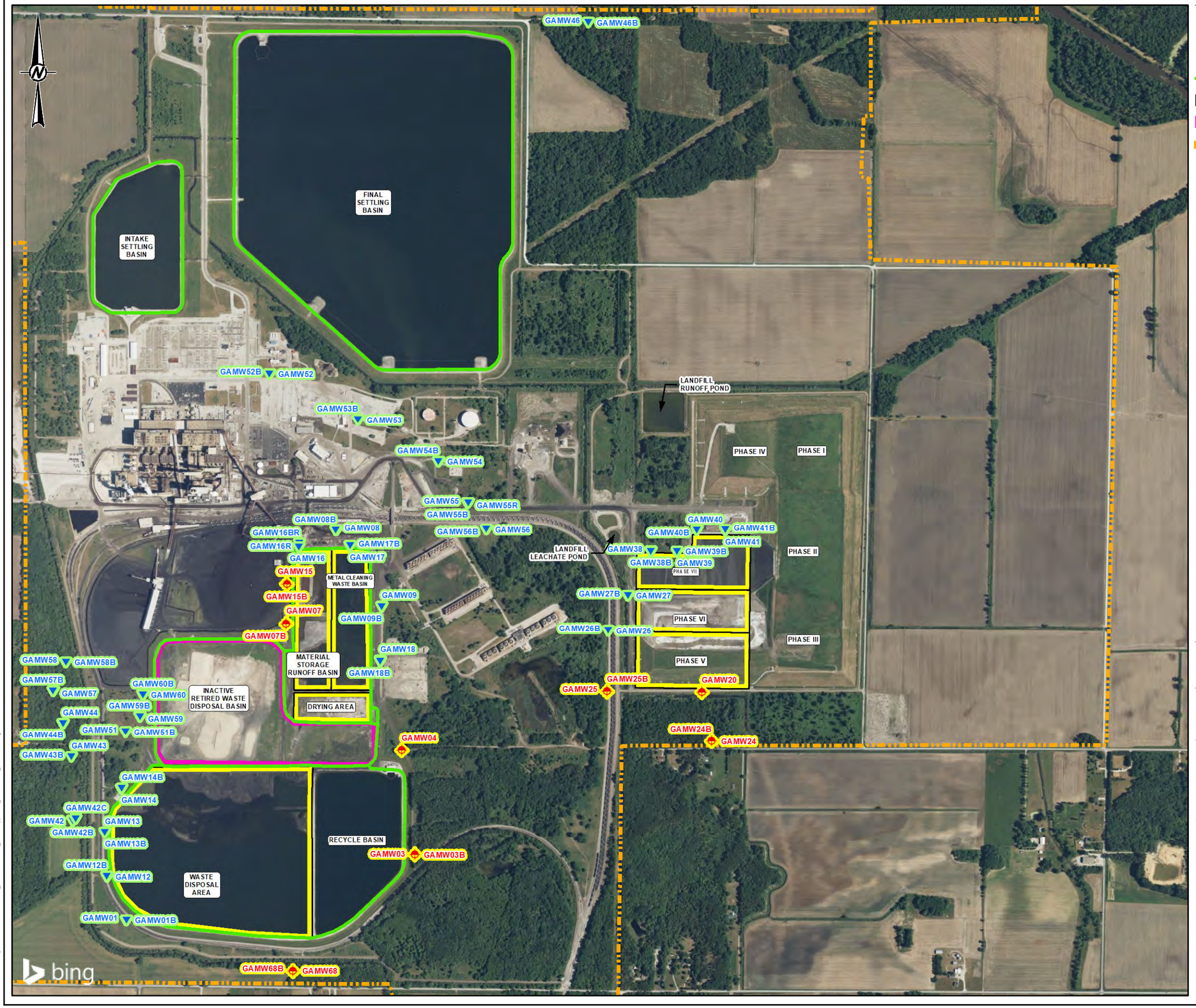
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Figure 3
Operation and Closure Schedule





LEGEND

- Background Monitoring Well
- Downgradient Monitoring Well
- Slurry Wall
- CCR Units
- Inactive Retired Waste Disposal Basin
- Approximate Property Line

0 1,000 2,000
Feet

NOTE(S)
1. WATER LEVEL MEASUREMENTS COLLECTED ON MARCH 18, 2022.

REFERENCE(S)
1. © 2022 MICROSOFT CORPORATION © 2022 MAXAR ©CNES (2022) DISTRIBUTION AIRBUS DS

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

MONITORING WELL LOCATION MAP

CONSULTANT

WSP GOLDER

YYYY-MM-DD	2022-06-08
DESIGNED	TH
PREPARED	SHL
REVIEWED	DFSC
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
GL21508844	A	0	4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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APPENDIX A

Part A Demonstration Annual Progress Report #01-21 40 CFR Part §257. 103(f)(2)(X)

DEMONSTRATION ANNUAL PROGRESS REPORT #01-21

DATE October 29, 2021 **Project No.** 20368079

TO Jeff Loewe, Maureen Turman, Joe Kutch, Maggie Rice
Northern Indiana Public Service Company LLC

CC Richard Wesenberg, Danielle Sylvia Cofelice

FROM Mark Haney **EMAIL mhaney@golder.com**

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC
R. M. SCHAHFER GENERATING STATION, WASTE DISPOSAL AREA
40 CFR §257.103(F)(2)(X) PART A DEMONSTRATION ANNUAL PROGRESS REPORT #01-21

On October 30, 2020 in accordance with the requirements of 40 Code of Federal Regulations (CFR) §257.103(f)(2), Northern Indiana Public Service Company LLC (NIPSCO) submitted the "*NIPSCO LLC RMSGS Demonstration of Site-specific Alternative Deadline to Initiate Closure of CCR Surface Impoundment Due to Permanent Cessation of Coal-Fired Boilers by a Date Certain*" (hereinafter Demonstration) for the NIPSCO R.M. Schahfer Generating Station (RMSGS or Site), 2723 E 1500 N Road, Wheatfield, Jasper County, Indiana. The Demonstration, the subject of which is the Coal Combustion Residuals (CCR) Rule regulated surface impoundment referred to as the Waste Disposal Area (WDA), was submitted to and is currently under review by the United States Environmental Protection Agency (USEPA).

Both the text of the 2020 Demonstration and 40 CFR §257.103(f)(2)(x) address completion of an annual report documenting the continued lack of alternative capacity and the progress toward the closure of the surface impoundment. This Demonstration Annual Progress Report #01-21 (hereinafter Report) fulfills the 40 CFR §257.103(f)(2)(x) regulatory requirement and the reporting commitments as outlined in the Demonstration. In addition to providing the aforementioned information, the Report serves as an update on select additional RMSGS CCR Rule compliance and Demonstration actions completed by NIPSCO subsequent to the October 2020 submission.

Progress Toward Closure/Permanent Cessation of Coal-Fired Boiler Operations

As of October 1, 2021, NIPSCO permanently shut down operations of Units 14 and 15, representing two of the four coal-fired boilers at RMSGS. Remaining Units 17 and 18 continue to operate, with management of CCR and non-CCR waste streams produced from these Units being provided by the WDA. Cessation of operations of the two coal-fired boilers is consistent with overall Site retirement plans and on schedule with NIPSCO's planned permanent cessation of all coal-fired generation activities by Q2 2023, as outlined in the Demonstration (Section 2.4 and Figure 3).

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670 North Commercial Street, Suite 103, Manchester, NH 03101 T: +1 603 668-0880 F: +1 603 668-1199

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Ongoing Need for Operation of the WDA

As evidenced by the recent shut down of two of its four coal-fired boilers, NIPSCO is progressing toward permanent cessation of all coal-fired generation activities at RMSGS. Although Units 14 and 15 have been shut down, boiler decommissioning and washdown event(s) associated with these two Units will increase the generation of CCR and non-CCR wastewater and resultant discharge to the WDA for a period of time. Furthermore, Units 17 and 18 continue to operate at or near their capacity, generating substantial volumes of CCR and non-CCR waste streams as detailed in the Demonstration and discussed below. Thus, the need remains for existing capacity and continued operation of the WDA to meet both ongoing coal-fired generation and current and future decommissioning demands.

Aside from ongoing operational and future decommissioning needs, continued availability of the WDA is also a pivotal component in the planned closure of three other inactive CCR Rule regulated surface impoundments referred to collectively as the Multi-Cell Unit (MCU). A Closure Application, which has undergone several revisions in response to Indiana Department of Environmental Management (IDEM) reviews, is awaiting final IDEM approval. A key facet of the MCU closure by removal approach is the planned discharge of dewatering fluids to the WDA. As the only remaining operational CCR Rule regulated impoundment on-Site, discharge to the WDA is the only viable alternative for the management of high-volume dewatering effluent. Anticipating IDEM approval will be received, NIPSCO is in the construction contractor procurement stage. Contractor selection is expected within the next few months and closure construction activities, including dewatering, are currently planned for summer 2023. Completion of the 2023 closure activities, shutdown of the remaining coal-fired boilers, and conclusion of decommissioning activities will reduce reliance on the WDA as a CCR and non-CCR waste management unit.

As designed and constructed, most of NIPSCO's wastewater and stormwater systems feature a network of common sumps which ultimately discharge to the WDA. Until such time as CCR Rule regulated waste streams are no longer being generated, separation of the various sumps and pipelines is impractical, especially for a generating station with less than two years of active generation life remaining. Therefore, until cessation and decommissioning actions are completed, the WDA remains essential to the management of these high-volume waste streams. Once CCR generation activities cease and boiler decommissioning is complete, ongoing post-generation non-CCR waste streams can be managed in one or more existing NPDES-regulated non-CCR impoundments as an alternative to management in the WDA.

Continued Lack of Alternative Capacity

At the time of preparation of this Report the measurable reduction in Site-wide generation of CCR and non-CCR waste streams resulting from these boiler shutdowns could not be definitively quantified due to the absence of flow metering capacity in individual feed and discharge lines. However, in determination of alternative capacity and reliance for the operation of the WDA, the combined estimated average daily waste stream flow of 5.04 MGD reported in the Demonstration (i.e., October 2020) from Units 14 and 15, has been removed from the combined total waste stream flow considered in this Report. Note that such an approach assumes an instantaneous and maximum waste stream flow reduction (and does not account for the compulsory boiler washdown flow from Units' decommissioning) and is, as a result, considered a conservative compacity demand-based approach to this update. Therefore, due to ongoing Site operations and maintenance activities (e.g., boiler room sump dewatering for both shut down and active Units, stormwater collection and management), volumes of individual CCR and non-CCR effluent being discharged to the WDA are estimated to be between 0.34 MGD and 1.42 MGD, with a combined estimated daily flow of 4.1 MGD.

Consistent with the requirements of 40 CFR §257.103(f)(2)(x) and employing processes consistent with those used in the evaluation of alternate disposal capacity for the Demonstration, Golder Associates USA Inc. (Golder), *a member of WSP*, on behalf of NIPSCO, performed a valuation of its previous assessment. The continued lack of alternative capacity is supported by the following conclusions:

- No existing on-Site impoundment system can accept partial or total flows of CCR waste streams that are currently discharging into the WDA
- No alternative disposal available for CCR and non-CCR waste streams in the existing on-Site WWTP
- No existing off-loading or conveyance piping infrastructure to support on or off-Site alternative disposal of CCR or non-CCR waste streams
- Commercial tanker truck, railcar, on-Site infrastructure, and treatment capacity in the region continue to preclude off-Site transport and/or alternative disposal
- An employee and public health and safety risk associated with off-Site disposal due to the additional truck traffic both on-Site and on the public roads as well as an increased carbon footprint with added truck traffic
- An increased risk of release that could harm the environment every time the wastewater is handled (i.e., pumped for off-Site transport, pumped to the on-Site WWTP)

NIPSCO previously evaluated the feasibility of constructing new alternative CCR and non-CCR waste management options on-Site, even though RMSGS will cease all coal-fired generation in about one and one-half years. As in 2020, due to Site-specific factors (e.g., space limitations, shallow depth to groundwater and thus the inability to reasonably achieve the 40 CFR §257.60(a) five-foot separation from the upper limit of the uppermost aquifer), permitting and/or regulatory hurdles, and building timeframes, construction of new alternative management facilities is infeasible.

Based on current operating conditions and an updated evaluation regarding alternative disposal capacity, Golder concludes that no viable alternative to continued use of the WDA currently exists.

Additional NIPSCO Demonstration-Related Work Completed Subsequent to October 2020

In April 2019, NIPSCO completed an Assessment of Corrective Measures (ACM) in accordance with the requirements of 40 CFR §257.96. In November 2020, based upon informal feedback from USEPA officials regarding their interpretation of ACM content, Golder, on behalf of NIPSCO, prepared an Addendum (hereinafter Addendum #1) to the 2019 ACM. Addendum #1 was certified by a qualified Indiana-licensed professional engineer on November 30, 2020. Following certification, the ACM was placed in the facility operating record and NIPSCO posted it to their publicly accessible CCR website. In July 2021, consistent with changes to the Multi-Cell Unit (MCU) closure design and resultant impacts on remedy alternatives, Golder, on behalf of NIPSCO, prepared a second Addendum (hereinafter Addendum #2) to the 2020 ACM in accordance with the requirements of 40 CFR §257.96. Addendum #2 was certified by a qualified Indiana-licensed professional engineer on July 29, 2021. Following certification, the ACM was placed in the facility operating record and NIPSCO posted it to their publicly accessible CCR website. Predicated upon IDEM approval of the MCU Closure Application, NIPSCO expects the groundwater Selection of Remedy process to be completed in the next few months.

NIPSCO continues to perform all CCR Rule required activities at RMSGS' four regulated CCR surface impoundments and its multi-phase CCR landfill. Based upon its interpretation of the regulatory obligations, NIPSCO reasserts its facility-wide compliance with all applicable Part 257 requirements.

Conclusion

Golder completed the evaluation and prepared this Report on behalf of NIPSCO. The Report documents a) the continued lack of alternative capacity on-Site and off-Site, and b) NIPSCO's progress toward the closure of the RMSGS surface impoundment referred to as the WDA. NIPSCO currently anticipates no delays in the cease receipt date, or the final closure date as outlined in its 2020 Demonstration. As such, Golder submits this Report which fulfills the 40 CFR §257.103(f)(2)(x) annual progress reporting regulatory requirement and the reporting commitments as outlined in the Demonstration.

APPENDIX B

Certification of Facility Compliance
40 CFR Part §257.103(f)(2)(v)(C)(1)

Alternative Closure Requirements Certification of Compliance
Pursuant to 40 C.F.R. 257.103(f)

Northern Indiana Public Service Company LLC
R.M. Schahfer Generating Station

Northern Indiana Public Service Company LLC (NIPSCO) requires additional time to close the Waste Disposal Area ("WDA") and must continue to use the CCR surface impoundment due to the absence of alternative disposal capacity both on and offsite of the facility. In support of the demonstration, and as required by 40 C.F.R. §257.103(f)(2)(C)(1), NIPSCO submits the following certification:

> I hereby certify that to the best of my knowledge and inquiry of those persons who are immediately responsible for compliance with environmental regulations for the Waste Disposal Area at the NIPSCO R.M. Schahfer Generating System, the facility is in compliance with all of the requirements of 40 C.F.R. Part 257, Subpart D.

Kurt W. Sangster, Vice President Electric Generation
Northern Indiana Public Service Company LLC

8/15/2022
Date

APPENDIX C

Certifications of Design and Construction of Groundwater Monitoring Systems

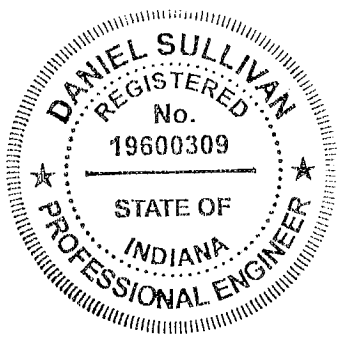
May 2022

Certification of Design and Construction of Groundwater Monitoring System (40 CFR §257.91(f))

Northern Indiana Public Service Company
R. M. Schahfer Generating Station
Wheatfield, Indiana

CCR Management Unit referred to as Waste Disposal Area

I, Daniel Sullivan, being a Professional Engineer in accordance with the laws of the State of Indiana, and having experience in the design, construction, and operation of groundwater monitoring systems for surface impoundments and landfills, do hereby state that I am qualified in the subject matter of CCR groundwater monitoring. I have personally examined and am familiar with the information related to design and construction of groundwater monitoring systems for CCR management units located at the Northern Indiana Public Service Company (NIPSCO) R. M. Schahfer Generating Station, as provided in the Groundwater Monitoring System Design Manual Revision 4.0 prepared by Golder Associates Inc. and dated May 2022. Based on an inquiry of those individuals immediately responsible, and on supporting information which I understand to be true, accurate and complete, I believe the design and construction of the groundwater monitoring system for the Waste Disposal Area meets the applicable requirements of the CCR Final Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the groundwater monitoring system for the regulated CCR management unit referred to as Waste Disposal Area has been designed and constructed to meet the applicable requirements of 40 CFR §257.91 and corresponding State of Indiana requirements.



Daniel Sullivan
Indiana Professional Engineer
License #19600309

5·24·2022
Date

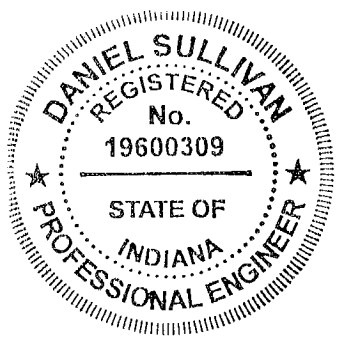
May 2022

Certification of Design and Construction of Groundwater Monitoring System (40 CFR §257.91(f))

Northern Indiana Public Service Company
R. M. Schahfer Generating Station
Wheatfield, Indiana

CCR Management Units referred to as Drying Area, Material Storage Runoff Basin, and Metal Cleaning Waste Basin

I, Daniel Sullivan, being a Professional Engineer in accordance with the laws of the State of Indiana, and having experience in the design, construction, and operation of groundwater monitoring systems for surface impoundments and landfills, do hereby state that I am qualified in the subject matter of CCR groundwater monitoring. I have personally examined and am familiar with the information related to design and construction of groundwater monitoring systems for CCR management units located at the Northern Indiana Public Service Company (NIPSCO) R. M. Schahfer Generating Station, as provided in the Groundwater Monitoring System Design Manual Revision 4.0, prepared by Golder Associates Inc. and dated May 2022. Based on an inquiry of those individuals immediately responsible, and on supporting information which I understand to be true, accurate and complete, I believe the design and construction of the multi-unit groundwater monitoring system that collectively monitors surface impoundments referred to as the Drying Area, Material Storage Runoff Basin, and Metal Cleaning Waste Basin meets the applicable requirements of the CCR Final Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the groundwater monitoring system for the regulated CCR management units referred to as the Drying Area, Material Storage Runoff Basin, and Metal Cleaning Waste Basin has been designed and constructed to meet the applicable requirements of 40 CFR §257.91 and corresponding State of Indiana requirements.



Daniel Sullivan
Indiana Professional Engineer
License #19600309

5.24.2022
Date

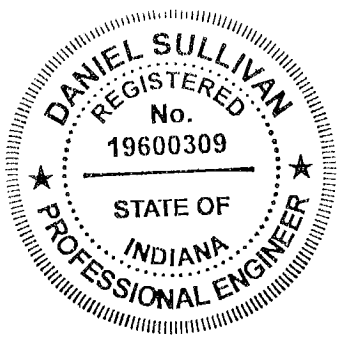
May 2022

Certification of Design and Construction of Groundwater Monitoring System (40 CFR §257.91(f))

Northern Indiana Public Service Company
R. M. Schahfer Generating Station
Wheatfield, Indiana

CCR Management Units referred to as Schahfer Landfill Phase V, VI, and VII

I, Daniel Sullivan, being a Professional Engineer in accordance with the laws of the State of Indiana, and having experience in the design, construction, and operation of groundwater monitoring systems for surface impoundments and landfills, do hereby state that I am qualified in the subject matter of CCR groundwater monitoring. I have personally examined and am familiar with the information related to design and construction of groundwater monitoring systems for CCR management units located at the Northern Indiana Public Service Company (NIPSCO) R. M. Schahfer Generating Station, as provided in the Groundwater System Design Manual Revision 4.0 prepared by Golder Associates Inc. and dated May 2022. Based on an inquiry of those individuals immediately responsible, and on supporting information which I understand to be true, accurate and complete, I believe the design and construction of the groundwater monitoring system for the Schahfer Landfill Phase V, VI, and VII meets the applicable requirements of the CCR Final Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the groundwater monitoring system for the regulated CCR management unit referred to as Schahfer Landfill Phase V, VI, and VII has been designed and constructed to meet the applicable requirements of 40 CFR §257.91 and corresponding State of Indiana requirements.



Daniel Sullivan
Indiana Professional Engineer
License #19600309

5·24·2022
Date

APPENDIX D

Soil Borings and Monitoring Well Logs 40 CFR Part §257.103(f)(2)(v)(C)(2)(ii)

BOREHOLE LOG: GAMW-65B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 37
DEPTH TO BEDROCK: 36.3

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173229.48 E: 2968253.82
GROUND SURFACE ELEV.: 665.45
TOP OF CASING ELEV.: 668.67
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/17/2020 8:45:00 AM
END DATE/TIME: 4/17/2020 11:50:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	dark brown fine clayey SILTY SAND		1	SS		1.4 / 2	0.0' to 1.3': (SM) clayey SILTY SAND, fine, low plasticity; dark brown; cohesive, w > PL, soft.		Cement-bentonite Grout 0-21 ft bgs
	brown fine SAND, trace coarse sand, trace fine to coarse gravel						1.3' to 1.4': (SP-SM) SAND, fine, some nonplastic fines; trace coarse sand, trace fine to coarse subrounded gravel; brown; non-cohesive, moist, very loose. SPTs (WOH-WOH-WOH-1)		
	gray-brown fine to medium SILTY SAND								
660.0	dark brown fine SILTY SAND		2	SS		1.3 / 2	5' to 5.4': (SM) SILTY SAND, fine to medium, trace coarse sand; gray-brown; non-cohesive, wet, loose. 5.4' to 6.3': (SM) SILTY SAND, fine; dark brown, clay pockets; non-cohesive, moist, loose. SPTs (4-4-4-5)		
	light brown fine to medium SAND, trace coarse sand, trace fine gravel								
655.0			3	SS		1.4 / 2	10' to 11.4': (SP) SAND, fine to medium; light brown; non-cohesive, wet, loose; grain size decreases with depth. SPTs (2-4-4-6)		
			4	SS		1.6 / 2	12' to 13.6': (SP) SAND, fine to medium, trace coarse sand, trace fine subrounded gravel; light brown; non-cohesive, wet, loose to compact. SPTs (3-5-6-6)		
650.0	gray fine to medium SAND, some coarse sand, trace fine to coarse gravel		5	SS		1.2 / 2	15.0' to 15.7': (SP) SAND, fine, trace fine subrounded gravel; light brown; non-cohesive, wet, loose to compact. 15.7' to 16.2: (SP) SAND, fine to medium, some coarse sand, trace fine to coarse subrounded gravel; gray; non-cohesive, wet, compact. SPTs (2-4-6-8)		
	light brown fine to medium SAND, trace coarse sand, trace fine to coarse gravel								
645.0			6	SS		2.0 / 2	20.0' to 22.0': (SP) SAND, fine, some medium, trace coarse sand, trace fine to coarse subrounded gravel; light brown; non-coheisve, wet, loose. SPTs (1-2-3-5)		Bentonite Chips 21-23 ft bgs
									#5 Sand Filter Pack 23-35 ft bgs

LITHOLOGY LEGEND

USCS Silty Sand (SM)
Shale
USCS Poorly-graded Sand with Silt (SP-SM)
USCS Poorly-graded Sand (SP)

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

Golder Associates

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 10/26/20

BOREHOLE LOG: GAMW-65B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 37
DEPTH TO BEDROCK: 36.3

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173229.48 E: 2968253.82
GROUND SURFACE ELEV.: 665.45
TOP OF CASING ELEV.: 668.67
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/17/2020 8:45:00 AM
END DATE/TIME: 4/17/2020 11:50:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	light brown fine to medium SAND, trace coarse sand, trace fine to coarse gravel		7	SS		1.4 / 2	25.0' to 26.4': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, compact. SPTs (2-8-12-22)		2" PVC Screen slot 0.010 25-35 ft bgs
635.0			8	SS		1.2 / 2	30.0' to 31.2': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, compact. SPTs (3-8-15-20)		
			9	SS		1.2 / 2	32.0' to 33.2': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, compact. SPTs (4-9-20-22)		
630.0			10	SS		1.4 / 2	35.0' to 36.3': (SP) SAND, fine to medium, trace coarse sand; light borwn; non-cohesive, wet, compact. 36.3' to 36.4: clayey SHALE, light gray, highly weathered; sampled as sandy gravel. SPTs (5-15-27-17)		
	highly weathered, light gray CLAYEY SHALE								
625.0									
620.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
Shale
USCS Poorly-graded Sand with Silt (SP-SM)
USCS Poorly-graded Sand (SP)

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

Golder Associates

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 10/26/20

BOREHOLE LOG: GAMW-66B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 45.3
DEPTH TO BEDROCK: 44.2

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173363.62 E: 2967853.2
GROUND SURFACE ELEV.: 669.20
TOP OF CASING ELEV.: 672.99
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/21/2020 7:45:00 AM
END DATE/TIME: 4/21/2020 12:00:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	brown to dark brown fine SAND, some silt, some organics		1	SS		1.0 / 2	0.0' to 0.8': (SP-SM) SAND, fine, some nonplastic fines, some organics (grass), trace fine gravel; brown to dark brown; non-cohesive, moist, very loose.		Bentonite Chips 0-2 ft bgs
	light brown to yellow brown fine SAND, trace coarse sand						0.8'-1': (SP) SAND, fine; light brown to yellow brown; non-cohesive, moist, very loose.		Cement-bentonite Grout 2-22.5 ft bgs
	brown to dark brown fine SAND, some silt		2	SS		0.9 / 2	SPTs (1-1-1-1)		
665.0							2.0' to 2.9': (SP) SAND, fine, trace coarse sand; light brown, dark brown at 2.9'; non-cohesive, moist, loose.		
	yellow brown to brown fine to medium SAND		3	SS		1.0 / 2	SPTs (4-2-2-4)		
							4.0' to 4.5': (SP-SM) SAND, fine, some non-plastic fines; brown to dark brown, lenses of black fine sand, non-cohesive, moist, loose.		
			4	SS		1.6 / 2	4.5' to 5.0': (SP) SAND, fine to medium; brown to yellow brown; non-cohesive, moist, compact.		
							SPTs (3-4-6-10)		
660.0			5	SS		1.0 / 2	6.0' to 6.8': (SP) SAND, fine to medium, trace organics; light gray to brown, pockets of gray/light gray; non-cohesive, moist, compact.		
			6	SS		1.0 / 2	6.8' to 7.6': (SP) SAND, fine to medium; light yellow brown, non-cohesive, moist, compact.		
							SPTs(3-6-8-13)		
			7	SS		1.1 / 2	8.0' to 9.0': (SP) SAND, fine to medium; yellow brown; non-cohesive, moist, compact.		
							SPTs (3-6-10-11)		
655.0			8	SS		1.5 / 2	10.0' to 11.0': (SP) SAND, fine to medium; yellow brown; non-cohesive, wet, compact.		
							SPTs (2-4-8-6)		
	light brown fine to medium SAND, trace coarse sand, trace fine gravel						12.0' to 13.1': (SP) SAND, fine to medium, trace coarse sand; yellow brown; non-cohesive, wet, very loose.		
			9	SS		1.6 / 2	SPTs (1-2-2-2)		
							14.0' to 15.5': (SP) SAND, fine to medium, trace coarse sand; yellow brown; non-cohesive, wet, loose.		
							SPTs (2-2-6-6)		
650.0			10	SS		1.6 / 2	16.0' to 17.6': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, compact.		
							SPTs (4-7-9-10)		
							18.0' to 19.6': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, loose.		
			11	SS		1.0 / 2	SPTs (3-2-4-6)		
							20.0' to 21.0': (SP) SAND, fine to medium; light brown; non-cohesive, wet, compact.		
							SPTs (2-6-6-8)		
			12	SS		2.0 / 2	22.0' to 24.0': (SP) SAND, fine to medium, trace coarse sand, trace fine gravel, trace organics; light brown, pocket of clay at 23.4'; non-cohesive, wet, compact.		Bentonite Chips 22.5-29 ft bgs
645.0			13	SS		1.1 / 2	SPTs (4-6-7-7)		

LITHOLOGY LEGEND

USCS Poorly-graded Sand with Silt (SP-SM) | USCS Poorly-graded Sand (SP) | Shale

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

Golder Associates

BOREHOLE LOG: GAMW-66B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 45.3
DEPTH TO BEDROCK: 44.2

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173363.62 E: 2967853.2
GROUND SURFACE ELEV.: 669.20
TOP OF CASING ELEV.: 672.99
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/21/2020 7:45:00 AM
END DATE/TIME: 4/21/2020 12:00:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	light brown fine to medium SAND, trace coarse sand, trace fine gravel		13	SS		1.1 / 2	24.0' to 25.1': (SP) SAND, fine to medium, trace coarse sand, trace fine gravel, trace organics, light brown; non-cohesive, wet, loose. SPTs (2-3-4-4)		
			14	SS		2.0 / 2	26.0' to 28.0': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, loose. SPTs (2-3-6-8)		
	light brown to gray-brown fine to medium SAND, trace coarse sand, trace fine to coarse gravel		15	SS		1.2 / 2	28.0' to 28.5': (SP) SAND, fine to medium, trace coarse sand, trace fine to coarse subrounded gravel; light brown; non-cohesive, wet, compact.		
640.0			16	SS		1.9 / 2	28.5' to 29.2': (SP) SAND, fine to medium, some coarse sand, trace fine subrounded gravel; light gray to brown; non-cohesive, wet, compact. SPTs (3-6-12-14)		#5 Sand Filter Pack 29-44 ft bgs
			17	SS		1.2 / 2	30.0' to 31.6': (SP) SAND, fine to medium, trace coarse sand, trace fine subrounded gravel; light brown; non-cohesive, wet compact.		
635.0			18	SS		1.9 / 2	31.6' to 31.9': (SP) SAND, fine to medium, some coarse sand, trace fine subrounded gravel; light gray to brown; non-cohesive, wet, compact. SPTs (3-7-7-7)		2" PVC Screen slot 0.010 34-44 ft bgs
			19	SS		0.3 / 2	32.0' to 33.2': (SP) SAND, fine to medium, trace coarse sand; light brown to gray brown; non-cohesive, wet, loose; coarser 32.1-32.4'. SPTs (3-3-6-9)		
			20	SS		1.5 / 2	34.0' to 35.9': (SP) SAND, fine to medium, trace coarse sand; light brown, gray brown from 35.8-36.0'; non-cohesive, wet, compact. SPTs (3-4-7-10)		
630.0			21	SS		1.2 / 2	36.0' to 36.3': (SP) SAND, fine to medium, trace coarse sand, trace coarse subrounded gravel; light brown to gray brown; non-cohesive, wet, loose. SPTs (4-4-5-7)		
			22	SS		0.9 / 2	38.0' to 39.5': (SP) SAND, fine to medium, trace coarse sand; light brown to gray brown; non-cohesive, wet, compact. SPTs (3-3-8-7)		
	light gray fine to coarse SAND								
625.0	highly weathered, light gray CLAYEY SHALE		23	SS		1.1 / 1.3	40.0' to 41.2': (SP) SAND, fine to medium, trace coarse sand; light brown to gray brown; non-cohesive, wet, compact. SPTs (3-7-8-10)		
							42.0' to 42.8': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, compact.		
							42.8' to 42.9': (SW) SAND, fine to coarse, gray shale cobble; light gray; non-cohesive, wet, compact. SPTs (7-7-8-13)		
620.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand with Silt (SP-SM) | USCS Poorly-graded Sand (SP) | Shale

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

Golder Associates

BOREHOLE LOG: GAMW-66B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 45.3
DEPTH TO BEDROCK: 44.2

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173363.62 E: 2967853.2
GROUND SURFACE ELEV.: 669.20
TOP OF CASING ELEV.: 672.99
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/21/2020 7:45:00 AM
END DATE/TIME: 4/21/2020 12:00:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
							44.0' to 44.2': (SW) SAND, fine to coarse; light gray; non-cohesive, wet, compact. 44.2' to 45.1': (CL) sandy CLAY; light gray, platey, medium to high dry strength; cohesive, w < PL, stiff to very stiff. SPTs (5-28-50/3")		
615.0									
610.0									
605.0									
600.0									
595.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand with Silt (SP-SM)

USCS Poorly-graded Sand (SP)

Shale

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

Golder Associates

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 10/26/20

BOREHOLE LOG: GAMW-67B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 43
DEPTH TO BEDROCK: 40.7

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174213.3 E: 2967604.35
GROUND SURFACE ELEV.: 664.65
TOP OF CASING ELEV.: 667.97
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/20/2020 12:05:00 PM
END DATE/TIME: 4/20/2020 4:05:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	brown to dark brown fine SILTY SAND		1	SS		0.8 / 2	0.0' to 0.2': (SM) SILTY SAND, fine, trace organics (grass); brown to dark brown; non-cohesive, moist, very loose.		Bentonite Chips 0-2 ft bgs
	light gray fine to coarse SAND, some fine to coarse gravel						0.2' to 0.7': (SP) SAND, fine to coarse, some fine to coarse subrounded gravel; light gray; non-cohesive, moist, loose.		Cement-bentonite Grout 2-19 ft bgs
	yellow brown fine SAND						0.7' to 0.8': (SP) SAND, fine, trace medium to coarse sand; yellow brown; non-cohesive, moist, loose. SPTs(2-10-7-7)		
	dark brown fine SAND		2	SS		0.9 / 2	5.0' to 5.9': (SP) SAND, fine; dark brown; non-cohesive, moist, loose. SPTs (4-3-5-5)		
660.0									
	light brown fine to medium SAND, trace coarse sand		3	SS		0.7 / 2	10.0' to 10.7': (SP) SAND, fine, some medium sand; light brown; non-cohesive, wet, very loose. SPTs (1-1-2-3)		
655.0			4	SS		1.4 / 2	12.0' to 13.4': (SP) SAND, fine to medium, trace coarse sand, trace fine subrounded gravel; light brown; non-cohesive, wet, loose.		
650.0			5	SS		0.9 / 2	15.0' to 15.9': (SP) SAND, fine to medium, trace coarse sand, light brown; non-cohesive, wet, compact. SPTs (2-5-7-6)		
645.0			6	SS		2.0 / 2	20.0' to 22.0': (SP) SAND, fine to medium, trace coarse sand, light brown; non-cohesive, wet, loose. SPTs (1-1-4-5)		Bentonite Chips 19-28 ft bgs
640.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
Shale
USCS Poorly-graded Sand (SP)
USCS Well-graded Sand (SW)

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

Golder Associates

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 10/26/20

BOREHOLE LOG: GAMW-67B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 43
DEPTH TO BEDROCK: 40.7

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174213.3 E: 2967604.35
GROUND SURFACE ELEV.: 664.65
TOP OF CASING ELEV.: 667.97
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/20/2020 12:05:00 PM
END DATE/TIME: 4/20/2020 4:05:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	light brown fine to medium SAND, trace coarse sand		7	SS		1.4 / 2	25.0' to 26.0': (SP) SAND, fine medium, trace coarse sand; light brown; non-cohesive, wet, compact.		
	light gray to brown fine to coarse SAND						26.0' to 26.4': (SW) SAND, fine to coarse, trace round fine to coarse gravel; light gray brown; non-cohesive, wet, compact; coarser 26.3-26.4'. SPTs (6-10-16-18)		
	light brown fine to medium SAND, trace fine gravel								#5 Sand Filter Pack 28-40.5 ft bgs
635.0			8	SS		2.0 / 2	30.0' to 32.0': (SP) SAND, fine to medium, trace coarse sand, trace round to subrounded fine gravel; light brown; non-cohesive, wet, compact. SPTs (6-8-8-10)		2" PVC Screen slot 0.010 30.5-40.5 ft bgs
	light gray to brown, medium to coarse SAND, some fine sand, trace fine gravel		9	SS		0.6 / 2	32.0' to 32.6': (SW) SAND, medium to coarse, some fine sand, trace fine subrounded gravel; light gray to brown; non-cohesive, wet, compact; coarser 32.3-32.6', light brown fine sand at 32.6'. SPTs (4-8-8-14)		
630.0	light brown fine to medium SAND, trace coarse sand, trace fine to coarse gravel, lenses of medium to coarse sand		10	SS		1.5 / 2	35.0' to 36.5': (SP) SAND, fine to medium, trace coarse sand, trace fine subrounded gravel; light brown; non-cohesive, wet, very dense. SPTs (15-20-33-42)		
			11	SS		2.0 / 2	37.0' to 39.0': (SP) SAND, fine to medium, trace coarse sand, trace fine to coarse round to subrounded gravel; light brown, lenses of medium to coarse sand; non-cohesive, wet, compact. SPTs (7-12-17-17)		
625.0			12	SS		1.4 / 2	39.0' to 40.0': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, compact.		
	highly weathered, light gray CLAYEY SHALE and light brown fine to coarse sand								
	highly weathered, light gray CLAYEY SHALE		13	SS		1.2 / 2	40.0' to 40.4': clayey SHALE, light gray, highly weathered, platey, fine to coarse sand and fine to coarse subrounded gravel; non-cohesive, wet, compact. SPTs (10-14-20-12)		
							41.0' to 42.2': (CL), SILTY CLAY, light gray; cohesive, w~PL, firm to stiff. SPTs (3-4-6-14)		
620.0									
615.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
Shale
USCS Poorly-graded Sand (SP)
USCS Well-graded Sand (SW)

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

Golder Associates

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BOREHOLE LOG: GAMW-68

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19121567
HOLE DEPTH: 18
DEPTH TO BEDROCK: N/A

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2168555.544 E: 2970328.36
GROUND SURFACE ELEV.: 665.95
TOP OF CASING ELEV.: 665.53
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD: N/A
DRILL RIG: Geoprobe 7822 DT
START DATE/TIME: 8/27/2020 3:25:00 PM
END DATE/TIME: 8/27/2020 6:00:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	brown fine SAND, some silt, trace organics light and dark brown fine SAND, trace organics		1	SS		1.8 / 2	0-0.5': (SP-SM) SAND, fine, some organics (roots), brown, non cohesive, dry, loose 0.5-1.5': (SP) SAND, fine, light dark, brown, non cohesive, moist, loose 1.5-1.8': (SP) SAND, fine, trace organics (roots), light and dark, brown, non cohesive, moist, loose SPTs (6-6-6-7)		Completed as flush mount Bentonite Chips 1-4 ft bgs
	orange and brown fine SAND light brown to brown fine to medium SAND		2	SS		1.4 / 2	2-2.5': (SP) SAND, fine, trace organics (roots), light and dark brown, non cohesive, moist, loose 2.5-2.8': (SP) SAND, fine, orange and brown, non cohesive, moist, loose 2.8-3.4': (SP) SAND, fine, light brown, non cohesive, moist, loose SPTs (3-3-4-3)		1/4" Coated Bentonite Pellets 4-6 ft bgs
660.0			3	SS		1.2 / 2			#5 Sand Filter Pack 6-17 ft bgs
			4	SS		1.2 / 2	4-5.2': (SP) SAND, fine to medium, light brown, non cohesive, moist, loose, wet at 4.4 ft-bgs SPTs (3-4-4-3)		2" PVC Screen slot 0.010 7-17 ft bgs
			5	SS		1 / 2	6-7.2': (SP) SAND, fine to medium, light brown to brown, non cohesive, wet, compact SPTs (4-6-12-16)		
655.0			6	SS		1.6 / 2	8-9': (SP) SAND, fine to medium, trace coarse, brown, non cohesive, wet, compact SPTs (2-5-8-11) 10-11': (SP) SAND, fine to medium, some coarse sand and fine round gravel from 11 to 11.3 ft bgs; brown, non cohesive, wet, compact		
			7	SS		2 / 2	11.3-11.6': (SP) SAND, fine to medium, trace coarse, brown, non cohesive, wet, compact SPTs (4-7-8-11)		
			8	SS		0.7 / 2	12-14': (SP) SAND, medium, some fine and coarse sand, brown, non cohesive, wet, compact SPTs (3-7-10-12) 14-14.6': (SP) SAND, medium, some fine and coarse sand, trace fine-coarse subrounded gravel, brown, non cohesive, wet, compact		
650.0			9	SS		2 / 2	14.6-14.7': (SP) SAND, fine, brown, non cohesive, wet, compact SPTs (2-3-7-12)		Native sand collapsed to 17 ft bgs
							16-17.5': (SP) SAND, fine, some medium, brown, non cohesive, wet, loose 17.5-18': (SP) SAND, fine, brown, non cohesive, wet, compact SPTs (2-5-8-14)		
645.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand with Silt (SP-SM)

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Strata Earth Services, LLC
DRILLER: Scott Komen
DRILL RIG: Geoprobe 7822 DT

LOGGED BY: KMC
CHECKED BY: KJ
DATE: 10/19/20

Golder Associates

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BOREHOLE LOG: GAMW-68B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19121567
HOLE DEPTH: 34.7
DEPTH TO BEDROCK: 34.7

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2168557.418 E: 2970325.081
GROUND SURFACE ELEV.: 665.97
TOP OF CASING ELEV.: 665.72
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD: N/A
DRILL RIG: Geoprobe 7822 DT
START DATE/TIME: 8/26/2020 11:20:00 AM
END DATE/TIME: 8/27/2020 3:15:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	brown fine SAND, some silt, trace organics light and dark brown fine SAND, trace organics		1	SS		1.8 / 2	0-0.5': (SP-SM) SAND, fine, some organics (roots), brown, non cohesive, dry, loose 0.5-1.5': (SP) SAND, fine, light dark, brown, non cohesive, moist, loose 1.5-1.8': (SP) SAND, fine, trace organics (roots), light and dark, brown, non cohesive, moist, loose SPTs (6-6-6-7)		Completed as flush mount Bentonite chips 1-6 ft bgs
	orange and brown fine SAND light brown to brown fine to medium SAND		2	SS		1.4 / 2	2-2.5': (SP) SAND, fine, trace organics (roots), light and dark brown, non cohesive, moist, loose 2.5-2.8': (SP) SAND, fine, orange and brown, non cohesive, moist, loose 2.8-3.4': (SP) SAND, fine, light brown, non cohesive, moist, loose SPTs (3-3-4-3)		
660.0			3	SS		1.2 / 2			Cement Grout 6-20 ft bgs
			4	SS		1.2 / 2	4-5.2': (SP) SAND, fine to medium, light brown, non cohesive, moist, loose, wet at 4.4 ft-bgs SPTs (3-4-4-3)		
			5	SS		1 / 2	6-7.2': (SP) SAND, fine to medium, light brown to brown, non cohesive, wet, compact SPTs (4-6-12-16)		
655.0			6	SS		1.6 / 2	8-9': (SP) SAND, fine to medium, trace coarse, brown, non cohesive, wet, compact SPTs (2-5-8-11) 10-11': (SP) SAND, fine to medium, some coarse sand and fine round gravel from 11 to 11.3 ft bgs; brown, non cohesive, wet, compact		
			7	SS		2 / 2	11.3-11.6': (SP) SAND, fine to medium, trace coarse, brown, non cohesive, wet, compact SPTs (4-7-8-11)		
			8	SS		0.7 / 2	12-14': (SP) SAND, medium, some fine and coarse sand, brown, non cohesive, wet, compact SPTs (3-7-10-12)		
650.0			9	SS		2 / 2	14-14.6': (SP) SAND, medium, some fine and coarse sand, trace fine-coarse subrounded gravel, brown, non cohesive, wet, compact 14.6-14.7': (SP) SAND, fine, brown, non cohesive, wet, compact SPTs (2-3-7-12)		
			10	SS		2 / 2	16-17.5': (SP) SAND, fine, some medium, brown, non cohesive, wet, loose 17.5-18': (SP) SAND, fine, brown, non cohesive, wet, compact SPTs (2-5-8-14)		
	brown SILT and fine SAND brown to gray-brown fine to medium SAND, some coarse sand, trace fine gravel						18-19.4': (SP) SAND, fine to medium, brown, non cohesive, wet, loose		1/4" Coated Bentonite Pellets 20-22 ft bgs
645.0			11	SS		1.8 / 2	19.4-19.7': (ML/SP) SILT and SAND, fine, brown, non cohesive, wet, loose 19.7-20': (SP) SAND, fine to medium, brown-gray, non cohesive, wet, loose SPTs (2-4-4-7)		
			12	SS		2 / 2	20-21': (SP) SAND, fine to medium, brown-gray, non cohesive, wet, loose 21-21.8': (SW) SAND, fine to coarse, trace fine sub rounded gravel, gray-brown, non cohesive, wet, loose SPTs (2-1-2-7)		#5 Sand Filter Pack 22-34.5 ft bgs
			13	SS		2 / 2			2" PVC Screen slot

LITHOLOGY LEGEND

USCS Poorly-graded Sand with Silt (SP-SM)
Shale
USCS Poorly-graded Sand (SP)
USCS Silt (ML)

DRILLING COMPANY: Strata Earth Services, LLC
DRILLER: Scott Komen
DRILL RIG: Geoprobe 7822 DT

LOGGED BY: KMC
CHECKED BY: KJ
DATE: 10/19/20

Golder Associates

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BOREHOLE LOG: GAMW-68B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19121567
HOLE DEPTH: 34.7
DEPTH TO BEDROCK: 34.7

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2168557.418 E: 2970325.081
GROUND SURFACE ELEV.: 665.97
TOP OF CASING ELEV.: 665.72
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD: N/A
DRILL RIG: Geoprobe 7822 DT
START DATE/TIME: 8/26/2020 11:20:00 AM
END DATE/TIME: 8/27/2020 3:15:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	brown to gray-brown fine to medium SAND, some coarse sand, trace fine gravel		13	SS		2 / 2	22-22.8': (SW) SAND, fine to coarse, trace fine sub rounded gravel, gray-brown, non cohesive, wet, loose		0.010 24.5-34.5 ft bgs
			14	SS		2 / 2	22.8-23.4': (SP) SAND, fine to medium, some coarse sand, trace fine rounded gravel, brown, non cohesive, wet, compact 23.4-24': (SP) SAND, fine to medium, trace coarse sand, trace fine rounded gravel, gray-brown, non cohesive, wet, compact SPTs (5-12-15-16)		
			15	SS		2 / 2	24-26': (SP) SAND, fine to medium, trace coarse sand, trace fine sub rounded gravel, gray-brown, non cohesive, wet, compact SPTs (4-9-16-16)		
635.0			16	SS		1.5 / 2	26-26.3': (SW) SAND, fine to coarse, gray-brown, non cohesive, wet, loose 26.3-28': (SP) SAND, fine to medium, some coarse sand, trace fine rounded gravel, non cohesive, wet, compact to dense SPTs (7-14-19-21)		
			17	SS		1.5 / 2	28-30': (SP) SAND, fine to medium, some coarse sand, trace fine rounded gravel, non cohesive, wet, compact to dense SPTs (9-14-22-19)		
	slightly weathered, weak, friable light gray SHALE		18	SS		0.7 / 0.7	30-31.5': (SW) SAND, fine to coarse, trace fine rounded gravel, gray-brown, non cohesive, wet, loose. Increasing grain size with depth SPTs (2-3-4-10)		
630.0							32-33.5': (SP) SAND, medium, some fine, some coarse sand, non cohesive, wet, compact SPTs (6-8-13-23)		
							34-34.5': (SP) SAND, medium, some fine, some coarse sand, non cohesive, wet, compact 34.5-34.7': Slightly weathered, weak, friable light gray shale		
625.0									
620.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand with Silt (SP-SM)
Shale
USCS Poorly-graded Sand (SP)
USCS Silt (ML)

DRILLING COMPANY: Strata Earth Services, LLC
DRILLER: Scott Komen
DRILL RIG: Geoprobe 7822 DT

LOGGED BY: KMC
CHECKED BY: KJ
DATE: 10/19/20

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APPENDIX E

Analytical Data 40 CFR Part §257.103(f)(2)(v)(C)(3)

Appendix E-1: Analytical Data- Waste Diposal Area
NIPSCO R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW01			GAMW01B			GAMW03		
Sample Date		2020-10-21	2021-04-14	2021-09-16	2020-10-21	2021-04-14	2021-09-16	2020-10-22	2021-04-14	2021-09-17
Sample Type		N	N	N	N	N	N	N	N	N
Chemical Name	Unit									
CCR Appendix III										
Boron	mg/L	0.71	0.78	0.24	0.34	0.35	0.29	0.18	0.22	0.13
Calcium	mg/L	89.6	95.2	76.7	104	103	112	78.3	90.3	70.2
Chloride	mg/L	11.3	10.1	5.9	19.9	20.8	18.6	6.6	4.3	4.2
Fluoride	mg/L	0.36	0.29	0.36 J-	0.12	0.076	0.094 J-	0.14	0.13	0.2
pH	SU	7.53	7.11	6.61	7.25	6.96	6.5	6.9	6.77	6.9
Sulfate	mg/L	100	157	42.3	74.2	85.2	69.3	70.3	97.5	40.2
Total Dissolved Solids	mg/L	387	574	294	423	450	443	317	390	298
CCR Appendix IV										
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.019	0.012	0.02	0.001 U	0.001 U	0.001 U	0.014	0.0094	0.019
Barium	mg/L	0.059	0.051	0.049	0.16	0.17	0.17	0.086	0.074	0.08
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.0013	0.0019	0.001	0.001 U	0.001	0.001 U	0.0012	0.0055	0.001 U
Fluoride	mg/L	0.36	0.29	0.36 J-	0.12	0.076	0.094 J-	0.14	0.13	0.2
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.0087	0.008 U	0.008 U
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.019	0.011	0.0076	0.001 U	0.001 U	0.001 U	0.01	0.011	0.0084
Radium, Total	pci/l		0.642 U			2.02			0.158 U	
Selenium	mg/L	0.001 U	0.01	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Sample Parameters										
DO	mg/L	0.39	0.6	0.49	0.43	0.51	0.51	0.54	1.47	0.27
ORP	millivolts	-35.4	-37.2	-240.2	-73.8	-88	-217.6	2.6	-33.4	-225.9
pH	SU	7.53	7.11	6.61	7.25	6.96	6.5	6.9	6.77	6.9
SC	uS/cm	656	721	524	747	752	705	576	605	479
TEMP	deg c	16.2	9.7	18.23	13.3	12.1	14.36	15.9	9.5	16.85
TURB	ntu	2.81	4.06	3.51	1.01	3.19	2.19	4.09	5.99	2.8

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter
detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.

Appendix E-1: Analytical Data- Waste Diposal Area
NIPSCO R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW03B			GAMW12			GAMW12B			
Sample Date		2020-10-22	2021-04-15	2021-09-17	2020-10-20	2021-04-15	2021-09-16	2020-10-20	2021-04-15		2021-09-16
Sample Type		N	N	N	N	N	N	N	FD	N	N
Chemical Name	Unit										
CCR Appendix III											
Boron	mg/L	0.25	0.25	0.27	0.1 U	0.1 U	0.1 U	0.36	0.29	0.31	0.32
Calcium	mg/L	92.7	96.4	102	84.8	87	80.7	108	103	104	107
Chloride	mg/L	17	20.1	23.1	6.3	2.3	3.2	23.1	20.5	20.8	20.6
Fluoride	mg/L	0.23	0.2	0.23	0.23	0.16	0.19 J-	0.098	0.079	0.082	0.079 J-
pH	SU	7.32	7.03	6.97	6.69	7.31	6.49	7.11		7.55	6.99
Sulfate	mg/L	66.8	58	78.6	49.7	9.2	24.2	79.9	63.8	66.5	57.5
Total Dissolved Solids	mg/L	372	400	439	313	336	325	432	435	430	451
CCR Appendix IV											
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.001 U	0.001 U	0.001 U	0.02	0.012	0.043	0.001 U	0.001 U	0.001 U	0.001 U
Barium	mg/L	0.1	0.11	0.12	0.11	0.095	0.094	0.13	0.13	0.13	0.14
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.001 U	0.001 U	0.002	0.0025	0.0028	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	0.23	0.2	0.23	0.23	0.16	0.19 J-	0.098	0.079	0.082	0.079 J-
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.0072	0.0051	0.0066	0.003	0.0028	0.0041	0.0017	0.0012	0.0012	0.0013
Radium, Total	pci/l		1.08 U			1.1 U			1.65	2.42	
Selenium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Sample Parameters											
DO	mg/L	0.39	0.95	0.28	0.54	0.2	0.28	0.36		0.13	0.46
ORP	millivolts	-11.2	-81.8	-255.4	-4.4	-90.7	-191.9	1		-107.1	-265.3
pH	SU	7.32	7.03	6.97	6.69	7.31	6.49	7.11		7.55	6.99
SC	uS/cm	670	695	634	586	583	625	734		709	704
TEMP	deg c	13.2	11.8	13.22	16.2	9.04	19.11	14		11.67	14.81
TURB	ntu	3.56	4.08	3.19	3.89	4.78	4.53	2.35		3.58	3.64

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter
detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.

Appendix E-1: Analytical Data- Waste Diposal Area
NIPSCO R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW13			GAMW13B			GAMW14			
Sample Date		2020-10-20	2021-04-19	2021-09-17	2020-10-20	2021-04-19	2021-09-17	2020-10-20		2021-04-19	2021-09-17
Sample Type		N	N	N	N	N	N	FD	N	N	N
Chemical Name	Unit										
CCR Appendix III											
Boron	mg/L	0.16	0.16	0.19	0.67	0.71	0.6	0.14	0.14	0.29	0.2
Calcium	mg/L	77.9	95.6	71.2	78.6	82.7	77.8	73.8	71.7	67.7	82.6
Chloride	mg/L	9.3	4.3	10.5	28.8	28.3	26	3.6	3.6	11.3	10.6
Fluoride	mg/L	0.31	0.27	0.31	0.26	0.31	0.25	0.21	0.21	0.26	0.26
pH	SU	6.57	6.95	6.67	7.47	7.73	7.32		6.36	7.03	6.61
Sulfate	mg/L	22	48.6	49.3	143	146	137	8.4	8.5	40.6	31.8
Total Dissolved Solids	mg/L	291	355	317	383	376	395	259	240	270	330
CCR Appendix IV											
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.01	0.027	0.0076	0.0011	0.0012	0.001	0.029	0.029	0.018	0.039
Barium	mg/L	0.1	0.11	0.08	0.083	0.081	0.077	0.053	0.053	0.061	0.081
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.0012	0.001 U	0.001 U	0.001 U	0.001 U	0.023	0.023	0.017	0.024
Fluoride	mg/L	0.31	0.27	0.31	0.26	0.31	0.25	0.21	0.21	0.26	0.26
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.0039	0.0096	0.004	0.017	0.016	0.016	0.0087	0.0088	0.0073	0.0077
Radium, Total	pci/l		1.06 U			0.82 U				0.883 U	
Selenium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Sample Parameters											
DO	mg/L	0.69	0.46	0.29	0.37	0.23	0.32		0.49	0.2	0.29
ORP	millivolts	-18.5	-16.8	-155.2	-31.1	-120.6	-259.6		61.1	-31.7	-234.5
pH	SU	6.57	6.95	6.67	7.47	7.73	7.32		6.36	7.03	6.61
SC	uS/cm	582	461	580	636	527	568		478.2	377	568
TEMP	deg c	16.6	9.5	18.84	14.1	11.97	14.15		15.5	10.2	16.83
TURB	ntu	3.73	3.79	2.17	4.1	3.92	0.5		3.3	4.19	0.85

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter
detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.

Appendix E-1: Analytical Data- Waste Diposal Area
NIPSCO R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW14B				GAMW42			GAMW42B		
Sample Date		2020-10-20	2021-04-19		2021-09-17	2020-10-15	2021-04-23	2021-09-14	2020-10-15	2021-04-23	2021-09-14
Sample Type		N	FD	N	N	N	N	N	N	N	N
Chemical Name	Unit										
CCR Appendix III											
Boron	mg/L	4.6	2.8	2.8	2.7	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Calcium	mg/L	171	146	143	112	42.6	47.1	59.9	53.2	57.9	62.6
Chloride	mg/L	138	112	108	85.2	2.8	4.2	11.4	5.6	8.6	10.3
Fluoride	mg/L	0.3	0.29	0.29	0.28	0.21	0.17 J-	0.19	0.15	0.15 J-	0.12
pH	SU	7.53		7.71	7.39	7.22	7.62	7	7.73	7.72	8
Sulfate	mg/L	1570	1330	1350	841	23.6	29.9	66.5	29.3	37.7	31.8
Total Dissolved Solids	mg/L	2630	1730	1740	1660	178	148	253	207	193	241
CCR Appendix IV											
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.0015	0.0012	0.0011	0.001 U	0.001 U	0.001 U
Barium	mg/L	0.11	0.08	0.08	0.059	0.019	0.018	0.023	0.016	0.016	0.021
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	0.3	0.29	0.29	0.28	0.21	0.17 J-	0.19	0.15	0.15 J-	0.12
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.0093	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.048	0.028	0.028	0.04	0.0021	0.0022	0.0033	0.0026	0.0029	0.0027
Radium, Total	pci/l		1.92	1.85			0 U			0.853 U	
Selenium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Sample Parameters											
DO	mg/L	0.36		0.29	0.42	0.37	0.59	0.17	0.34	0.49	0.15
ORP	millivolts	-13.2		-103.5	-193.7	-13.5	-80.9	-191	-58.7	-125.5	-261
pH	SU	7.53		7.71	7.39	7.22	7.62	7	7.73	7.72	8
SC	uS/cm	3573		2128	2053	280.5	326.1	413	352.2	407	414
TEMP	deg c	13.7		12.37	13.98	13.7	9.9	14.9	12.4	11.8	13.1
TURB	ntu	3.56		1.86	1.1	2.28	2.56	1.76	2.25	4.87	3.98

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter
detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.

Appendix E-1: Analytical Data- Waste Diposal Area
NIPSCO R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW42C			GAMW43			GAMW43B			
Sample Date		2020-10-15	2021-04-23	2021-09-15	2020-10-15	2021-04-23	2021-09-14	2020-10-16	2021-04-27		2021-09-14
Sample Type		N	N	N	N	N	N	N	FD	N	N
Chemical Name	Unit										
CCR Appendix III											
Boron	mg/L	0.74	0.69	0.62	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Calcium	mg/L	48	48.6	53.9	29.5	28	32.6	39.3	41.2	40.4	38.2
Chloride	mg/L	5.5	6.3	8.3	0.9	0.53	0.85	1.7	1.7	1.7	1.8
Fluoride	mg/L	0.2	0.2 J-	0.22	0.12	0.13 J-	0.11	0.15	0.19	0.19	0.15
pH	SU	7.29	7.59	7.36	7.08	7.22	7.22	8.03		8.04	7.64
Sulfate	mg/L	3.9	4.4	4.3	24.8	30	28.4	23.8	28.9 J+	27.9 J+	22.2
Total Dissolved Solids	mg/L	223	203	254	126	86	137	149	145	151	137
CCR Appendix IV											
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.001 U	0.001 U	0.001 U	0.003	0.0016	0.0028	0.001 U	0.001 U	0.001 U	0.001 U
Barium	mg/L	0.01	0.0092	0.0089	0.019	0.019	0.026	0.011	0.012	0.011	0.011
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.001 U	0.001 U	0.0043	0.0024	0.0022	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	0.2	0.2 J-	0.22	0.12	0.13 J-	0.11	0.15	0.19	0.19	0.15
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.028	0.032	0.024	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.0031	0.0026	0.0021	0.0019	0.0018	0.002	0.0022	0.0023	0.0021	0.0024
Radium, Total	pci/l		0.802 U			0.568 U			0.985 U	0.731 U	
Selenium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Sample Parameters											
DO	mg/L	0.29	0.43	0.12	0.36	0.7	0.64	0.38		0.51	0.27
ORP	millivolts	-25.6	-123.3	-231	65.1	35.1	-329	-60.8		-108.7	-323.9
pH	SU	7.29	7.59	7.36	7.08	7.22	7.22	8.03		8.04	7.64
SC	uS/cm	409	455.1	475	245.5	209	226	244.6		282	191
TEMP	deg c	11.9	11.8	12.7	14.8	9.7	17.01	12.4		11.4	12.88
TURB	ntu	8.56	7.69	5.86	3.69	4.3	2.99	2.13		2.38	1.37

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter
detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.

Appendix E-1: Analytical Data- Waste Diposal Area
NIPSCO R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW44			GAMW44B				GAMW51			
Sample Date		2020-10-16	2021-04-27	2021-09-15	2020-10-16		2021-04-27	2021-09-15	2020-10-27	2021-04-21	2021-09-29	
Sample Type		N	N	N	FD	N	N	N	N	N	FD	N
Chemical Name	Unit											
CCR Appendix III												
Boron	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.92	0.43	0.51	0.5
Calcium	mg/L	28.1	21.5	20.2	33.8	34.4	31.2	31.7	180	144	148	147
Chloride	mg/L	1.9	2.3	1.7	3.5	3.6	1.6	1.5	7.1	1.5	2.3	2.3
Fluoride	mg/L	0.054	0.19	0.13	0.12	0.11	0.14	0.18	0.42	0.26	0.34	0.34
pH	SU	5.87	6.21	6.21		8.24	8.22	7.81	7.1	7.19		7.04
Sulfate	mg/L	44.6	63.9 J+	44.8	9.8	10.4	12.3 J+	7.5	323	196	191	193
Total Dissolved Solids	mg/L	153	165	136	118	126	85	113	755	604	597	600
CCR Appendix IV												
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.026	0.095	0.052	0.001 U	0.001 U	0.001 U	0.001 U	0.0021	0.0016	0.0016	0.0016
Barium	mg/L	0.025	0.018	0.02	0.0092	0.0092	0.0084	0.0082	0.1	0.1	0.11	0.11
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.0034	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.0033	0.0026	0.0029	0.001 U	0.001 U	0.001 U	0.001 U	0.0022	0.0033	0.0031	0.0031
Fluoride	mg/L	0.054	0.19	0.13	0.12	0.11	0.14	0.18	0.42	0.26	0.34	0.34
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.010	0.008 U	0.012	0.012
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.0029	0.0044	0.004	0.0017	0.0017	0.0022	0.002	0.031	0.011	0.0092	0.0098
Radium, Total	pci/l		0.365 U				1.03 U			1.23 U		
Selenium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Sample Parameters												
DO	mg/L	0.9	1.07	0.83		0.37	0.5	0.36	0.83	0.48		0.27
ORP	millivolts	109.9	-8.1	-294.6		-67.9	-125.8	-318	-86	-100.6		0.197
pH	SU	5.87	6.21	6.21		8.24	8.22	7.81	7.1	7.19		7.04
SC	uS/cm	267.1	257.8	192		212.3	210.9	158	910	873		937
TEMP	deg c	14.2	11.2	16.11		11.7	11.5	12.16	14.2	11.1		15.9
TURB	ntu	3.22	4.66	2.04		1.3	2.15	1.19	3.48	4.2		4.12

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter
detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.

Appendix E-1: Analytical Data- Waste Diposal Area
NIPSCO R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW51B			GAMW57			GAMW57B		
Sample Date		2020-10-27	2021-04-21	2021-09-29	2020-10-16	2021-04-23	2021-09-15	2020-10-16	2021-04-23	2021-09-15
Sample Type		N	N	N	N	N	N	N	N	N
Chemical Name	Unit									
CCR Appendix III										
Boron	mg/L	7.5	7.2	7	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.13
Calcium	mg/L	256	261	282	23.4	13.9	21.8	44.9	43.1	47.5
Chloride	mg/L	62.2	54.8	53.2	1.2	1.6	1	10.7	11.2	12.4
Fluoride	mg/L	0.92	0.45	0.82	0.05 U	0.05 UJ	0.073	0.11	0.13 J-	0.17
pH	SU	8.07	8.11	7.83	8.88	6.22	8.03	7.9	7.95	7.33
Sulfate	mg/L	1610	1490	1480	28.4	38	25.8	24	19.1	24.4
Total Dissolved Solids	mg/L	2360	2180 J	2270	104	58	101	179	150	205
CCR Appendix IV										
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.0034	0.004	0.0044	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Barium	mg/L	0.068	0.072	0.077	0.0059	0.014	0.0055	0.021	0.02	0.022
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.0014	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	0.92	0.45	0.82	0.05 U	0.05 UJ	0.073	0.11	0.13 J-	0.17
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.063	0.071	0.078	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
Mercury	mg/L	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.17	0.16	0.15	0.0051	0.0011	0.003	0.0049	0.0028	0.0067
Radium, Total	pci/l		3.57			0.194 U			0.368 U	
Selenium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Sample Parameters										
DO	mg/L	2.12	0.55	0.29	5.35	4.93	6.33	0.35	0.22	0.37
ORP	millivolts	-152.7	-108.7	0.246	147	111.6	-297.7	-51.1	-132.7	-316.7
pH	SU	8.07	8.11	7.83	8.88	6.22	8.03	7.9	7.95	7.33
SC	uS/cm	2352	3094	303.9	177	124	136	317.8	291	284
TEMP	deg c	12.9	12.4	14.2	12.2	10.25	12.45	11.4	11.2	11.54
TURB	ntu	1.65	1.82	1.43	3.9	2.7	2.63	2.58	3.04	1.65

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter
detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.

Appendix E-1: Analytical Data- Waste Diposal Area
NIPSCO R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW58			GAMW58B				GAMW59		
Sample Date		2020-10-19	2021-04-23	2021-09-15	2020-10-19	2021-04-23	2021-09-15		2020-10-28	2021-04-21	2021-09-29
Sample Type		N	N	N	N	N	FD	N	N	N	N
Chemical Name	Unit										
CCR Appendix III											
Boron	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1.7	0.89	1
Calcium	mg/L	10.8	7.3	10.9	39.5	37.8	29.2	38.6	239	209	217
Chloride	mg/L	1.1	0.95	1.1	4.3	3.6	2.1	4	5 J-	11.3	21.1
Fluoride	mg/L	0.38	0.22 J-	0.35	0.14	0.15 J-	0.12	0.19	0.59	0.42	0.7
pH	SU	5.37	4.4	5.87	8.12	7.92		7.32	7.49	7.53	7.26
Sulfate	mg/L	39.6	45	38.9	26.7	24.9	32.1	23.6	692	473	434
Total Dissolved Solids	mg/L	67	44 J	82	148	124	135	161	2310	756	866
CCR Appendix IV											
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0017	0.0012	0.002
Barium	mg/L	0.039	0.059	0.041	0.016	0.015	0.0044	0.015	0.076	0.048	0.055
Beryllium	mg/L	0.00076	0.0012	0.00075	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.00025	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.0083	0.01	0.0093	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	0.38	0.22 J-	0.35	0.14	0.15 J-	0.12	0.19	0.59	0.42	0.7
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.015	0.012	0.018
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.001 U	0.001 U	0.001 U	0.0034	0.0034	0.001 U	0.0041	0.048	0.03	0.045
Radium, Total	pci/l		1.95			0.703 U				1.17 U	
Selenium	mg/L	0.001 U	0.001 U	0.0025	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Sample Parameters											
DO	mg/L	1.52	4.1	0.98	0.39	0.3		0.73	0.43	0.21	0.28
ORP	millivolts	207.7	291.1	-314	-69.1	-140.4		-298.9	-36.1	-105.5	0.202
pH	SU	5.37	4.4	5.87	8.12	7.92		7.32	7.49	7.53	7.26
SC	uS/cm	121.9	110	102	280.7	252		218	1595	1038	125.5
TEMP	deg c	12.7	9.27	13.67	11	10.84		11.37	16.9	11.28	22.2
TURB	ntu	1.45	0.84	1.27	3.67	2.96		2.66	3.57	4.8	4.52

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter
detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.

Appendix E-1: Analytical Data- Waste Diposal Area
NIPSCO R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW59B			GAMW60				GAMW60B		
Sample Date		2020-10-28	2021-04-22	2021-09-29	2020-10-28		2021-04-21	2021-09-24	2020-10-28	2021-04-21	2021-09-24
Sample Type		N	N	N	FD	N	N	N	N	N	N
Chemical Name	Unit										
CCR Appendix III											
Boron	mg/L	6.4	5.4	6.3	1.1	1.1	1	0.97	7.3	6.5	7.3
Calcium	mg/L	208	292	253	285	293	343	379	304	351	309
Chloride	mg/L	46.7 J-	52	51.3	18 J-	18.1 J-	17.2	16.5	17.4 J-	14.3	69.6
Fluoride	mg/L	0.56	0.45	0.53	0.57	0.57	0.3	0.51	0.53	0.34	1.1
pH	SU	8.15	7.6	7.57		7.02	7.05	7.01	8.66	7.74	7.76
Sulfate	mg/L	1130	1180	1180	654	656	748	1050	1160	1140	443
Total Dissolved Solids	mg/L	1790	1860	1950	1120	1130	1300	1540	1700	2710	1440
CCR Appendix IV											
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Barium	mg/L	0.039	0.037	0.04	0.028	0.028	0.027	0.031	0.071	0.077	0.063
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.001 U	0.001 U	0.0012	0.0011	0.0013	0.002	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	0.56	0.45	0.53	0.57	0.57	0.3	0.51	0.53	0.34	1.1
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.014	0.017	0.019	0.008 U	0.008 U	0.012	0.015	0.0086	0.034	0.045
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.052	0.044	0.05	0.024	0.024	0.013	0.015	0.49	0.35	0.37
Radium, Total	pci/l		1.76				1.29 U			3.02	
Selenium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0017	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Sample Parameters											
DO	mg/L	0.32	0.49	0.29		0.51	1.34	0.29	0.34	0.56	0.25
ORP	millivolts	-64.1	-119.4	0.231		217.1	84.3	0.56	-63.5	-101.3	0.238
pH	SU	8.15	7.6	7.57		7.02	7.05	7.01	8.66	7.74	7.76
SC	uS/cm	2638	2650	264.7		1580	1747	187.2	2216	2181	209.8
TEMP	deg c	14.2	13.1	17.4		16.7	11.5	20.7	13.7	12.2	14.9
TURB	ntu	2.7	1.46	1.58		0.94	0.9	1.56	3.43	1.04	2.05

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter
detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.

Appendix E-1: Analytical Data- Waste Diposal Area
NIPSCO R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW68			GAMW68B		
Sample Date		2020-10-29	2021-04-22	2021-09-17	2020-10-29	2021-04-22	2021-09-17
Sample Type		N	N	N	N	N	N
Chemical Name	Unit						
CCR Appendix III							
Boron	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Calcium	mg/L	62.7	60.7	66.4	44.4	43.5	44.7
Chloride	mg/L	24.7	22.8	20.4	20.3	19.5	18.4
Fluoride	mg/L	0.2	0.16	0.28	0.15	0.1	0.2
pH	SU	8.32	7.82	7.75	8.09	8.35	7.99
Sulfate	mg/L	77.1	68.6	81.3	80.7	62.5	63.5
Total Dissolved Solids	mg/L	301	320	315	256	2040	242
CCR Appendix IV							
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Barium	mg/L	0.078	0.085	0.1	0.11	0.11	0.1
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	0.2	0.16	0.28	0.15	0.1	0.2
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.008 U	0.008 U	0.0081	0.008 U	0.008 U	0.008 U
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.0034	0.0035	0.0045	0.0022	0.0022	0.0027
Radium, Total	pci/l		0.285 U			1.35 U	
Selenium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Sample Parameters							
DO	mg/L	0.5	0.51	0.28	1.41	0.5	0.21
ORP	millivolts	157.2	-39.2	0.187	-163	-154.3	0.216
pH	SU	8.32	7.82	7.75	8.09	8.35	7.99
SC	uS/cm	532	490	515	336	410.1	413
TEMP	deg c	14.5	9.7	16	12.5	11.6	13.5
TURB	ntu	1.05	2.02	3.99	1.65	3.57	3.56

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter
detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.

Appendix E-2: Analytical Results - MSRB, MCWB, and Drying Area
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	Unit	GAMW04				GAMW07				GAMW07B		
		2020-10-22	2021-04-15	2021-09-23	2021-09-23	2020-10-27	2021-04-16	2021-09-21	2021-09-21	2020-10-27	2021-04-16	2021-09-23
		N	N	FD	N	N	N	FD	N	N	N	N
Appendix III Parameters												
Boron	mg/L	0.4	1.1	0.36	0.35	1.1	0.81	0.91	0.85	5.3	5.9	6.9
Calcium	mg/L	90.3	178	108	107	213	198	215	212	282	327	373
Chloride	mg/L	4.9	6.2	3.7	3.6	12.3	11.7	11.9	12	21	38	60.3
Fluoride	mg/L	0.59	0.2	0.35	0.35	0.88	0.66	0.85	0.85	1.2	0.79	0.95
pH	SU	7.79	7.26		7.4	6.98	7.14		7.14	8.26	7.94	7.58
Sulfate	mg/L	82.1	375	116	121	439	352	362	359	1040	1010	1060
Total Dissolved Solids	mg/L	299	726	381	380	911	846	887	894	1590	1700	1790
Appendix IV Parameters												
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.0055	0.0019	0.0041	0.0036	0.001 U	0.001 U	0.0012	0.0013	0.0021	0.0022	0.0022
Barium	mg/L	0.054	0.079	0.057	0.056	0.057	0.046	0.053	0.052	0.036	0.041	0.037
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.0016	0.001 U	0.001 U	0.0074	0.0056	0.0061	0.006	0.001 U	0.0011	0.001 U
Fluoride	mg/L	0.59	0.2	0.35	0.35	0.88	0.66	0.85	0.85	1.2	0.79	0.95
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.0091	0.0088	0.008 U	0.008 U	0.013
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.01	0.066	0.015	0.016	0.0094	0.0078	0.01	0.01	0.036	0.029	0.023
Radium 226 + 228	pCi/L		0.659 U				1.29 U				2.16	
Selenium	mg/L	0.001 U	0.0033	0.001 U	0.001 U	0.0013	0.0069	0.0044	0.0039	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters												
Dissolved Oxygen	mg/L	0.37	1.71		0.31	0.47	0.39		0.25	0.32	0.23	0.26
Oxidation Reduction Potential	millivolts	-7	-29		0.149	259.4	55.5		0.1	-73.9	-124.1	0.224
pH	SU	7.79	7.26		7.4	6.98	7.14		7.14	8.26	7.94	7.58
Specific Conductivity	uS/cm	521	950		595	1250	1064		123	2055	1970	222.4
Temperature	deg C	16.2	9.24		15.9	15.5	11.06		17	13.3	12.2	14.7
Turbidity	NTU	1.9	4.67		7.06	1.51	3.4		2.65	8.02	2.6	4.84

Notes:
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Appendix E-2: Analytical Results - MSRB, MCWB, and Drying Area
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	Unit	GAMW08			GAMW08B			GAMW09			GAMW09B			
		2020-10-26	2021-04-22	2021-09-24	2020-10-23	2021-04-22	2021-09-24	2020-10-23	2021-04-20	2021-09-23	2020-10-23	2021-04-20		2021-09-23
		N	N	N	N	N	N	N	N	N	N	FD	N	N
Appendix III Parameters														
Boron	mg/L	0.52	0.89	1.1	7	7.7	8.4	3.7	3.5	3.8	6.3	6.1	6.2	6.7
Calcium	mg/L	168	266	260	203	198	235	192	168	227	162	169	171	163
Chloride	mg/L	26.4	50	14.9	134	178	179	59.8	41.6	54.7	107	102	94	113
Fluoride	mg/L	0.71	0.97	0.44	0.93	0.9	0.73	0.31	0.26	0.34	1.4	1.4	1.4	1.3
pH	SU	6.87	7.04	7.04	7.95	7.49	7.44	7.92	8.48 O	7.51	8		10.49 O	7.56
Sulfate	mg/L	229	477	841	769	751	1060	397	418	509	540	582 J	1040 J	773
Total Dissolved Solids	mg/L	636	1120	2380	1250	1620	2040	796	659	1040	1010	1030	982	1430
Appendix IV Parameters														
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.001 U	0.001 U	0.0013	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0034	0.0033	0.0034	0.0031
Barium	mg/L	0.056	0.07	0.076	0.031	0.039	0.046	0.046	0.037	0.053	0.039	0.036	0.035	0.059
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.00022	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.037	0.017	0.015	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	0.71	0.97	0.44	0.93	0.9	0.73	0.31	0.26	0.34	1.4	1.4	1.4	1.3
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.008 U	0.012	0.015	0.008 U	0.012	0.014	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.0095
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.013	0.034	0.043	0.0096	0.011	0.011	0.051	0.04	0.058	0.011	0.012	0.012	0.015
Radium 226 + 228	pCi/L		1.57			2.53			0.649 U			0.924 U	1.67 U	
Selenium	mg/L	0.0011	0.01	0.005	0.001 U	0.001 U	0.001 U	0.0082	0.0053	0.0079	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters														
Dissolved Oxygen	mg/L	0.44	1	0.35	0.33	0.29	0.27	3.43	3.42	6.2	0.34		0.2	0.31
Oxidation Reduction Potential	millivolts	300	22	19.3	-51.2	-120.1	0.218	337.2	-20.6	0.2	-29.9		-113.1	0.204
pH	SU	6.87	7.04	7.04	7.95	7.49	7.44	7.92	8.48	7.51	8		10.49	7.56
Specific Conductivity	uS/cm	1040	1432	167.2	1917	2151	286.3	1218	970	138.4	1513		1459	201.2
Temperature	deg C	16.3	11.2	18.8	14	13	15.2	17.8	10.6	18.7	15.4		13.4	16.4
Turbidity	NTU	2.39	1.99	1.48	3.85	2.78	3.9	4	1.02	2.95	2.76		4.26	3.02

Notes:
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
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"J+" = Indicates the result is estimated and may be biased high.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Appendix E-2: Analytical Results - MSRB, MCWB, and Drying Area
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	Unit	GAMW15			GAMW15B				GAMW16R				GAMW16BR	
		2020-10-27	2021-04-16	2021-09-22	2020-10-27	2021-04-16		2021-09-22	2020-10-29		2021-04-22	2021-09-21	2020-10-26	2021-04-22
		N	N	N	N	FD	N	N	FD	N	N	N	N	N
Appendix III Parameters														
Boron	mg/L	0.47 O	8 O	3.5	42.5 O	32.7 O	32.5 O	28.1	9.6 O	9.7 O	3.6 O	4.1	41 O	24.8 O
Calcium	mg/L	122 O	160 O	136	446 O	335 O	321 O	352	312 O	313 O	410 O	275	439 O	380 O
Chloride	mg/L	95.7 O	99.3 O	49.8	613 O	372 O	396 O	269	155 O	155 O	81.1 O	112	566 O	331 O
Fluoride	mg/L	0.85 O	0.76 O	0.77 J-	0.41 O	0.37 O	0.35 O	0.44 J-	0.5 O	0.5 O	0.39 O	0.57	0.68 O	0.41 O
pH	SU	7.02 O	7.1 O	7.12	6.6 O		7.15 O	7.08		7.21 O	7.16 O	7.1	7.2 O	7.21 O
Sulfate	mg/L	153 O	371 O	265	468 O	596 O	643 O	900	720 O	698 O	1060 O	633	570 O	723 O
Total Dissolved Solids	mg/L	556 O	770 O	675	2170 O	1740 O	1870 O	2030	1600 O	1540 O	1850 O	1370	2170 O	2080 O
Appendix IV Parameters														
Antimony	mg/L	0.001 UO	0.001 UO	0.001 U	0.001 UO	0.001 UO	0.001 UO	0.001 U	0.001 UO	0.001 UO	0.001 UO	0.001 U	0.001 UO	0.001 UO
Arsenic	mg/L	0.078 O	0.046 O	0.09	0.001 UO	0.001 UO	0.001 UO	0.001 U	0.0059 O	0.0058 O	0.0042 O	0.0088	0.001 UO	0.001 UO
Barium	mg/L	0.053 O	0.058 O	0.05	0.21 O	0.18 O	0.18 O	0.17	0.097 O	0.097 O	0.074 O	0.06	0.091 O	0.073 O
Beryllium	mg/L	0.0002 UO	0.0002 UO	0.0002 U	0.0002 UO	0.0002 UO	0.0002 UO	0.0002 U	0.0002 UO	0.0002 UO	0.0002 UO	0.0002 U	0.0002 UO	0.0002 UO
Cadmium	mg/L	0.0002 UO	0.0002 UO	0.0002 U	0.0002 UO	0.0002 UO	0.0002 UO	0.0002 U	0.0002 UO	0.0002 UO	0.0002 UO	0.0002 U	0.0002 UO	0.0002 UO
Chromium	mg/L	0.002 UO	0.002 UO	0.002 U	0.002 UO	0.002 UO	0.002 UO	0.002 U	0.002 UO	0.002 UO	0.002 UO	0.002 U	0.002 UO	0.002 UO
Cobalt	mg/L	0.0019 O	0.003 O	0.0021	0.001 UO	0.0011 O	0.001 O	0.001 U	0.0039 O	0.004 O	0.0064 O	0.0038	0.001 UO	0.001 UO
Fluoride	mg/L	0.85 O	0.76 O	0.77 J-	0.41 O	0.37 O	0.35 O	0.44 J-	0.5 O	0.5 O	0.39 O	0.57	0.68 O	0.41 O
Lead	mg/L	0.001 UO	0.001 UO	0.001 U	0.001 UO	0.001 UO	0.001 UO	0.001 U	0.001 UO	0.001 UO	0.001 UO	0.001 U	0.001 UO	0.001 UO
Lithium	mg/L	0.008 UO	0.008 UO	0.01	0.015 O	0.011 O	0.012 O	0.026	0.008 UO	0.008 UO	0.008 UO	0.011	0.013 O	0.033 O
Mercury	mg/L	0.0002 UO	0.0002 UO	0.0002 U	0.0002 UO	0.0002 UO	0.0002 UO	0.0002 U	0.0002 UO	0.0002 UO	0.0002 UO	0.0002 U	0.0002 UO	0.0002 UO
Molybdenum	mg/L	0.031 O	0.028 O	0.027	0.001 UO	0.0012 O	0.0012 O	0.0029	0.019 O	0.019 O	0.027 O	0.019	0.001 UO	0.001 UO
Radium 226 + 228	pCi/L		0.191 UO			2.96 O	2.15 O				0.968 UO			2.06 O
Selenium	mg/L	0.001 UO	0.0036 O	0.001 U	0.001 UO	0.001 UO	0.001 UO	0.001 U	0.042 O	0.043 O	0.001 UO	0.001 U	0.001 UO	0.001 UO
Thallium	mg/L	0.001 UO	0.001 UO	0.001 U	0.001 UO	0.001 UO	0.001 UO	0.001 U	0.001 UO	0.001 UO	0.001 UO	0.001 U	0.001 UO	0.001 UO
Field Parameters														
Dissolved Oxygen	mg/L	0.3	0.2	0.28	0.36		0.26	0.32		0.48	0.27	0.29	0.47	0.28
Oxidation Reduction Potential	millivolts	-45.8	-64.1	0.193	-7.2		-65.7	0.164		39.1	-78.9	0.208	-21.2	-95.1
pH	SU	7.02	7.1	7.12	6.6		7.15	7.08		7.21	7.16	7.1	7.2	7.21
Specific Conductivity	uS/cm	941	1153	104.8	3077		2491	286.6		2098	2025	185	3281	2510
Temperature	deg C	22.3	14.38	19.2	19.8		17.6	17		20.4	15.08	25	17.5	16.38
Turbidity	NTU	4.15	9.82	6.36	2.06		1.1	1.7		2.69	4.65	1.79	8.93	7.82

Notes:
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
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"O" = Indicates te result was identified as an outlier and removed from the data set.

Appendix E-2: Analytical Results - MSRB, MCWB, and Drying Area
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	Unit	
		2021-09-21
		N
Appendix III Parameters		
Boron	mg/L	25.3
Calcium	mg/L	265
Chloride	mg/L	516
Fluoride	mg/L	2.6
pH	SU	7.5
Sulfate	mg/L	2970
Total Dissolved Solids	mg/L	5970
Appendix IV Parameters		
Antimony	mg/L	0.001 U
Arsenic	mg/L	0.0042
Barium	mg/L	0.041
Beryllium	mg/L	0.0002 U
Cadmium	mg/L	0.0002 U
Chromium	mg/L	0.0023
Cobalt	mg/L	0.001 U
Fluoride	mg/L	2.6
Lead	mg/L	0.001 U
Lithium	mg/L	0.031
Mercury	mg/L	0.0002 U
Molybdenum	mg/L	0.043
Radium 226 + 228	pCi/L	
Selenium	mg/L	0.0013
Thallium	mg/L	0.001 U
Field Parameters		
Dissolved Oxygen	mg/L	0.31
Oxidation Reduction Potential	millivolts	0.212
pH	SU	7.5
Specific Conductivity	uS/cm	795.5
Temperature	deg C	19.5
Turbidity	NTU	20.19

Notes:
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Appendix E-2: Analytical Results - MSRB, MCWB, and Drying Area
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	Unit	GAMW17			GAMW17B			GAMW18			GAMW18B			
		2020-10-26	2021-04-14	2021-09-22	2020-10-26	2021-04-14	2021-09-22	2020-10-23	2021-04-20	2021-09-16	2020-10-23	2021-04-21	2021-09-17	
		N	N	N	N	N	N	N	N	N	N	N	FD	N
Appendix III Parameters														
Boron	mg/L	4.6	4.3	12.5	7.8	10.2	7.3	3.6	3.1	5.9	9	8.4	8.2	8.2
Calcium	mg/L	144	139	346	152	164	155	341	436	456	301	317	325	323
Chloride	mg/L	79.4	79	175	118	135	105	54.8	40.3	97	114	112	85.8	86.3
Fluoride	mg/L	1.5	1.2	1.3 J-	0.53	0.3	0.49 J-	0.19	0.16	0.16 J-	0.8	0.35	0.6	0.6
pH	SU	7.38	7.3	7.16	8.21	7.84	7.6	7.1	10.36 O	7.1	7.43	7.51		7.34
Sulfate	mg/L	396	358	964	404	549	365	765	1310	1160	1240	1260	1100	1120
Total Dissolved Solids	mg/L	726	806	1890	866	1250	928	1450	1440	2020	1830	3340	1930	2010
Appendix IV Parameters														
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.0027	0.0024	0.0027	0.0022	0.0012	0.0021	0.001 U	0.001 U	0.001 U	0.0025	0.0025	0.0028	0.0027
Barium	mg/L	0.071	0.059	0.17	0.061	0.094	0.053	0.053	0.044	0.057	0.032	0.041	0.028	0.029
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.0012	0.001 U	0.001 U	0.0015	0.001 U	0.001 U	0.001 U	0.0011	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	1.5	1.2	1.3 J-	0.53	0.3	0.49 J-	0.19	0.16	0.16 J-	0.8	0.35	0.6	0.6
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.008 U	0.008 U	0.021	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.011	0.03	0.037	0.031	0.028
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.013	0.012	0.01	0.0082	0.0058	0.012	0.079	0.082	0.14	0.05	0.074	0.03	0.031
Radium 226 + 228	pCi/L		1.05 U			1.47 U			0.538 U			2.14		
Selenium	mg/L	0.0047	0.01	0.0036	0.001 U	0.001 U	0.001 U	0.034	0.042	0.028	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters														
Dissolved Oxygen	mg/L	1.21	2.52	3.75	0.4	0.21	0.29	6.58	6.82	5.39	0.35	0.25		0.19
Oxidation Reduction Potential	millivolts	234.5	29.8	10.2	-55.5	-117.5	0.215	320.6	-64.3	56.8	15.9	-104.5		0.192
pH	SU	7.38	7.3	7.16	8.21	7.84	7.6	7.1	10.36	7.1	7.43	7.51		7.34
Specific Conductivity	uS/cm	1188	1152	236.5	1396	1778	138.8	1921	1699	245.9	2646	2494		247.3
Temperature	deg C	20.4	11.95	21.8	16.9	15.19	16.7	17.4	10.29	21.4	15.2	12.15		15.8
Turbidity	NTU	3.85	1.25	1.47	4	1.44	4.22	2.84	2.84	3.74	3.28	4.19		4.59

Notes:
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

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"O" = Indicates te result was identified as an outlier and removed from the data set.

Appendix E-2: Analytical Results - MSRB, MCWB, and Drying Area
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	Unit	GAMW46			GAMW46B			GAMW52			GAMW52B		
		2020-10-19	2021-04-27	2021-09-15	2020-10-19	2021-04-27	2021-09-15	2020-10-22	2021-04-16	2021-09-30	2020-10-23	2021-04-16	2021-09-30
		N	N	N	N	N	N	N	N	N	N	N	N
Appendix III Parameters													
Boron	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1	0.1	0.1	1.7	1.2	0.64
Calcium	mg/L	22.7	29.1	29.3	51	54.3	51	71.4	59.9	62.5	142	94.9	120
Chloride	mg/L	1.3	2.1	2.1	4.6	5.5	5.4	49.1	18.7	15.9	248	131	135
Fluoride	mg/L	0.05 U	0.078	0.11	0.058	0.077	0.12	0.26	0.22	0.31	0.26	0.24	0.38
pH	SU	8.67	8.36	8.16	7.97	7.69	7.73	7.82	7.5	7.6	7.29	7.46	7.57
Sulfate	mg/L	23.9	33 J+	31.8	60.5	61.6 J+	55.3	58.6	55.8	50.1	259	181	156
Total Dissolved Solids	mg/L	85	112	137	197	190	243	336	269	276	982	673	667
Appendix IV Parameters													
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0011	0.0011
Barium	mg/L	0.0046	0.005	0.0044	0.023	0.025	0.023	0.014	0.011	0.014	0.23	0.15	0.14
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	0.05 U	0.078	0.11	0.058	0.077	0.12	0.26	0.22	0.31	0.26	0.24	0.38
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.001 U	0.001 U	0.001 U	0.0022	0.0018	0.0018	0.0022	0.0021	0.0025	0.015	0.013	0.011
Radium 226 + 228	pCi/L		1.28 U			1.65 U			0.23 U			1.05 U	
Selenium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0011	0.0011	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters													
Dissolved Oxygen	mg/L	4.78	1.59	1.26	1.1	0.64	0.2	0.35	0.91	0.56	1.02	0.42	0.28
Oxidation Reduction Potential	millivolts	127	109.8	-130	-40.5	-101.3	-241	227.8	-23.1	0.38	-141.6	-123.5	0.241
pH	SU	8.67	8.36	8.16	7.97	7.69	7.73	7.82	7.5	7.6	7.29	7.46	7.57
Specific Conductivity	uS/cm	175.1	238.2	238	358.9	351	388	641	545	501	1400	1159	110.4
Temperature	deg C	13.5	10.7	15.1	11.7	11.37	12.2	19	12	20	17.1	15.8	18
Turbidity	NTU	3.02	1.73	3.21	4.69	4.58	4.3	1.09	1.79	1.39	2.36	3.9	1.27

Notes:
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Appendix E-2: Analytical Results - MSRB, MCWB, and Drying Area
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	Unit	GAMW53				GAMW53B			GAMW54			GAMW54B		
		2020-10-23		2021-04-16	2021-09-30	2020-10-23	2021-04-16	2021-09-30	2020-10-23	2021-04-19	2021-10-01	2020-10-23	2021-04-19	2021-10-01
		FD	N	N	N	N	N	N	N	N	N	N	N	N
Appendix III Parameters														
Boron	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	2.5	1.9	2.7	0.72	0.5	0.63	2.2	3.1	3.1
Calcium	mg/L	16.9	17	17.5	28.3	136	142	128	154	164	114	195	236	190
Chloride	mg/L	1.8	2	2.4	2.7	84.6	84.8	66.4	50.3	53.9	24.6	49.2	83.9	70.4
Fluoride	mg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.58	0.4	0.46	0.28	0.2	0.3	0.59	0.53	0.52
pH	SU		5.88	5.76	6.17	7.39	7.28	7.48	6.21	6.52	6.82	6.97	7.3	7.36
Sulfate	mg/L	26.6	28.2	35.2	49.4	327	304	295	341	492	191	438	891	501
Total Dissolved Solids	mg/L	89	99	97	147	730	748	802	689	735	506	878	1120	1030
Appendix IV Parameters														
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0011	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.0014	0.0014	0.0012	0.0012	0.001 U	0.001 U	0.0014	0.0038	0.0075	0.024	0.0042	0.0044	0.004
Barium	mg/L	0.022	0.023	0.027	0.033	0.061	0.067	0.051	0.068	0.071	0.048	0.054	0.063	0.056
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0011	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	0.05 U	0.05 U	0.05 U	0.05 U	0.58	0.4	0.46	0.28	0.2	0.3	0.59	0.53	0.52
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.0066	0.0066	0.0052	0.0097	0.011	0.015	0.011	0.023	0.011	0.025	0.029	0.017	0.025
Radium 226 + 228	pCi/L			0 U			1.21 U			0.694 U			1.43	
Selenium	mg/L	0.001 U	0.001 U	0.001 U	0.0019	0.001 U	0.001 U	0.001 U	0.0029	0.0044	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters														
Dissolved Oxygen	mg/L		1.16	1.99	0.92	0.65	0.39	0.24	1.04	0.68	0.29	0.72	0.45	0.26
Oxidation Reduction Potential	millivolts		122.8	111.7	94.9	-111.8	-104	-232.6	67.5	81.2	-153.9	-143.2	-105.3	-211.7
pH	SU		5.88	5.76	6.17	7.39	7.28	7.48	6.21	6.52	6.82	6.97	7.3	7.36
Specific Conductivity	uS/cm		144	173	204	1091	1227	125.6	875	1097	782	1105	1626	149.4
Temperature	deg C		19	13	20.4	19.5	17.6	20	17	11.8	20.1	16.2	14.3	17.3
Turbidity	NTU		2.19	4.56	4.51	4.03	3.27	3.62	2.45	6.79	3.79	4.6	6.74	3.54

Notes:
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Appendix E-2: Analytical Results - MSRB, MCWB, and Drying Area
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	Unit	GAMW55R			GAMW55B			GAMW56			GAMW56B		
		2020-10-28	2021-04-20	2021-10-01	2020-10-28	2021-04-20	2021-10-01	2020-10-28	2021-04-20	2021-10-04	2020-10-28	2021-04-21	2021-10-04
		N	N	N	N	N	N	N	N	N	N	N	N
Appendix III Parameters													
Boron	mg/L	0.95	0.87	1.7	10.8	9.9	8.3	0.3	0.23	0.19	2	1.6	1.4
Calcium	mg/L	170	237	197	226	254	205	111	130	108	138	157	160
Chloride	mg/L	48.2 J-	51.4	44.1	120 J-	120	79.4	3.2 J-	2.9	1.7	45.7 J-	70.8	73.7
Fluoride	mg/L	0.63	0.46	0.51	0.28	0.3	0.3	0.83	0.05 U	1	0.51	0.41	0.46
pH	SU	7.45	7.6	7.27	7.56	7.7	7.44	7.07	7.05	7.09	7.47	7.55	7.34
Sulfate	mg/L	351	867	389	720	985	496	49.6	57.6	64.8	275	277	268
Total Dissolved Solids	mg/L	789	842	948	1380	1370	1120	390	480	379	696	738	802
Appendix IV Parameters													
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0059	0.007	0.0018	0.001 U	0.001 U	0.001 U
Barium	mg/L	0.038	0.032	0.038	0.06	0.061	0.05	0.044	0.042	0.04	0.066	0.071	0.081
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01	0.016	0.0045	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	0.63	0.46	0.51	0.28	0.3	0.3	0.83	0.05 U	1	0.51	0.41	0.46
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.008 U	0.008 U	0.01	0.008 U	0.008 U	0.012	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.0091
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.025	0.013	0.017	0.0062	0.0068	0.0058	0.0093	0.0083	0.011	0.0075	0.0074	0.0062
Radium 226 + 228	pCi/L		1.47 R			1.49 U			0.222 U			2.97	
Selenium	mg/L	0.0028	0.0029	0.0046	0.001 U	0.001 U	0.001 U	0.001 U	0.0011	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters													
Dissolved Oxygen	mg/L	2.5	1.19	0.47	1.37	0.65	0.26	1.88	1	0.37	1.48	0.23	0.29
Oxidation Reduction Potential	millivolts	12.8	32.3	-16.8	-130.1	-97.3	-213.9	-64.4	65.9	-133.7	-123.9	-110.5	-214.1
pH	SU	7.45	7.6	7.27	7.56	7.7	7.44	7.07	7.05	7.09	7.47	7.55	7.34
Specific Conductivity	uS/cm	994	1319	139.1	1588	1896	162.3	560	740	655	772	1100	124.4
Temperature	deg C	17.6	11.3	20.6	17.2	15.3	18.7	14.7	9	17.2	12.9	12	14.3
Turbidity	NTU	1.2	2.35	1.59	3.22	4.78	4.48	0.83	2.67	3.48	2.39	6.72	4.65

Notes:
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
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"J+" = Indicates the result is estimated and may be biased high.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Appendix E-3: Analytical Data - Landfill Phases V, VI, and VII
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW20				GAMW24			
	Sample Date	2020-09-16		2021-04-12	2021-09-13	2020-09-15	2021-04-12	2021-09-13	
	Sample Type	FD	N	N	N	N	N	FD	N
Chemical Name	Unit								
CCR Appendix III									
Boron	mg/L	3.4	3.4	2.8	3.7	0.1 U	0.1 U	0.12	0.1 U
Calcium	mg/L	188	188	164	249	91	80.2	83.3	86.8
Chloride	mg/L	7.9	7.8	11.4	11.2	28 J+	18.5	21.6	22
Fluoride	mg/L	0.24	0.22	0.19	0.22	0.099	0.083	0.067	0.15
pH	SU		7.07	7.17	7.2	7.3	7.68		7.34
Sulfate	mg/L	552	549	500	529	88	70	70	69.6
Total Dissolved Solids	mg/L	1110	1140	1050	1170	389	318	351	349
Field Parameters									
Dissolved Oxygen	mg/L		0.1	0.87	0.12	0.21	0.14		0.14
Oxidation-Reduction Potential	millivolts		-103.9	-94	0.188	-76.9	-14.8		0.129
pH	SU		7.07	7.17	7.2	7.3	7.68		7.34
Specific Conductance	uS/cm		1314	1530	163.7	530	561		609
Temperature	deg c		17.3	10.6	17.1	17	9.95		16.8
Turbidity	ntu		5.1	2.71	5.22	3.87	4.6		4.84

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter

"U" = Indicates the result is not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result was estimated.
"J+" = Indicates the result was estimated and maybe biased high.
"J-" = Indicates the result was estimated and maybe biased low.

Appendix E-3: Analytical Data - Landfill Phases V, VI, and VII
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW24B			GAMW25			GAMW25B			
	Sample Date	2020-09-15	2021-04-13	2021-09-13	2020-09-15	2021-04-12	2021-09-10	2020-09-16	2021-04-12		2021-09-10
	Sample Type	N	N	N	N	N	N	N	FD	N	N
Chemical Name	Unit										
CCR Appendix III											
Boron	mg/L	0.1 U	0.1 U	0.1 U	0.18	0.17	0.15	0.13	0.13	0.13	0.13
Calcium	mg/L	50.8	46.9	51.3	82.8	76.4	72.5	83	94	94.2	97.4
Chloride	mg/L	6.6 J+	3.3	4.1	5.6 J+	4.3	2.7	6.8	8.7	8.6	7.2
Fluoride	mg/L	0.14	0.12	0.19	1.1	1.1	1.2 J-	0.21	0.18	0.18	0.13 J-
pH	SU	7.96	7.58	7.91	7.23	7.27	7.4	7.35		7.16	7.36
Sulfate	mg/L	37	26.7	24	57.7	44.9	48.5	77	67.2	67.2	88.9
Total Dissolved Solids	mg/L	210	184	190	334	288	329	348	378	377	417
Field Parameters											
Dissolved Oxygen	mg/L	0.19	0.65	0.24	1.57	3.81	1.65	0.18		0.49	0.27
Oxidation-Reduction Potential	millivolts	-152.7	-114.6	0.23	-10.1	154.4	96.6	-130.4		-127	0.185
pH	SU	7.96	7.58	7.91	7.23	7.27	7.4	7.35		7.16	7.36
Specific Conductance	uS/cm	284	312.5	340	465	472.3	514	449		599	653
Temperature	deg c	14	10.9	13.5	16.3	8.8	16	12.8		11	12.1
Turbidity	ntu	4.91	7.77	5.64	0.74	1.99	1.9	4.02		3	1.88

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter

"U" = Indicates the result is not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result was estimated.
"J+" = Indicates the result was estimated and maybe biased high.
"J-" = Indicates the result was estimated and maybe biased low.

Appendix E-3: Analytical Data - Landfill Phases V, VI, and VII
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW26			GAMW26B			GAMW27				
	Sample Date	2020-09-16	2021-04-12	2021-09-10	2020-09-16	2021-04-12	2021-09-10	2020-09-17		2021-04-13		2021-09-10
	Sample Type	N	N	N	N	N	N	FD	N	FD	N	N
Chemical Name	Unit											
CCR Appendix III												
Boron	mg/L	0.18	0.18	0.22	0.64	0.21	0.21	4	3.9	4.2	4.1	4.1
Calcium	mg/L	86.6	84.7	92.6	158	93.3	103	286	283	276	279	277
Chloride	mg/L	13.8	11.5	4.2	56.3	14.6	23.1	12.3	12.9	20.9	20.4	14.2
Fluoride	mg/L	3.2	2.9	2.8 J-	0.17	0.18	0.11 J-	0.67	0.63	0.66	0.63	0.56 J-
pH	SU	7.23	7.51	7.54	7.62	7.79	7.8		7.33		7.55	7.65
Sulfate	mg/L	53.7	55.2	80.2	803	86.6	189	884	824	693	701	756
Total Dissolved Solids	mg/L	389	350	449	1510	437	624	1370	1340	1250	1270	1400
Field Parameters												
Dissolved Oxygen	mg/L	0.2	1.31	3.45	1.42	1.31	3.45		0.27		0.45	0.21
Oxidation-Reduction Potential	millivolts	-28.4	-0.1	-96.1	-75.4	-0.1	-96.1		-114.7		-118	0.18
pH	SU	7.23	7.79	7.8	7.62	7.79	7.8		7.33		7.55	7.65
Specific Conductance	uS/cm	561	711	737	1516	711	737		1401		1558	170
Temperature	deg c	18	11.53	13.63	12.7	11.53	13.63		16.3		11.5	16.8
Turbidity	ntu	0.49	3.85	2.98	4.65	3.85	2.98		0.53		4.24	1.26

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter

"U" = Indicates the result is not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result was estimated.
"J+" = Indicates the result was estimated and maybe biased high.
"J-" = Indicates the result was estimated and maybe biased low.

Appendix E-3: Analytical Data - Landfill Phases V, VI, and VII
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW27B			GAMW38			GAMW39B			
	Sample Date	2020-09-17	2021-04-13	2021-09-13	2020-09-17	2021-04-13	2021-09-11	2020-09-17	2021-04-13	2021-09-11	
	Sample Type	N	N	N	N	N	N	N	N	FD	N
Chemical Name	Unit										
CCR Appendix III											
Boron	mg/L	12.3	12.1	13.1	0.99	0.87	1	5.8	6.2	6.9	6.9
Calcium	mg/L	356	364	367	79	90.4	77.3	232	249	274	268
Chloride	mg/L	451	408	438	4.9	4.7	4.2	36.5	35.1	37.4	39.9
Fluoride	mg/L	0.05 U	0.05 U	0.05 U	0.19	0.15	0.15	0.055	0.05 U	0.05 U	0.05 U
pH	SU	7.43	7.41	7.36	7.08	7.44	7.03	6.86	7.11		6.68
Sulfate	mg/L	6790	6190	6530	224	211	164	742	687	726	785
Total Dissolved Solids	mg/L	10800	9980	10800	551	522	471	1440	1400	1590	1550
Field Parameters											
Dissolved Oxygen	mg/L	0.6	1.27	1.19	0.17	0.15	0.53	0.12	0.21		0.33
Oxidation-Reduction Potential	millivolts	-110.8	-95.5	-272.6	-104.6	-82.5	-229.7	-95.7	-65.2		-329.8
pH	SU	7.43	7.41	7.36	7.08	7.44	7.03	6.86	7.11		6.68
Specific Conductance	uS/cm	10122	12351	10440	738	816	716	1575	1913		1747
Temperature	deg c	14.1	12.6	14.15	19	9.83	18.94	14.8	11.41		14.37
Turbidity	ntu	0.88	2.35	3.59	1.5	7.49	2.73	4.56	4.62		2.92

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter

"U" = Indicates the result is not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result was estimated.
"J+" = Indicates the result was estimated and maybe biased high.
"J-" = Indicates the result was estimated and maybe biased low.

Appendix E-3: Analytical Data - Landfill Phases V, VI, and VII
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW39			GAMW39B			GAMW40		
	Sample Date	2020-09-17	2021-04-13	2021-09-11	2020-09-17	2021-04-13	2021-09-11	2020-09-17	2021-04-14	2021-09-13
	Sample Type	N	N	N	N	N	N	N	N	N
Chemical Name	Unit									
CCR Appendix III										
Boron	mg/L	0.93	1.1	1.4	9.7	10.1	9.8	3.2	2.8	4.1
Calcium	mg/L	229	173	162	386	409	443	280	273	276
Chloride	mg/L	12.2	10.2	9.7	70	61.9	85.7	16.2	12.8	11.8
Fluoride	mg/L	0.12	0.14	0.12	0.05 U	0.05 U	0.5 U	0.18	0.067	0.072
pH	SU	6.51	7.12	6.83	6.67	7.16	6.68	6.52	7.19	6.62
Sulfate	mg/L	430	359	396	1280	1140	1330	438	388	501
Total Dissolved Solids	mg/L	1090	816	865	2400	2230	2690	1450	1360	1550
Field Parameters										
Dissolved Oxygen	mg/L	0.12	0.14	0.43	0.12	0.16	0.48	0.11	0.3	0.46
Oxidation-Reduction Potential	millivolts	-59.6	-42.6	-284	-75.2	-47.6	310.6	-51.1	-39.8	-304
pH	SU	6.51	7.12	6.83	6.67	7.16	6.68	6.52	7.19	6.62
Specific Conductance	uS/cm	1322	1248	1109	2460	2863	2813	1824	1968	1933
Temperature	deg c	18.3	11.05	17.47	15.7	12.32		18.1	10	17.03
Turbidity	ntu	4.29	4.27	1.25	3.64	4.4	2.47	1.02	2.46	0.63

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter

"U" = Indicates the result is not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result was estimated.
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"J-" = Indicates the result was estimated and maybe biased low.

Appendix E-3: Analytical Data - Landfill Phases V, VI, and VII
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW40B			GAMW41			GAMW41B		
	Sample Date	2020-09-21	2021-04-14	2021-09-13	2020-09-21	2021-04-14	2021-09-13	2020-09-21	2021-04-13	2021-09-13
	Sample Type	N	N	N	N	N	N	N	N	N
Chemical Name	Unit									
CCR Appendix III										
Boron	mg/L	31.3	30	29.9	8.9	10	9.4	28.7	26.2	28.8
Calcium	mg/L	228	225	195	186	123	134	260	223	231
Chloride	mg/L	744	859	700	254	119	44.4	722	571	687
Fluoride	mg/L	0.05 U	0.79	0.05 U	0.21	0.2	0.33	0.05 U	0.79	0.05 U
pH	SU	8.03	8.5	7.87		8.08	7.48		8.05	7.94
Sulfate	mg/L	5640	6420	6580	2450	2220	1750	6750	6320	6250
Total Dissolved Solids	mg/L	11400	9860	11500	4160	3250	2750	11200	10500	10800
Field Parameters										
Dissolved Oxygen	mg/L	0.34	0.23	0.3	0.28	0.14	0.21	0.29	0.42	0.19
Oxidation-Reduction Potential	millivolts	-112.3	-162.9	-288.3	-54.8	-137.2	-247	-134	-187.2	-291.7
pH	SU	8.03	8.5	7.87	7.07	8.08	7.48	8.1	8.05	7.94
Specific Conductance	uS/cm	13584	13406	11500	5522	4602	3312	13465	13006	11430
Temperature	deg c	14.4	11.97	14.28	19.2	10.15	19.2	16.7	13	15.88
Turbidity	ntu	3.7	1.37	1.18	4.21	4.43	1.91	4.28	3.81	1.8

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter

"U" = Indicates the result is not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
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APPENDIX F

2021 Annual Groundwater Monitoring and Corrective Action Reports - January 2022

2021 Annual Groundwater Monitoring and Corrective Action Report - Waste Disposal Area

NIPSCO LLC R. M. Schahfer Generating Station

Prepared Pursuant to 40 CFR §257.90(e) and Corresponding Regulations under 329 Indiana Administrative Code 10-9-1

Submitted to:

Northern Indiana Public Service Company LLC
R.M. Schahfer Generating Station
Wheatfield, Indiana

Submitted by:

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January 31, 2022

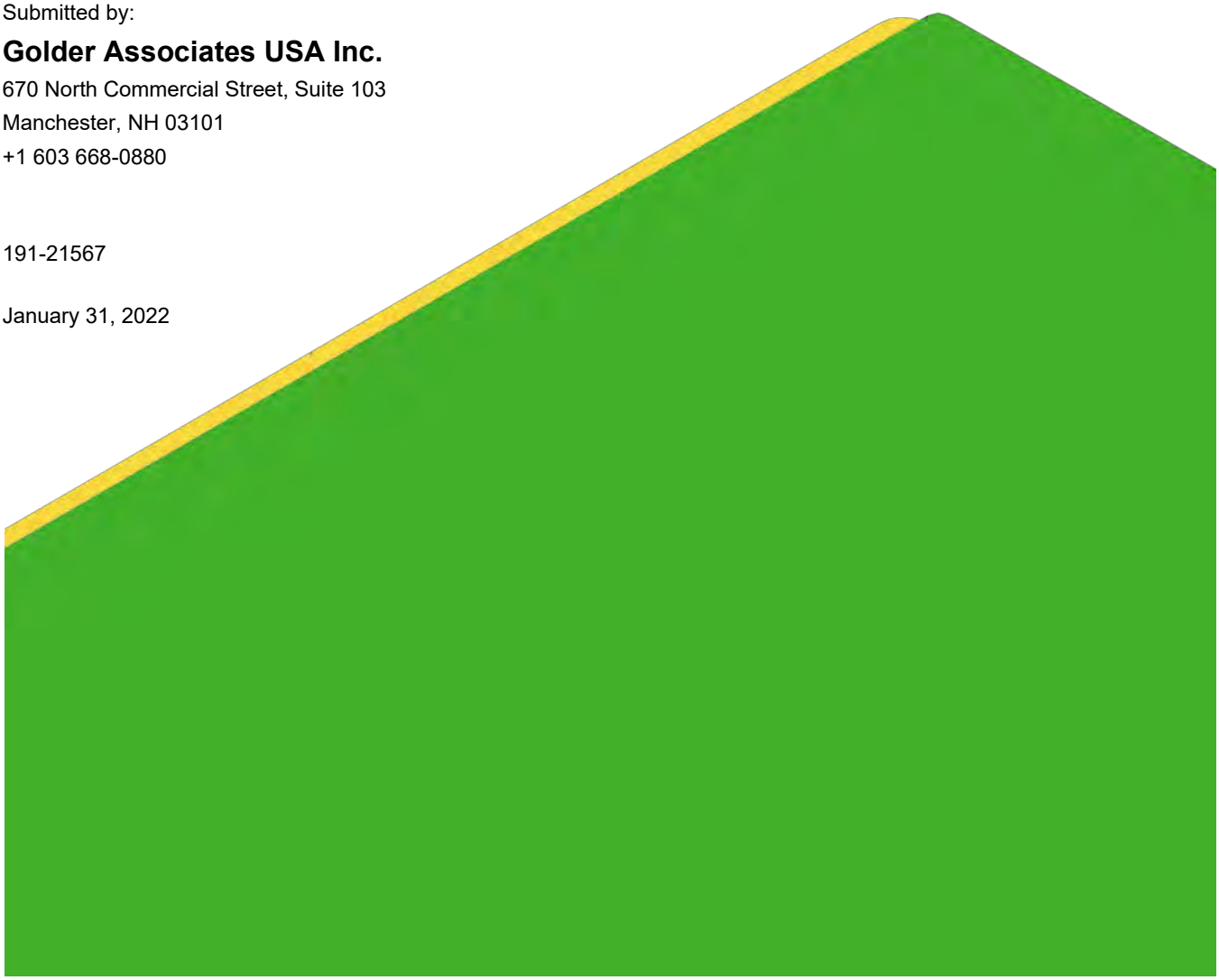


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1.0 INTRODUCTION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), Golder Associates USA Inc., *a member of WSP* (Golder), prepared this 2021 Annual Groundwater Monitoring and Corrective Action Report (2021 Annual Report) for the Rollin M. Schahfer Generating Station (RMSGS, Schahfer) Waste Disposal Area (WDA, the CCR Unit) located at 2723 E 1500 N, Wheatfield, Jasper County, Indiana (Latitude 41° 12' 36" and Longitude 87° 01' 48", see Figure 1). As shown in Figure 2, the WDA is an approximately 80-acre impoundment located in the southwest portion of the RMSGS facility. Golder prepared the 2021 Annual Report in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, “Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule” (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

The CCR Unit is currently in Assessment Monitoring pursuant to 40 CFR §257.95. Routine monitoring activities performed during the reporting period include inspection of wells for integrity and security, measurement of groundwater levels prior to sample collection to assess groundwater flow direction, and collection of groundwater samples for laboratory analysis.

In conformance with the applicable requirements of 40 CFR §257.90(e)(1) through (5) and corresponding State of Indiana requirements, the 2021 Annual Report:

- Documents the status of the groundwater monitoring and corrective action program
- Provides figures showing the CCR Unit and monitoring well locations
- Summarizes key CCR Rule groundwater activities completed during calendar year 2021
- Includes CCR Rule groundwater monitoring data obtained in calendar year 2021
- Describes any problems encountered during the monitoring activities
- Discusses actions taken to resolve the problems, if applicable
- Projects key activities for the upcoming year

2.0 GROUNDWATER MONITORING AND CORRECTIVE ACTION PROGRAM OVERVIEW OF CURRENT STATUS

Starting in 2016 following the installation of a groundwater monitoring system (Table 1) and throughout calendar year 2017, Golder collected background groundwater samples and performed Detection Monitoring at the CCR Unit pursuant to the requirements of 40 CFR §257.94. Due to the identification of significantly statistical increases (SSIs) in January 2018, NIPSCO established an Assessment Monitoring program in April 2018 pursuant to the requirements of 40 CFR §257.95. In 2018, Golder performed the first and second Assessment Monitoring sampling events. Following the first Assessment Monitoring sampling event, including verification sampling, Golder prepared an alternative source demonstration (ASD) indicating that the detections of Appendix IV parameters downgradient of the WDA are not due to a release from the WDA. In 2019, Golder completed the third and fourth Assessment Monitoring sampling events and completed ASDs following each sampling event. In 2020, Golder performed the fifth and sixth Assessment Monitoring sampling events and completed ASDs following each sampling event. In 2021, Golder performed the seventh and eighth Assessment Monitoring sampling events. The WDA began and ended the current annual reporting period in Assessment Monitoring pursuant to 40 CFR §257.95. Appendix IV constituents statistically significant levels (SSLs) identified in 2021 include molybdenum and

lithium in groundwater samples collected from well GAMW-51B and molybdenum in well GAMW-60B. In May 2021, Golder prepared an ASD indicating that the SSLs for molybdenum and lithium were not due to a release from the WDA; therefore, the CCR Unit remained in Assessment Monitoring. Pursuant to 40 CFR §257.94, a qualified Indiana-licensed professional engineer recertified the ASD in November 2021. The sampling dates, number of groundwater samples collected from each background and downgradient well, and the purpose of sampling associated with the seventh and eighth Assessment Monitoring events are provided in Table 2. The 2021 analytical results are presented in Table 3. Based upon groundwater monitoring results collected pursuant to the CCR Rule to date, no corrective action program requirements as outlined in 40 CFR §257.96-98 have either been triggered or implemented at this CCR Unit.

2.1 Key Actions Completed - 2021

NIPSCO completed the following key actions relative to CCR Rule groundwater monitoring at the WDA during calendar year 2021:

- Preparation of the of 2020 Groundwater Monitoring and Corrective Action Annual Report in January 2021 (2020 Annual Report, 40 CFR §257.90(e))
- Evaluation of the results of the sixth Assessment Monitoring event in February 2021 (40 CFR §257.95)
- Notification that constituents in 40 CFR Part 257 Appendix IV exceeded the groundwater protection standard (GWPS) in March 2021 (40 CFR §257.95(g))
- Performance of the seventh Assessment Monitoring event in April 2021 (40 CFR §257.95)
- Recertification of the ASD in May 2021 (40 CFR §257.95(g))
- Evaluation of the results of the seventh Assessment Monitoring event in August 2021 (40 CFR §257.95)
- Notification that constituents in 40 CFR Part 257 Appendix IV exceeded the GWPS in September 2021 (40 CFR §257.95(g))
- Performance of the eighth Assessment Monitoring event in September 2021 (40 CFR §257.95)
- Recertification of the ASD in November 2021 (40 CFR §257.95(g))

2.2 Monitoring System Modifications

The groundwater monitoring system did not require any modifications in 2021 (see Figure 2). Table 1 provides a summary of the well rationale/purpose and date of installation. An overview of the modified groundwater monitoring network is provided in the embedded table below.

Background Monitoring Wells	Downgradient Monitoring Wells	Assessment Monitoring Wells
GAMW03, GAMW-03B, GAMW-68, and GAMW-68B	GAMW-01, GAMW-01B, GAMW-12, GAMW-12B, GAMW-13, GAMW-13B, GAMW-14, and GAMW-14B	GAMW-42, GAMW-42B, GAMW-42C, GAMW-43, GAMW-43B, GAMW-44, GAMW-44B, GAMW-51, GAMW-51B, GAMW-57, GAMW-57B, GAMW-58, GAMW-58B, GAMW-59, GAMW-59B, GAMW-60, and GAMW-60B

2.3 Background Monitoring (2016 to 2017)

Per the requirements of 40 CFR §257.94, Golder collected eight independent background groundwater samples from each background and downgradient well between July 2016 and August 2017. Golder used the results of the background monitoring phase to develop appropriate, statistically valid background values for each constituent/monitoring well. Golder submitted the samples to a contract laboratory, in accordance with chain of custody and quality assurance/quality control procedures, for analysis of 40 CFR Part 257 Appendix III and Appendix IV constituents. In addition, Golder personnel measured field water quality parameters including specific conductance, temperature, dissolved oxygen, turbidity, oxidation-reduction potential, and pH. The background data set was included in the 2017 CCR Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2018 (2017 Annual Report, Golder 2018).

Golder performed a periodic update of background datasets, which includes incorporation of additional background data, to improve statistical power and accuracy by providing a more conservative estimate of the true background populations. The CCR Rule Groundwater Monitoring Program Implementation Manual (GMPIM, Golder 2017) allows for the statistical limits to be updated after four to eight new measurements are available (i.e., every two to four years of semi-annual monitoring). Golder incorporated the new data into the background dataset, updated the GWPS, in March 2020 (see Table 4).

2.4 Detection Monitoring

Golder performed the first Detection Monitoring event in October 2017, followed by a statistical evaluation and data analysis in January 2018. Golder collected groundwater samples from the CCR Unit background and downgradient monitoring wells for analysis of Appendix III constituents per 40 CFR §257.94 and included the results in the 2017 Annual Report. Following receipt and validation of laboratory results, Golder evaluated the results of the first Detection Monitoring sampling event to compare the concentration of 40 CFR Part 257 Appendix III constituents relative to facility background concentrations. Using Sanitas™ software, Golder pooled the background data to calculate prediction limits and compared the October 2017 results to the calculated prediction limits to identify SSIs. Due to the identification of SSIs, NIPSCO established an Assessment Monitoring program in April 2018.

2.5 Assessment Monitoring

Golder performed the first Assessment Monitoring event (i.e., Assessment and Verification sampling) in March and April 2018, followed by a statistical evaluation and data analysis in August 2018. In March 2018, Golder collected groundwater samples from each background and downgradient monitoring well for analysis of Appendix IV constituents per 40 CFR §257.95. In April 2018, Golder collected groundwater samples from the downgradient monitoring well locations for analysis of Appendix III and detected Appendix IV constituents per 40 CFR §257.95. In August 2018, Golder developed GWPS to compare against the Assessment Monitoring results. Following receipt and validation of laboratory results, Golder evaluated the 40 CFR Part 257 Appendix IV constituent results relative to CCR Unit-specific GWPS (Table 4). At the time of the statistical evaluation, the GWPS was the higher value of either the Maximum Contaminant Level (MCL) or the CCR Unit-specific background concentration for each analyte calculated using a tolerance/prediction limit procedure in accordance with 40 CFR §257.95(h)(2). Golder assessed the groundwater results obtained from the downgradient monitoring wells by comparing the lower confidence limit (LCL) to the CCR Unit-specific GWPS for each Appendix IV analyte at each well. If the LCL exceeds the GWPS, there is statistical evidence of an SSL. Golder determined that SSLs existed for the WDA (molybdenum in GAMW-01, GAMW-13B, and GAMW-14B) but identified an alternative natural source for the

elevated levels of molybdenum detected in downgradient monitoring wells and prepared an ASD. A qualified Indiana-licensed professional engineer certified the ASD in November 2018 (Appendix A of the 2018 CCR Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2019 (2018 Annual Report, Golder 2019)).

Golder performed the second and third Assessment Monitoring events in October 2018 and April 2019, respectively, by collecting groundwater samples from each background and downgradient monitoring well for analysis of Appendix III and Appendix IV constituents per 40 CFR §257.95. The results from the first and second Assessment Monitoring events are included in the 2018 Annual Report and the results from the third Assessment Monitoring event is included in the 2019 CCR Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2020 (2019 Annual Report, Golder 2020). Golder performed the statistical evaluation of the analytical results of the second and third Assessment Monitoring sampling events in February 2019 and August 2019, respectively. Golder identified SSLs for arsenic (GAMW-01) and cobalt (GAMW-14). In May 2019, Golder prepared, and a qualified Indiana-licensed professional engineer certified an ASD demonstrating that the arsenic and cobalt concentrations observed in the downgradient monitoring wells were due to natural variation and not to a release from the WDA (Appendix A of the 2019 Annual Report, Golder 2020). A qualified-licensed professional engineer recertified the ASD in November 2019 (Appendix B of the 2019 Annual Report).

Golder collected groundwater samples from the following property boundary Assessment Monitoring wells (see Figure 2):

- GAMW-42/42B, GAMW-43/43B, and GAMW-44/44B in March, April, June, July, August, October, and November 2019
- GAMW-42C, GAMW-57/57B, and GAMW-58/58B installed in June 2019 in July, August, October, and November 2019.

SSLs were not identified in groundwater samples collected from these property boundary wells.

Golder performed the fourth and fifth Assessment Monitoring event in November 2019 and April/May 2020, respectively, by collecting groundwater samples from each background and downgradient monitoring well for analysis of Appendix III and detected Appendix IV constituents per 40 CFR §257.95. The results from the fourth Assessment Monitoring events are included in the 2019 Annual Report. In March 2020, Golder performed the statistical evaluation of the analytical results of the fourth Assessment Monitoring sampling event and identified an SSL for molybdenum in well GAMW-51B. In June 2020, Golder prepared, and a qualified Indiana-licensed professional engineer certified, an ASD demonstrating that the SSL for molybdenum and observed lithium levels above the GWPS in GAMW-51B were not due to a release from the WDA (Appendix A of the 2020 Annual Report, Golder 2021). Golder performed the statistical evaluation of the analytical results of the fifth Assessment Monitoring sampling event in September 2020 and identified SSLs for molybdenum and lithium in well GAMW-51B. As these results were consistent with the previous Assessment Monitoring event, a qualified Indiana-licensed professional engineer recertified the ASD in December 2020 (Appendix B of the 2020 Annual Report, Golder 2021).

Golder performed the sixth Assessment Monitoring event in October 2020 by collecting groundwater samples from each background and downgradient monitoring well for analysis of Appendix III and detected Appendix IV constituents per 40 CFR §257.95. Golder performed the statistical evaluation of the analytical results from the sixth Assessment Monitoring sampling event in February 2021 and identified SSLs for molybdenum and lithium in well GAMW-51B and molybdenum in GAMW-60B. As described in the 2019 Annual Report (Golder 2020), GAMW-60B was installed

downgradient of GAMW-51/51B in 2019 to further assess the nature and extent of groundwater quality further downgradient of the WDA. The October 2020 Assessment Monitoring event was the fourth round of sampling at this location, and therefore, was the first event for which SSLs were calculated. As these results are consistent with the primary lines of evidence presented in the June 2020 ASD, a qualified Indiana-licensed professional engineer recertified the ASD in May 2021 (Appendix A). The results from the fifth and sixth Assessment Monitoring events are included in the 2020 Annual Report (Golder, 2021).

Golder performed the seventh Assessment Monitoring event in April 2021 by collecting groundwater samples from each background and downgradient monitoring well for analysis of Appendix III and Appendix IV constituents per 40 CFR §257.95. Golder performed the statistical evaluation of the analytical results of the seventh Assessment Monitoring sampling event in August 2021 and identified SSLs for molybdenum and lithium in well GAMW-51B and molybdenum in GAMW-60B. As these results were consistent with the previous Assessment Monitoring event, a qualified Indiana-licensed professional engineer recertified the ASD in November 2021 (Appendix B).

Golder performed the eighth Assessment Monitoring event in September 2021 by collecting groundwater samples from each background and downgradient monitoring well for analysis of Appendix III and detected Appendix IV constituents per 40 CFR §257.95. Golder will perform the statistical evaluation of the analytical results from the eighth Assessment Monitoring event in January 2022.

2.6 Statistical Evaluation

After each monitoring event, Golder assessed the analytical data for outliers, anomalies, and trends that might be an indication of a sampling or analytical error. Outliers and anomalies are generally defined as inconsistently large or small values that can occur because of sampling, laboratory, transportation, or transcription errors, or even by chance alone. Significant trends may indicate natural geochemical variability, a source of systematic error, influence of an upgradient/off-site source, or an actual occurrence of CCR Unit influence upon groundwater quality. Appropriate statistical methods are used to remove outliers from the database and manage trends with detrending routines, prior to the calculation of statistical limits. To assess the data for outliers, anomalies, and trends, Golder assessed the data using time vs. concentration graphs, and statistical routines included in the Sanitas™ statistical analysis software package. Golder has not identified any additional outliers since the 2020 Annual Report.

Golder evaluated the background data set for trends using Sanitas™ software. Golder will continue to monitor all trends and apply detrending routines, if applicable, before using these data to calculate GWPS. Golder identified the following 40 CFR Part 257 Appendix IV parameter trends in background monitoring wells:

- Arsenic concentrations detected in groundwater samples collected from GAMW-03B show a deceasing trend and arsenic has never been detected above the MCL in this well. No detrending routines are required.
- Beryllium concentrations detected in groundwater samples collected from GAMW-03 and GAMW-03B show a decreasing trend, beryllium has never been detected above the laboratory reporting limit in these wells, and all background beryllium results are below the MCL, therefore, the GWPS is equal to the MCL. No detrending routines are required.
- Cadmium concentrations detected in groundwater samples collected from GAMW-03 and GAMW-03B show a decreasing trend, cadmium has never been detected above the laboratory reporting limit in these wells, and all background cadmium results are below the MCL, therefore, the GWPS is equal to the MCL. No detrending routines are required.

- Chromium concentrations detected in groundwater samples collected from GAMW-03 show a decreasing trend, chromium has never been detected above the laboratory reporting limit in this well, and all background chromium results are below the MCL, therefore, the GWPS is equal to the MCL. No detrending routines are required.
- Lead concentrations detected in groundwater samples collected from GAMW-03B show a decreasing trend, lead has never been detected above the laboratory reporting limit in this well, and all background lead results are below the health-based standard, therefore the GWPS is equal to the health-based standard. No detrending routines are required.
- Molybdenum concentrations detected in groundwater samples collected from GAMW-03B show an increasing trend, all background results are below the health-based standard, therefore, the GWPS is equal to the health-based standard. No detrending routines are required.
- Thallium concentrations detected in groundwater samples collected from GAMW-03 and GAMW-03B show a decreasing trend, thallium has never been detected above the laboratory reporting limit in these wells, and all background thallium results are below the MCL, therefore, the GWPS is equal to the MCL. No detrending routines are required.

2.7 Problems Encountered and Follow-Up Corrective Actions

One cooler containing the radium samples collected from GAMW-13/13B and GAMW-14/14B in the seventh Assessment Monitoring event (April 2021), was delayed during shipping (i.e., FedEx issue). The laboratory received the radium samples approximately one month after the sample collection date. Since the radium analyses have no temperature requirements and the laboratory received the samples within the method holding time, the samples were run despite the shipping delay. No follow up corrective action was required.

Golder encountered elevated turbidity levels (i.e., >5 nephelometric turbidity units - NTUs) during the 2021 Assessment Monitoring events including:

- Seventh Assessment Monitoring event (April 2021); Golder collected groundwater samples from monitoring wells GAMW-03 and GAMW-42C at turbidity levels of 5.99 and 7.69 NTUs, respectively.
- Eighth Assessment Monitoring event (September 2021); Golder collected the groundwater sample from monitoring well GAMW-42C at a turbidity level of 5.86 NTUs.

According to the CCR Groundwater Monitoring Program Implementation Manual (Golder 2017), groundwater samples are to be collected once groundwater has achieved a turbidity level below 5 NTUs. Due to time constraints in the field, Golder purged groundwater from the wells for a minimum of two hours and collected groundwater samples when turbidity appeared to stabilize (e.g., no downward or upward trend over three consecutive readings five minutes apart). Evaluation of the analytical results from these wells suggests that the slightly elevated turbidity levels had no significant effect on the representativeness of groundwater quality. During future monitoring events, Golder will purge groundwater for two hours or five well volumes, whichever is shorter and use professional judgement to assess whether the purge water is representative of groundwater for sampling. If an acceptable turbidity level cannot be achieved within a reasonable timeframe (i.e., three hours), Golder will redevelop the affected monitoring wells prior to the next sampling event.

3.0 KEY ACTIVITIES PROJECTED FOR 2022

During calendar year 2022, NIPSCO anticipates conducting the following key CCR Rule groundwater monitoring activities for the WDA:

- Prepare and submit the appropriate notifications according to the CCR Rule;
- Continue semi-annual Assessment Monitoring groundwater sampling per CCR Rule requirements; and,
- Inspect and maintain the monitoring system including wells, pumps, and equipment.

4.0 REFERENCES

Golder Associates, “2017 Annual Groundwater Monitoring and Corrective Action Report - Waste Disposal Area, NIPSCO R. M. Schafer Generating Station”, January 31, 2018.

Golder Associates, “2018 Annual Groundwater Monitoring and Corrective Action Report - Waste Disposal Area, NIPSCO R. M. Schafer Generating Station”, January 31, 2019.

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Golder Associates 2020, “2020 Annual Groundwater Monitoring and Corrective Action Report – Waste Disposal Area, NIPSCO R. M. Schahfer Generating Station”, January 31, 2021.

Golder Associates, “CCR Groundwater Monitoring Program Implementation Manual,” October 2017.

Golder Associates, “Waste Disposal Area Alternative Source Demonstration,” November 19, 2018.

Golder Associates, “Alternative Source Demonstration - Waste Disposal Area,” May 17, 2019.

Golder Associates, “Recertification of R. M. Schahfer Waste Disposal Area Alternative Source Demonstration,” November 26, 2019.

Golder Associates, “Alternative Source Demonstration – Waste Disposal Area,” June 9, 2020.

Golder Associates, “Recertification of R. M. Schahfer Waste Disposal Area Alternative Source Demonstration,” December 4, 2020.

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Tables

Table 1: Monitoring Well Network
CCR Unit Schahfer Waste Disposal Area
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

CCR Unit	Well Purpose	Monitoring Well ID	Installation Date	Decommission Date (If Applicable)	Basis For Action
Waste Disposal Area	Background Monitoring Well	GAMW-03	6/27/2015	-	Installed for groundwater quality monitoring[1]
		GAMW-03B	5/24/2016	-	
		GAMW-68	8/27/2020	-	
		GAMW-68B	8/27/2020	-	
	Downgradient Monitoring Well	GAMW-01	6/26/2015	-	Installed for groundwater quality monitoring[1]
		GAMW-12	5/23/2016	-	
		GAMW-13	5/24/2016	-	
		GAMW-13B	5/23/2016	-	
		GAMW-14	5/23/2016	-	
		GAMW-14B	5/23/2016	-	
		GAMW-01B	7/31/2018	-	Installed to characterize the nature and extent of a potential release[2]
		GAMW-12B	7/31/2018	-	
		GAMW-51	7/25/2018	-	
		GAMW-51B	7/25/2018	-	
		GAMW-42	7/24/2018	-	Installed to monitor groundwater quality at the property boundary[3]
		GAMW-42B	7/24/2018	-	
		GAMW-42C	6/8/2019	-	
		GAMW-43	5/16/2018	-	
		GAMW-43B	5/16/2018	-	
		GAMW-44	5/16/2018	-	
		GAMW-44B	5/16/2018	-	
		GAMW-57	6/7/2019	-	
		GAMW-57B	6/7/2019	-	
		GAMW-58	6/6/2019	-	
		GAMW-58B	6/6/2019	-	
		GAMW-59	6/8/2019	-	Installed to characterize the nature and extent of a potential release[2]
		GAMW-59B	6/6/2019	-	
		GAMW-60	6/8/2019	-	
		GAMW-60B	6/4/2019	-	

1) Per 40 CFR §257.93, Golder collected eight rounds of background data prior to October 17, 2017, excluding wells GAMW-68 and GAMW-68B.
2) Per 40 CFR §257.95(g)(1)(i) Rule requirements, Golder collected additional data to further characterize the nature and extent of potential groundwater impacts.
3) Per 40 CFR §257.95(g)(1)(iii), Golder collected data to monitor groundwater quality in the direction of flow at the property boundary.

Prepared by: KMC
Checked by: DFSC
Reviewed by: MAH

Table 2: Summary of Sampling Events
CCR Unit Schahfer Waste Disposal Area
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Well Purpose	Monitoring Well ID	Sample Event #16	Sample Event #17	Total Number of Samples
Purpose of Sample		Annual Assessment Monitoring	Semi-Annual Assessment Monitoring	
Sample Parameters		Appendix III and Appendix IV	Appendix III and detected Appendix IV	
Background Monitoring Well	GAMW03	4/14/2021	9/17/2021	2
	GAMW03B	4/15/2021	9/17/2021	2
	GAMW68	4/22/2021	9/17/2021	2
	GAMW68B	4/22/2021	9/17/2021	2
Downgradient Monitoring Well	GAMW01	4/14/2021	9/16/2021	2
	GAMW01B	4/14/2021	9/16/2021	2
	GAMW12	4/15/2021	9/16/2021	2
	GAMW12B	4/15/2021	9/16/2021	2
	GAMW13	4/19/2021	9/17/2021	2
	GAMW13B	4/19/2021	9/17/2021	2
	GAMW14	4/19/2021	9/17/2021	2
	GAMW14B	4/19/2021	9/17/2021	2
	GAMW42	4/23/2021	9/14/2021	2
	GAMW42B	4/23/2021	9/14/2021	2
	GAMW42C	4/23/2021	9/15/2021	2
	GAMW43	4/23/2021	9/14/2021	2
	GAMW43B	4/27/2021	9/14/2021	2
	GAMW44	4/27/2021	9/15/2021	2
	GAMW44B	4/27/2021	9/15/2021	2
	GAMW51	4/21/2021	9/29/2021	2
	GAMW51B	4/21/2021	9/29/2021	2
	GAMW57	4/23/2021	9/15/2021	2
	GAMW57B	4/23/2021	9/15/2021	2
	GAMW58	4/23/2021	9/15/2021	2
	GAMW58B	4/23/2021	9/15/2021	2
	GAMW59	4/21/2021	9/29/2021	2
	GAMW59B	4/22/2021	9/29/2021	2
	GAMW60	4/21/2021	9/24/2021	2
	GAMW60B	4/21/2021	9/24/2021	2
Total Number of Samples		29	29	58

Notes:
Sample counts do not include QC/QA samples.

(1) Sample events #1-15 were completed prior to 2021. The purpose, sample parameters, and sample dates are included in the 2017, 2018, 2019, and 2020 Annual Reports.

(2) Semi-annual assessment monitoring parameters did not include radium.

(3) Sample events #16 and 17 correspond to the seventh and eighth Assessment Monitoring events, respectively.

Prepared by: KMC
Checked by: DFSC
Reviewed by: JSP

Table 3: Analytical Data
CCR Unit R. M. Schahfer Waste Disposal Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW01		GAMW01B		GAMW03		GAMW03B		GAMW12		GAMW12B			GAMW13		GAMW13B	
	Sample Date	2021-04-14	2021-09-16	2021-04-14	2021-09-16	2021-04-14	2021-09-17	2021-04-15	2021-09-17	2021-04-15	2021-09-16	2021-04-15		2021-09-16	2021-04-19	2021-09-17	2021-04-19	2021-09-17
	Sample Type	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N
Chemical Name	Unit																	
CCR Appendix III																		
Boron	mg/L	0.78	0.24	0.35	0.29	0.22	0.13	0.25	0.27	0.1 U	0.1 U	0.29	0.31	0.32	0.16	0.19	0.71	0.6
Calcium	mg/L	95.2	76.7	103	112	90.3	70.2	96.4	102	87	80.7	103	104	107	95.6	71.2	82.7	77.8
Chloride	mg/L	10.1	5.9	20.8	18.6	4.3	4.2	20.1	23.1	2.3	3.2	20.5	20.8	20.6	4.3	10.5	28.3	26
Fluoride	mg/L	0.29	0.36 J-	0.076	0.094 J-	0.13	0.2	0.2	0.23	0.16	0.19 J-	0.079	0.082	0.079 J-	0.27	0.31	0.31	0.25
pH	SU	7.11	6.61	6.96	6.5	6.77	6.9	7.03	6.97	7.31	6.49		7.55	6.99	6.95	6.67	7.73	7.32
Sulfate	mg/L	157	42.3	85.2	69.3	97.5	40.2	58	78.6	9.2	24.2	63.8	66.5	57.5	48.6	49.3	146	137
Total Dissolved Solids	mg/L	574	294	450	443	390	298	400	439	336	325	435	430	451	355	317	376	395
CCR Appendix IV																		
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.012	0.02	0.001 U	0.001 U	0.0094	0.019	0.001 U	0.001 U	0.012	0.043	0.001 U	0.001 U	0.001 U	0.027	0.0076	0.0012	0.001
Barium	mg/L	0.051	0.049	0.17	0.17	0.074	0.08	0.11	0.12	0.095	0.094	0.13	0.13	0.14	0.11	0.08	0.081	0.077
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.0019	0.001	0.001	0.001 U	0.0055	0.001 U	0.001 U	0.001 U	0.0025	0.0028	0.001 U	0.001 U	0.001 U	0.0012	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	0.29	0.36 J-	0.076	0.094 J-	0.13	0.2	0.2	0.23	0.16	0.19 J-	0.079	0.082	0.079 J-	0.27	0.31	0.31	0.25
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.011	0.0076	0.001 U	0.001 U	0.011	0.0084	0.0051	0.0066	0.0028	0.0041	0.0012	0.0012	0.0013	0.0096	0.004	0.016	0.016
Radium, Total	pci/l	0.642 U		2.02		0.158 U		1.08 U		1.1 U		1.65	2.42		1.06 U		0.82 U	
Selenium	mg/L	0.01	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																		
Dissolved Oxygen	mg/L	0.6	0.49	0.51	0.51	1.47	0.27	0.95	0.28	0.2	0.28		0.13	0.46	0.46	0.29	0.23	0.32
Oxidation-Reduction Potential	millivolts	-37.2	-240.2	-88	-217.6	-33.4	-225.9	-81.8	-255.4	-90.7	-191.9		-107.1	-265.3	-16.8	-155.2	-120.6	-259.6
pH	SU	7.11	6.61	6.96	6.5	6.77	6.9	7.03	6.97	7.31	6.49		7.55	6.99	6.95	6.67	7.73	7.32
Specific Conductance	uS/cm	721	524	752	705	605	479	695	634	583	625		709	704	461	580	527	568
Temperature	deg c	9.7	18.23	12.1	14.36	9.5	16.85	11.8	13.22	9.04	19.11		11.67	14.81	9.5	18.84	11.97	14.15
Turbidity	ntu	4.06	3.51	3.19	2.19	5.99	2.8	4.08	3.19	4.78	4.53		3.58	3.64	3.79	2.17	3.92	0.5

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ"= Indicates the result was not detected above MDL for the sample and the RL is estimated. The estimated RL is provided.

GOLDER
MEMBER OF WSP

Table 3: Analytical Data
CCR Unit R. M. Schahfer Waste Disposal Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW14		GAMW14B			GAMW42		GAMW42B		GAMW42C		GAMW43		GAMW43B			GAMW44	
Sample Date		2021-04-19	2021-09-17	2021-04-19		2021-09-17	2021-04-23	2021-09-14	2021-04-23	2021-09-14	2021-04-23	2021-09-15	2021-04-23	2021-09-14	2021-04-27		2021-09-14	2021-04-27	2021-09-15
Sample Type		N	N	FD	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	N
Chemical Name	Unit																		
CCR Appendix III																			
Boron	mg/L	0.29	0.2	2.8	2.8	2.7	0.1 U	0.1 U	0.1 U	0.1 U	0.69	0.62	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Calcium	mg/L	67.7	82.6	146	143	112	47.1	59.9	57.9	62.6	48.6	53.9	28	32.6	41.2	40.4	38.2	21.5	20.2
Chloride	mg/L	11.3	10.6	112	108	85.2	4.2	11.4	8.6	10.3	6.3	8.3	0.53	0.85	1.7	1.7	1.8	2.3	1.7
Fluoride	mg/L	0.26	0.26	0.29	0.29	0.28	0.17 J-	0.19	0.15 J-	0.12	0.2 J-	0.22	0.13 J-	0.11	0.19	0.19	0.15	0.19	0.13
pH	SU	7.03	6.61		7.71	7.39	7.62	7	7.72	8	7.59	7.36	7.22	7.22		8.04	7.64	6.21	6.21
Sulfate	mg/L	40.6	31.8	1330	1350	841	29.9	66.5	37.7	31.8	4.4	4.3	30	28.4	28.9 J+	27.9 J+	22.2	63.9 J+	44.8
Total Dissolved Solids	mg/L	270	330	1730	1740	1660	148	253	193	241	203	254	86	137	145	151	137	165	136
CCR Appendix IV																			
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.018	0.039	0.001 U	0.001 U	0.001 U	0.0012	0.0011	0.001 U	0.001 U	0.001 U	0.001 U	0.0016	0.0028	0.001 U	0.001 U	0.001 U	0.095	0.052
Barium	mg/L	0.061	0.081	0.08	0.08	0.059	0.018	0.023	0.016	0.021	0.0092	0.0089	0.019	0.026	0.012	0.011	0.011	0.018	0.02
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.0034	0.002 U
Cobalt	mg/L	0.017	0.024	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0024	0.0022	0.001 U	0.001 U	0.001 U	0.0026	0.0029
Fluoride	mg/L	0.26	0.26	0.29	0.29	0.28	0.17 J-	0.19	0.15 J-	0.12	0.2 J-	0.22	0.13 J-	0.11	0.19	0.19	0.15	0.19	0.13
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.032	0.024	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.0073	0.0077	0.028	0.028	0.04	0.0022	0.0033	0.0029	0.0027	0.0026	0.0021	0.0018	0.002	0.0023	0.0021	0.0024	0.0044	0.004
Radium, Total	pci/l	0.883 U		1.92	1.85		0 U		0.853 U		0.802 U		0.568 U		0.985 U	0.731 U		0.365 U	
Selenium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																			
Dissolved Oxygen	mg/L	0.2	0.29		0.29	0.42	0.59	0.17	0.49	0.15	0.43	0.12	0.7	0.64		0.51	0.27	1.07	0.83
Oxidation-Reduction Potential	millivolts	-31.7	-234.5		-103.5	-193.7	-80.9	-191	-125.5	-261	-123.3	-231	35.1	-329		-108.7	-323.9	-8.1	-294.6
pH	SU	7.03	6.61		7.71	7.39	7.62	7	7.72	8	7.59	7.36	7.22	7.22		8.04	7.64	6.21	6.21
Specific Conductance	uS/cm	377	568		2128	2053	326.1	413	407	414	455.1	475	209	226		282	191	257.8	192
Temperature	deg c	10.2	16.83		12.37	13.98	9.9	14.9	11.8	13.1	11.8	12.7	9.7	17.01		11.4	12.88	11.2	16.11
Turbidity	ntu	4.19	0.85		1.86	1.1	2.56	1.76	4.87	3.98	7.69	5.86	4.3	2.99		2.38	1.37	4.66	2.04

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ"= Indicates the result was not detected above MDL for the sample and the RL is estimated. The estimated RL is provided.

Table 3: Analytical Data
CCR Unit R. M. Schahfer Waste Disposal Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

		Location	GAMW44B		GAMW51			GAMW51B		GAMW57		GAMW57B		GAMW58		GAMW58B			GAMW59	
		Sample Date	2021-04-27	2021-09-15	2021-04-21	2021-09-29		2021-04-21	2021-09-29	2021-04-23	2021-09-15	2021-04-23	2021-09-15	2021-04-23	2021-09-15	2021-04-23	2021-09-15		2021-04-21	2021-09-29
		Sample Type	N	N	N	FD	N	N	N	N	N	N	N	N	N	N	FD	N	N	N
Chemical Name	Unit																			
CCR Appendix III																				
Boron	mg/L		0.1 U	0.1 U	0.43	0.51	0.5	7.2	7	0.1 U	0.1 U	0.1 U	0.13	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.89	1
Calcium	mg/L		31.2	31.7	144	148	147	261	282	13.9	21.8	43.1	47.5	7.3	10.9	37.8	29.2	38.6	209	217
Chloride	mg/L		1.6	1.5	1.5	2.3	2.3	54.8	53.2	1.6	1	11.2	12.4	0.95	1.1	3.6	2.1	4	11.3	21.1
Fluoride	mg/L		0.14	0.18	0.26	0.34	0.34	0.45	0.82	0.05 UJ	0.073	0.13 J-	0.17	0.22 J-	0.35	0.15 J-	0.12	0.19	0.42	0.7
pH	SU		8.22	7.81	7.19		7.04	8.11	7.83	6.22	8.03	7.95	7.33	4.4	5.87	7.92		7.32	7.53	7.26
Sulfate	mg/L		12.3 J+	7.5	196	191	193	1490	1480	38	25.8	19.1	24.4	45	38.9	24.9	32.1	23.6	473	434
Total Dissolved Solids	mg/L		85	113	604	597	600	2180 J	2270	58	101	150	205	44 J	82	124	135	161	756	866
CCR Appendix IV																				
Antimony	mg/L		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L		0.001 U	0.001 U	0.0016	0.0016	0.0016	0.004	0.0044	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0012	0.002
Barium	mg/L		0.0084	0.0082	0.1	0.11	0.11	0.072	0.077	0.014	0.0055	0.02	0.022	0.059	0.041	0.015	0.0044	0.015	0.048	0.055
Beryllium	mg/L		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0012	0.00075	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00025	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L		0.001 U	0.001 U	0.0033	0.0031	0.0031	0.001 U	0.001 U	0.0014	0.001 U	0.001 U	0.001 U	0.01	0.0093	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	mg/L		0.14	0.18	0.26	0.34	0.34	0.45	0.82	0.05 UJ	0.073	0.13 J-	0.17	0.22 J-	0.35	0.15 J-	0.12	0.19	0.42	0.7
Lead	mg/L		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L		0.008 U	0.008 U	0.008 U	0.012	0.012	0.071	0.078	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.012	0.018
Mercury	mg/L		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L		0.0022	0.002	0.011	0.0092	0.0098	0.16	0.15	0.0011	0.003	0.0028	0.0067	0.001 U	0.001 U	0.0034	0.001 U	0.0041	0.03	0.045
Radium, Total	pci/l		1.03 U		1.23 U			3.57		0.194 U		0.368 U		1.95		0.703 U			1.17 U	
Selenium	mg/L		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0025	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	mg/L		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																				
Dissolved Oxygen	mg/L		0.5	0.36	0.48		0.27	0.55	0.29	4.93	6.33	0.22	0.37	4.1	0.98	0.3		0.73	0.21	0.28
Oxidation-Reduction Potential	millivolts		-125.8	-318	-100.6		0.197	-108.7	0.246	111.6	-297.7	-132.7	-316.7	291.1	-314	-140.4		-298.9	-105.5	0.202
pH	SU		8.22	7.81	7.19		7.04	8.11	7.83	6.22	8.03	7.95	7.33	4.4	5.87	7.92		7.32	7.53	7.26
Specific Conductance	uS/cm		210.9	158	873		937	3094	303.9	124	136	291	284	110	102	252		218	1038	125.5
Temperature	deg c		11.5	12.16	11.1		15.9	12.4	14.2	10.25	12.45	11.2	11.54	9.27	13.67	10.84		11.37	11.28	22.2
Turbidity	ntu		2.15	1.19	4.2		4.12	1.82	1.43	2.7	2.63	3.04	1.65	0.84	1.27	2.96		2.66	4.8	4.52

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ"= Indicates the result was not detected above MDL for the sample and the RL is estimated. The estimated RL is provided.

Table 3: Analytical Data
CCR Unit R. M. Schahfer Waste Disposal Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW59B		GAMW60		GAMW60B		GAMW68		GAMW68B	
	Sample Date	2021-04-22	2021-09-29	2021-04-21	2021-09-24	2021-04-21	2021-09-24	2021-04-22	2021-09-17	2021-04-22	2021-09-17
	Sample Type	N	N	N	N	N	N	N	N	N	N
Chemical Name	Unit										
CCR Appendix III											
Boron	mg/L	5.4	6.3	1	0.97	6.5	7.3	0.1 U	0.1 U	0.1 U	0.1 U
Calcium	mg/L	292	253	343	379	351	309	60.7	66.4	43.5	44.7
Chloride	mg/L	52	51.3	17.2	16.5	14.3	69.6	22.8	20.4	19.5	18.4
Fluoride	mg/L	0.45	0.53	0.3	0.51	0.34	1.1	0.16	0.28	0.1	0.2
pH	SU	7.6	7.57	7.05	7.01	7.74	7.76	7.82	7.75	8.35	7.99
Sulfate	mg/L	1180	1180	748	1050	1140	443	68.6	81.3	62.5	63.5
Total Dissolved Solids	mg/L	1860	1950	1300	1540	2710	1440	320	315	2040	242
CCR Appendix IV											
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Barium	mg/L	0.037	0.04	0.027	0.031	0.077	0.063	0.085	0.1	0.11	0.1
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.001 U	0.0013	0.002	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	0.45	0.53	0.3	0.51	0.34	1.1	0.16	0.28	0.1	0.2
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.017	0.019	0.012	0.015	0.034	0.045	0.008 U	0.0081	0.008 U	0.008 U
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.044	0.05	0.013	0.015	0.35	0.37	0.0035	0.0045	0.0022	0.0027
Radium, Total	pci/l	1.76		1.29 U		3.02		0.285 U		1.35 U	
Selenium	mg/L	0.001 U	0.001 U	0.0017	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters											
Dissolved Oxygen	mg/L	0.49	0.29	1.34	0.29	0.56	0.25	0.51	0.28	0.5	0.21
Oxidation-Reduction Potential	millivolts	-119.4	0.231	84.3	0.56	-101.3	0.238	-39.2	0.187	-154.3	0.216
pH	SU	7.6	7.57	7.05	7.01	7.74	7.76	7.82	7.75	8.35	7.99
Specific Conductance	uS/cm	2650	264.7	1747	187.2	2181	209.8	490	515	410.1	413
Temperature	deg c	13.1	17.4	11.5	20.7	12.2	14.9	9.7	16	11.6	13.5
Turbidity	ntu	1.46	1.58	0.9	1.56	1.04	2.05	2.02	3.99	3.57	3.56

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ"= Indicates the result was not detected above MDL for the sample and the RL is estimated. The estimated RL is provided.

Prepared by: SLG
Checked by: DFSC
Reviewed by: JSP

GOLDER
MEMBER OF WSP

Table 4: Groundwater Protection Standards
CCR Unit Schahfer Waste Disposal Area
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

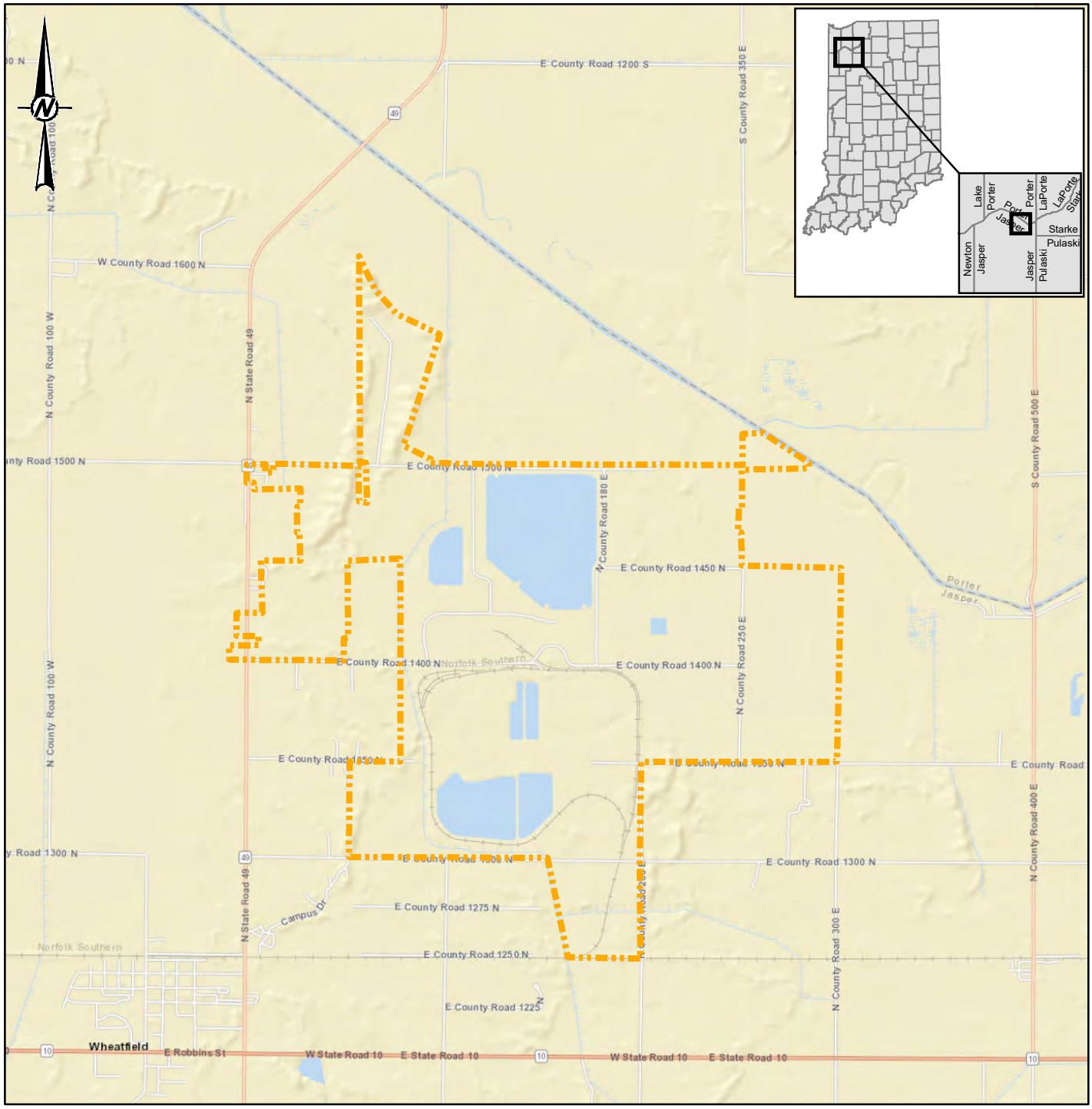
Analyte	MCL (mg/L)	GWPS (mg/L)[2]	GWPS (mg/L)[3]
Antimony	0.006	0.006	0.006
Arsenic	0.01	0.015	0.018
Barium	2	2	2
Beryllium	0.004	0.004	0.004
Cadmium	0.005	0.005	0.005
Chromium	0.1	0.1	0.1
Cobalt[1]	0.006	0.015	0.015
Fluoride	4	4	4
Lead[1]	0.015	0.015	0.015
Lithium[1]	0.04	0.04	0.04
Mercury	0.002	0.002	0.002
Molybdenum[1]	0.1	0.1	0.1
Radium 226+228	5	5	5
Selenium	0.05	0.05	0.05
Thallium	0.002	0.002	0.002

Notes:
MCL= Environmental Protection Agency Maximum Contaminant Level
GWPS= Groundwater Protection Standard
mg/L= milligrams per liter

1) As of August 29, 2018, these four constituents have health-based standards that can be used when calculating the GWPS, these health-based standards are not MCLs but are provided in the MCL column.
2) GWPS calculated in August 2018.
3) GWPS calculated in March 2020.

Prepared by: KMC
Checked by: DFSC
Reviewed by: JSP

Figures



LEGEND

Approximate Property Line

0 0.75 1.5

1 " = 0.75 miles Miles

REFERENCE(S)

SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

SITE LOCATION MAP

CONSULTANT

GOLDER
MEMBER OF WSP

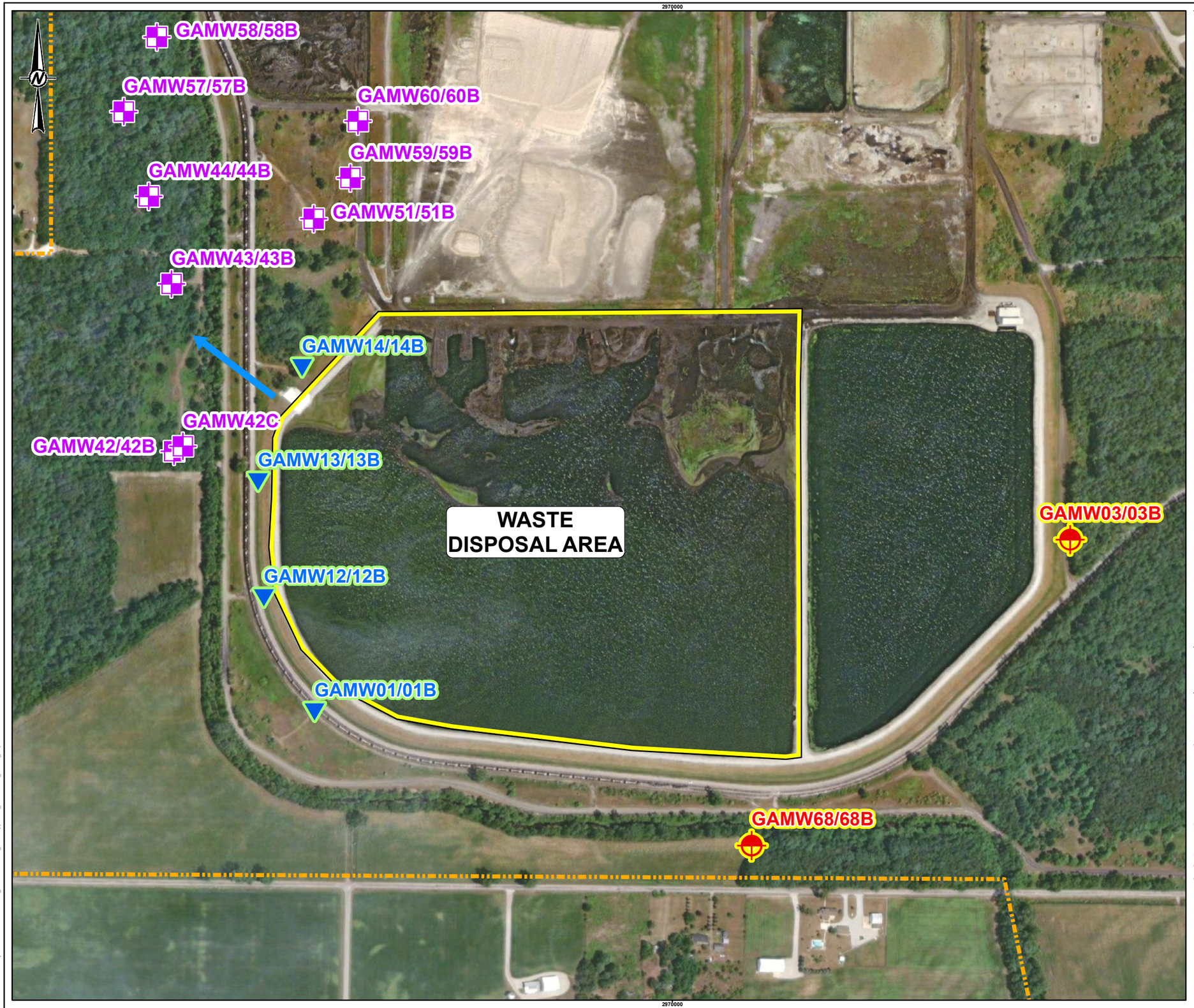
YYYY-MM-DD	1/4/2021
DESIGNED	DFS
PREPARED	SHL
REVIEWED	JSP
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
19121567	A	0	1

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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LEGEND

- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- Generalized Groundwater Flow Direction
- Approximate Property Line
- CCR Unit

0 400 800

1 " = 400 feet Feet

NOTE(S)

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

WELL LOCATION MAP
WASTE DISPOSAL AREA

CONSULTANT

GOLDER
MEMBER OF WSP

YYYY-MM-DD	1/5/2022
DESIGNED	DFS
PREPARED	TBH
REVIEWED	DFS
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
19121567	A	0	2

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1 in
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APPENDIX A

Waste Disposal Area Alternative Source Demonstration May 2021

Northern Indiana Public Service Company LLC (NIPSCO LLC)

R. M. Schahfer Generating Station – Waste Disposal Area

Wheatfield, Indiana

Recertification of Alternative Source Demonstration

40 CFR §257.95

I have personally reviewed this recertification of the alternative source demonstration (ASD), the subject of which is the Waste Disposal Area (WDA) at the NIPSCO LLC R. M. Schahfer Generating Station, prepared by Golder Associates Inc. and dated May 2021. Based on an inquiry of those individuals immediately responsible and on supporting data that I understand to be true, accurate, and complete, I verify the information in this recertification of the ASD is accurate and meets the applicable requirements of the CCR Final Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the ASD for the regulated CCR management unit referred to as the WDA meets the applicable requirements of 40 CFR §257.95.



Joseph Bernard Gormley, Jr.
Indiana Professional Engineer
License #: PE11900213

5/18/2021
Date

TECHNICAL MEMORANDUM

DATE May 18, 2021 **Project No.** 19121567

TO Jeff Loewe, Dan Sullivan, NIPSCO LLC

CC Maggie Rice, Maureen Turman, Joe Kutch, Mark Haney, Jim Peace, Joe Gormley

FROM Danielle Sylvia Cofelice **EMAIL dsylvia@golder.com**

RE: RECERTIFICATION OF R.M. SCHAHFER WASTE DISPOSAL AREA ALTERNATIVE SOURCE DEMONSTRATION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO LLC), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the sixth (October 2020) groundwater Assessment Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS) Waste Disposal Area (WDA, CCR Unit). This evaluation was conducted in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule" (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

The statistical evaluation of analytical data from the sixth Assessment Monitoring event was completed on February 17, 2021. The results of the statistical evaluation indicated the lower confidence level (LCL) exceeded the background concentrations for lithium and molybdenum in assessment monitoring well GAMW51B and the background concentration for molybdenum in assessment monitoring well GAMW60B, which are interpreted as apparent evidence of a statistically-significant levels (SSLs). Although determination of an SSL generally indicates that the groundwater monitoring program should transition from Assessment Monitoring to Assessment of Corrective Measures, 40 CFR §257.95(g)(3) allows the owner or operator (i.e., NIPSCO LLC) to demonstrate that a source other than the CCR Unit or another condition caused the apparent SSL.

Golder identified similar concentrations of lithium and molybdenum in groundwater samples collected from GAMW51B after the fourth (October 2019) Assessment Monitoring event at the WDA and submitted an Alternative Source Demonstration (ASD) on June 9, 2020 (Golder 2020). As described in the ASD, the source material characteristics and site hydrogeology indicated that the source of the lithium and molybdenum SSLs observed in GAMW51B was not due to a release from the WDA. Golder recertified this ASD after the fifth Assessment Monitoring event (April 2020), which confirmed the molybdenum and lithium results observed in GAMW-51B.

1.0 SUMMARY OF OCTOBER 2020 RESULTS

The lithium and molybdenum concentrations in samples collected from GAMW51B in October 2020 were 0.063 milligrams per liter (mg/L) and 0.17 mg/L, respectively. These results are less than two times the Groundwater Protection Standards (GWPS) of 0.04 mg/L and 0.1 mg/L for lithium and molybdenum, respectively, which are equal to the risk-based levels included in the CCR Rule, Part 1 Phase 1 Addendum. The molybdenum concentrations in the samples collected to date from GAMW60B range from 0.38 mg/L to 0.49 mg/L (approximately four times the GWPS of 0.1 mg/L). The October 2020 Assessment Monitoring event was the fourth

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round of sampling at this location. The most recent molybdenum and lithium results collected at both locations are within the range of the previous data. Overall, the data are consistent with the previous Assessment Monitoring event.

2.0 ALTERNATIVE SOURCE DEMONSTRATION

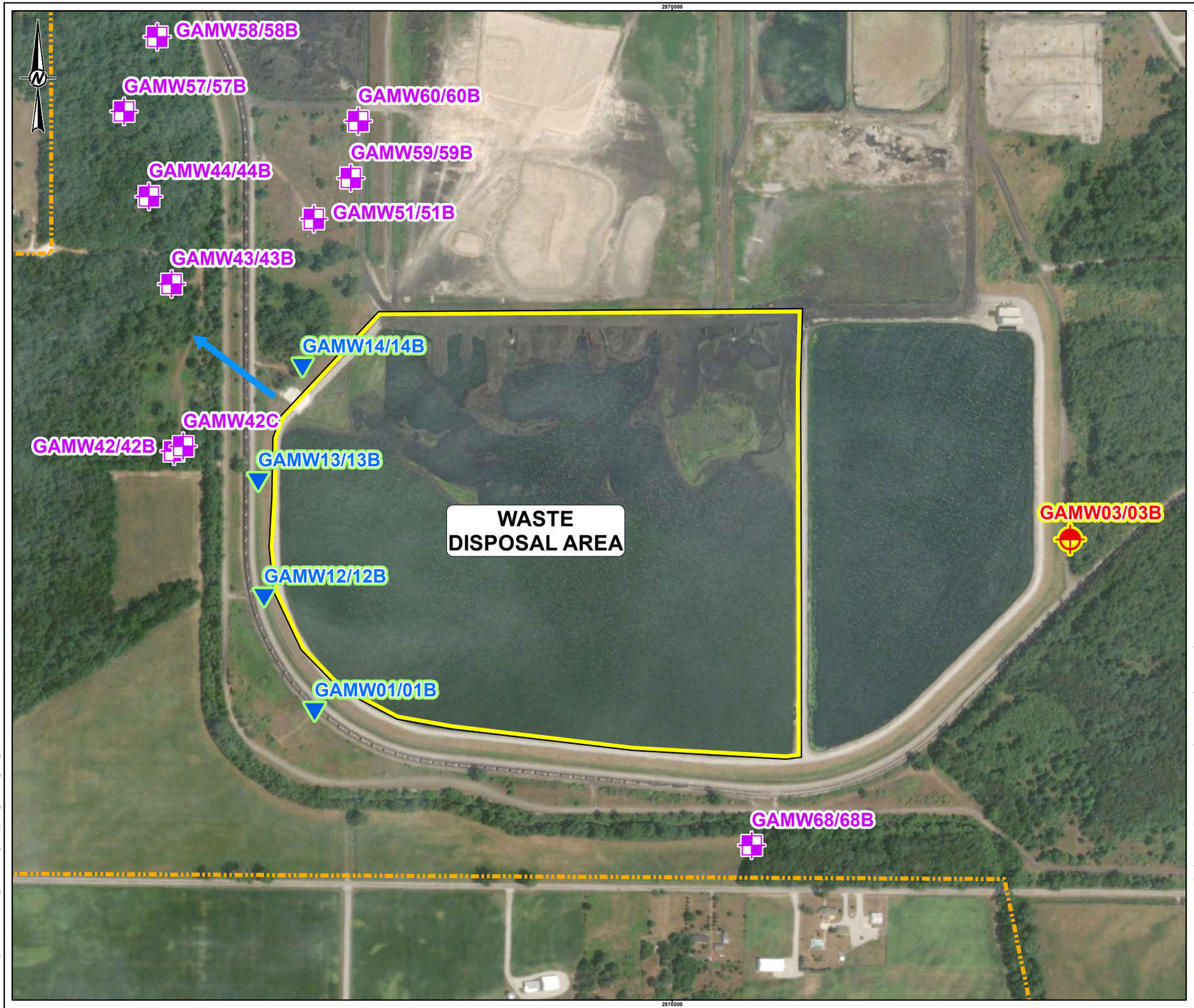
As described in the June 2020 ASD, Assessment Monitoring well GAMW60B was installed downgradient of GAMW51/51B in 2019 to further assess the nature and extent and overall groundwater quality farther downgradient of the WDA. Monitoring wells GAMW14, GAMW14B, GAMW51, and GAMW51B are all located between the WDA and Assessment Monitoring well GAMW60B (see Figure 1). The WDA has generally received and managed the same waste streams and been operated in a consistent manner since its opening more than 35 years ago. Given the lengthy time horizon of operations and geochemical fingerprints of the source materials within the CCR Unit, if the WDA was the source of molybdenum in groundwater at GAMW60B, it would be expected that upgradient wells would have similar or higher concentrations of molybdenum, which they do not.

The 2020 WDA ASD discusses three primary lines of evidence: 1) the low concentrations of molybdenum in the WDA source materials and porewater, 2) the relative major ion abundance in groundwater that demonstrates a distinct difference between WDA porewater and downgradient groundwater samples, with no indications of mixing, and 3) the waste management boundary monitoring wells GAMW14 and GAMW14B, which are located upgradient of monitoring wells GAMW51B and GAMW60B, do not indicate molybdenum above the GWPS, . Considered individually and together, these lines of evidence indicate the CCR Unit is not the source of the molybdenum in the groundwater monitored by GAMW51B and GAMW60B.

The information presented above confirms the results of the sixth Assessment Monitoring event are consistent with the previous Assessment Monitoring event, and the rationale presented in the June 9, 2020 ASD is still applicable. Golder prepared the current ASD in accordance with 40 CFR 257.95(g)(3) and it supports the finding that the SSLs determined in the February 17, 2021 statistical evaluation are not due to release from the CCR Unit. As described above and in the June 9, 2020 ASD, the source material characteristics and site hydrogeology indicate that the source of the lithium and molybdenum SSLs observed in GAMW51B and the molybdenum SSL in GAMW60B are due to a different condition and not due to a release from the WDA. Therefore, no further action (i.e., Assessment of Corrective Measures) is warranted, and the WDA will remain in Assessment Monitoring.

3.0 REFERENCES

Golder 2020. Alternative Source Demonstration - Waste Disposal Area, Golder Associates Inc., June 9, 2020.



LEGEND

- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- Generalized Groundwater Flow Direction
- Approximate Property Line
- CCR Unit

0 400 800

1 " = 400 feet Feet

NOTE(S)

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

WELL LOCATION MAP
WASTE DISPOSAL AREA

CONSULTANT

GOLDER

YYYY-MM-DD	1/8/2021
DESIGNED	DFS
PREPARED	TBH
REVIEWED	DFS
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
19121567	A	0	1

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APPENDIX B

Waste Disposal Area Alternative Source Demonstration November 2021

Northern Indiana Public Service Company LLC (NIPSCO LLC)

R. M. Schahfer Generating Station – Waste Disposal Area

Wheatfield, Indiana

Recertification of Alternative Source Demonstration

40 CFR §257.95

I have personally reviewed this recertification of the alternative source demonstration (ASD), the subject of which is the Waste Disposal Area (WDA) at the NIPSCO LLC R. M. Schahfer Generating Station, prepared by Golder Associates Inc. and dated November 2021. Based on an inquiry of those individuals immediately responsible and on supporting data that I understand to be true, accurate, and complete, I verify the information in this recertification of the ASD is accurate and meets the applicable requirements of the CCR Final Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the ASD for the regulated CCR management unit referred to as the WDA meets the applicable requirements of 40 CFR §257.95.



Joseph Bernard Gormley, Jr.
Indiana Professional Engineer
License #: PE11900213

11/12/2021
Date

TECHNICAL MEMORANDUM

DATE November12, 2021 **Project No.** 19121567

TO Jeff Loewe, Dan Sullivan, NIPSCO LLC

CC Maggie Rice, Maureen Turman, Joe Kutch, Mark Haney, Jim Peace, Joe Gormley

FROM Danielle Sylvia Cofelice **EMAIL dsylvia@golder.com**

RE: RECERTIFICATION OF R.M. SCHAHFER WASTE DISPOSAL AREA ALTERNATIVE SOURCE DEMONSTRATION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the seventh (April 2021) groundwater Assessment Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS) Waste Disposal Area (WDA, CCR Unit). This evaluation was conducted in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule" (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

The statistical evaluation of analytical data from the seventh Assessment Monitoring event was completed on August 19, 2021. The results of the statistical evaluation indicated the lower confidence level (LCL) concentrations for lithium and molybdenum in assessment monitoring well GAMW51B and molybdenum in assessment monitoring well GAMW60B exceeded background concentrations, which are interpreted as apparent evidence of statistically-significant levels (SSLs) in those wells. Although determination of apparent SSLs generally indicates that the groundwater monitoring program should transition from Assessment Monitoring to Assessment of Corrective Measures, 40 CFR §257.95(g)(3) allows the owner or operator (e.g., NIPSCO) to demonstrate that a source other than the CCR Unit or another condition caused the apparent SSLs.

Golder identified similar concentrations of lithium and molybdenum in GAMW51B after the fourth (October 2019) Assessment Monitoring event at the WDA and submitted an Alternative Source Demonstration (ASD) on June 9, 2020 (Golder 2020). As described in the ASD, the source material characteristics and site hydrogeology indicated that the apparent lithium and molybdenum SSLs observed in GAMW51B were not due to a release from the WDA. Golder recertified this ASD after the fifth Assessment Monitoring event (April 2020) and sixth Assessment Monitoring event (October 2020), which confirmed the molybdenum and lithium results observed previously in GAMW51B.

1.0 SUMMARY OF APRIL 2021 RESULTS

The lithium and molybdenum concentrations in samples collected from GAMW51B in April 2021 were 0.071 milligrams per liter (mg/L) and 0.16 mg/L, respectively. These results are less than two times the Groundwater Protection Standards (GWPS) of 0.04 mg/L and 0.1 mg/L for lithium and molybdenum, respectively, which are equal to the risk-based levels included in the CCR Rule, Part 1 Phase 1 Addendum. The molybdenum concentrations in the samples collected to date from GAMW60B range from 0.35 mg/L to 0.49 mg/L (approximately four times the GWPS of 0.1 mg/L). The most recent molybdenum and lithium results collected at

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both locations are within the range of the previous concentrations and are consistent with the previous Assessment Monitoring event.

2.0 ALTERNATIVE SOURCE DEMONSTRATION

As described in the June 2020 ASD, Assessment Monitoring well GAMW60B was installed downgradient of wells GAMW51 and GAMW51B in 2019 to further assess the nature and extent and overall groundwater quality farther downgradient of the WDA. Monitoring wells GAMW14, GAMW14B, GAMW51, and GAMW51B are all located between the WDA and Assessment Monitoring well GAMW60B (see Figure 1). The WDA has generally received and managed the same waste streams and been operated in a consistent manner since its opening more than 35 years ago. Given the lengthy time horizon of operations and geochemical fingerprints of the source materials within the CCR Unit, if the WDA was the source of molybdenum in groundwater at GAMW60B, it would be expected that wells upgradient of GAMW60B would have similar or higher concentrations of molybdenum, which they do not.

The June 2020 WDA ASD discusses three primary lines of evidence: 1) the low concentrations of molybdenum in the WDA source materials and porewater, 2) the relative major ion abundance in groundwater that demonstrates a distinct difference between WDA porewater and downgradient groundwater samples, with no indications of mixing, and 3) the waste management boundary monitoring wells GAMW14 and GAMW14B, which are located upgradient of monitoring wells GAMW51B and GAMW60B, do not indicate molybdenum above the GWPS. Considered individually and together, these lines of evidence indicate the CCR Unit is not the source of the molybdenum in the groundwater monitored by GAMW51B and GAMW60B.

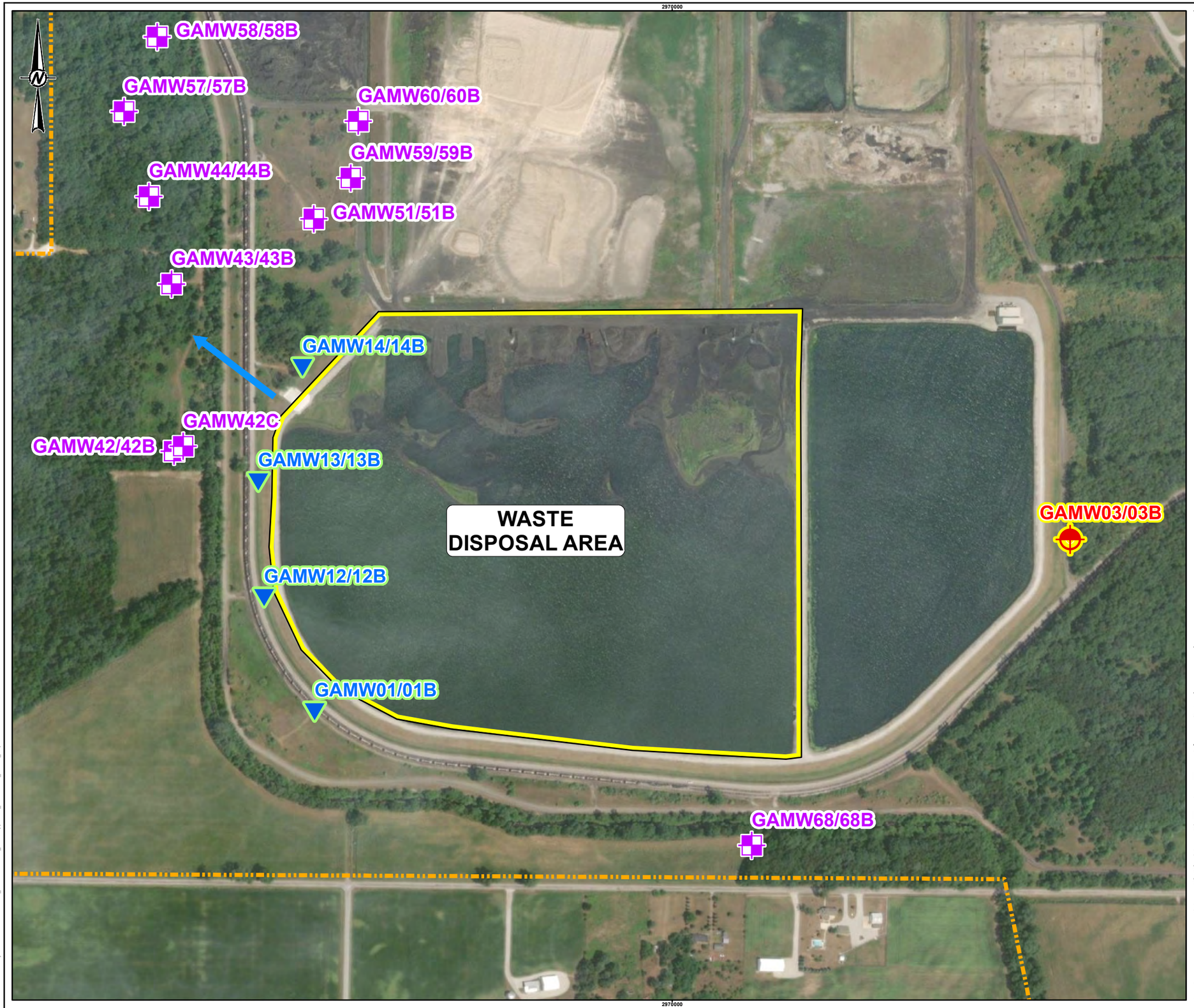
The information presented above confirms the results of the seventh Assessment Monitoring event are consistent with the previous Assessment Monitoring event, and the rationale presented in the June 9, 2020 ASD is still applicable. Golder prepared the current ASD in accordance with 40 CFR 257.95(g)(3) and it supports the finding that the SSLs determined in the August 19, 2021 statistical evaluation are not due to release from the CCR Unit. As described above and in the June 9, 2020 ASD, the source material characteristics and site hydrogeology indicate that the source of the apparent lithium and molybdenum SSLs observed in GAMW51B and the apparent molybdenum SSL in GAMW60B are due to a different condition and not due to a release from the WDA. Therefore, no further action (i.e., Assessment of Corrective Measures) is warranted, and the WDA will remain in Assessment Monitoring.

3.0 REFERENCES

Golder 2020. Alternative Source Demonstration – Waste Disposal Area, Golder Associates Inc., June 9, 2020.

Golder 2020. Recertification of R.M. Schahfer Waste Diposal Area Alternative Source Demonstration, Golder Associates Inc., December 4, 2020.

Golder 2021. Recertification of R.M. Schahfer Waste Disposal Area Alternative Source Demonstration, Golder Associates Inc., May 18, 2021.



LEGEND

- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- Generalized Groundwater Flow Direction
- Approximate Property Line
- CCR Unit

0 400 800

1 " = 400 feet Feet

NOTE(S)

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

WELL LOCATION MAP
WASTE DISPOSAL AREA

CONSULTANT

GOLDER

YYYY-MM-DD	1/8/2021
DESIGNED	DFS
PREPARED	TBH
REVIEWED	DFS
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
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2021 Annual Groundwater Monitoring and Corrective Action Report - Material Storage Runoff Basin, Metal Cleaning Waste Basin, and Drying Area

NIPSCO LLC R. M. Schahfer Generating Station

Prepared Pursuant to 40 CFR §257.90(e) and Corresponding Regulations under 329 Indiana Administrative Code 10-9-1

Submitted to:

Northern Indiana Public Service Company LLC
R.M. Schahfer Generating Station
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Submitted by:

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January 31, 2022

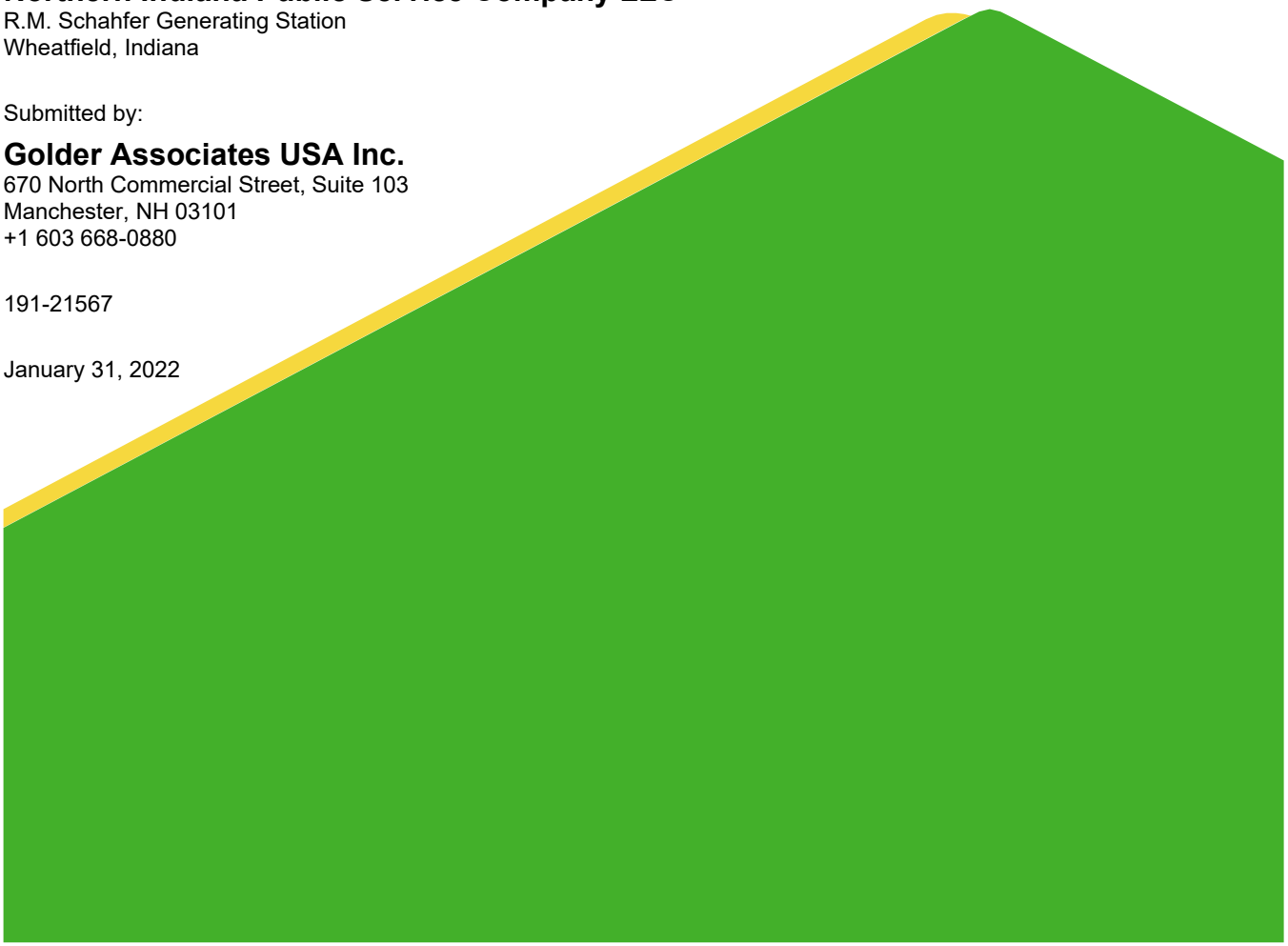


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1.0 INTRODUCTION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), Golder Associates USA Inc., *a member of WSP* (Golder), prepared this 2021 Annual Groundwater Monitoring and Corrective Action Report (2021 Annual Report) for the Rollin M. Schahfer Generating Station (RMSGS, Schahfer) Material Storage Runoff Basin (MSRB), Metal Cleaning Waste Basin (MCWB), and the Drying Area (together, the CCR Unit) located at 2723 E 1500 N, Wheatfield, Jasper County, Indiana (Latitude 41° 12' 36" and Longitude 87° 01' 48", see Figure 1). As shown in Figure 2, the Drying Area is an approximately 5.5-acre impoundment that has been filled with CCR. The MSRB and MCWB consist of two rectangular, approximately 15-acre impoundments, separated by a narrow berm, located adjacent to one another. Golder prepared the 2021 Annual Report in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, “Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule” (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

To comply with the CCR Rule, NIPSCO and Golder decided to monitor the MSRB, MCWB, and Drying Area as one CCR Unit due to the proximity of the MSRB, MCWB, and the Drying Area to one another, and because there are no practical means of monitoring groundwater between the impoundments. The CCR Unit is currently in Assessment Monitoring pursuant to 40 CFR §257.95. Routine monitoring activities performed during the reporting period include inspection of wells for integrity and security, measurement of groundwater levels prior to sample collection to assess groundwater flow direction, and collection of groundwater samples for laboratory analysis.

In conformance with the applicable requirements of 40 CFR §257.90(e)(1) through (5) and corresponding State of Indiana requirements, the 2021 Annual Report:

- Documents the status of the groundwater monitoring and corrective action program
- Provides figures showing the CCR Unit and monitoring well locations
- Summarizes key CCR Rule groundwater activities completed during calendar year 2021
- Includes CCR Rule groundwater monitoring data obtained in calendar year 2021
- Describes any problems encountered during the monitoring activities
- Discusses actions taken to resolve the problems, if applicable
- Projects key activities for the upcoming year

2.0 GROUNDWATER MONITORING AND CORRECTIVE ACTION PROGRAM OVERVIEW OF CURRENT STATUS

Starting in 2016 following the installation of a groundwater monitoring system (Table 1) and throughout calendar year 2017, Golder collected background groundwater samples and performed Detection Monitoring at the CCR Unit pursuant to the requirements of 40 CFR §257.94. Due to the identification of significantly statistical increases (SSIs) in January 2018, NIPSCO established an Assessment Monitoring program in April 2018 pursuant to the requirements of 40 CFR §257.95. In 2018, Golder performed the first and second Assessment Monitoring sampling events. Following the first Assessment Monitoring sampling event, including verification sampling, NIPSCO posted a notification to the publicly-accessible website that there were detections of 40 CFR Part 257 Appendix IV parameters downgradient of the MSRB, MCWB, and Drying Area above applicable groundwater

protection standards (GWPS). Consequently, NIPSCO initiated the assessment of corrective measures (ACM). process in November 2018. Golder performed subsequent monitoring events including:

- Third and fourth Assessment Monitoring events in 2019
- Fifth and sixth Assessment Monitoring events in 2020
- Seventh and Eighth Assessment Monitoring events in 2021

The sampling dates, number of groundwater samples collected from each background and downgradient well, and the purpose of sampling associated with the seventh and eighth Assessment Monitoring events are provided in Table 2. The 2021 analytical results are presented in Table 3. The CCR Unit began and ended the current annual reporting period in Assessment Monitoring pursuant to §257.95. Golder identified cobalt as an Appendix IV statistically significant level (SSL) in a groundwater sample collected from monitoring well GAMW-08 in 2021.

NIPSCO completed the assessment of corrective measures for groundwater impacts and prepared the ACM Report in April 2019. NIPSCO prepared Addendum #1 to the ACM Report in November 2020 and Addendum #2 to the ACM Report in July 2021. NIPSCO is continuing to evaluate the feasibility and design of potential groundwater remedial alternatives in accordance with the provisions of 40 CFR §259.97(a). NIPSCO has not selected a groundwater remedy nor completed the pond closure activities; therefore, no remediation activities were performed in 2021. NIPSCO will schedule a public meeting to present the proposed remedial approach for public comment at least 30 days prior to the selection of remedy.

2.1 Key Actions Completed - 2021

NIPSCO completed the following key actions relative to CCR Rule groundwater monitoring at the MSRB, MCWB, and Drying Area during calendar year 2021:

- Preparation of the 2020 Groundwater Monitoring and Corrective Action Annual Report in January 2021 (2020 Annual Report, 40 CFR §257.90(e))
- Evaluation of the results of the sixth Assessment Monitoring event in February 2021 (40 CFR §257.95)
- Notification that constituents in 40 CFR Part 257 Appendix IV exceeded the GWPS in March 2021 (40 CFR §257.95(g))
- Performance of the seventh Assessment Monitoring event in April 2021 (40 CFR §257.95)
- Preparation of the fourth semi-annual Selection of Remedy Progress Report in April 2021 (40 CFR §257.97)
- Preparation of Addendum #2 to the Assessment of Corrective Measures Report in July 2021 (40 CFR §257.96)
- Evaluation of the results of the seventh Assessment Monitoring event in August 2021 (40 CFR §257.95)
- Notification that constituents in 40 CFR Part 257 Appendix IV exceeded the GWPS in September 2021 (40 CFR §257.95(g))
- Performance of the eighth Assessment Monitoring event in September/October 2021 (40 CFR §257.95)
- Preparation of the fifth semi-annual Selection of Remedy Progress Report in October 2021 (40 CFR §257.97)

2.2 Monitoring System Modifications

The groundwater monitoring system did not require any modifications in 2021 (see Figure 2). Attached Table 1 provides a summary of the well rationale/purpose and date of installation. An overview of the modified groundwater monitoring network is provided in the embedded table below.

Background Monitoring Wells	Downgradient Monitoring Wells	Assessment Monitoring Wells
GAMW-04, GAMW-07, GAMW-07B, GAMW-15 and GAMW-15B	GAMW-08, GAMW-08B, GAMW-09, GAMW-09B, GAMW-16R, GAMW-16BR, GAMW-17, GAMW-17B, GAMW-18 and GAMW-18B	GAMW-46, GAMW-46B, GAMW-52, GAMW-52B, GAMW-53, GAMW-53B, GAMW-54, GAMW-54B, GAMW-55R, GAMW-55B, GAMW-56, and GAMW-56B

2.3 Background Monitoring (2016 to 2017)

Per the requirements of 40 CFR §257.94, Golder collected eight independent background groundwater samples from each background and downgradient well between July 2016 and August 2017. Golder used the results of the background monitoring phase to develop appropriate, statistically valid background values for each constituent/monitoring well. Golder submitted the samples to a contract laboratory, in accordance with chain of custody and quality assurance/quality control procedures, for analysis of 40 CFR Part 257 Appendix III and Appendix IV constituents. In addition, Golder personnel measured field water quality parameters including specific conductance, temperature, dissolved oxygen, turbidity, oxidation-reduction potential, and pH. The background data set is included in the 2017 CCR Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2018 (2017 Annual Report, Golder 2018).

Golder performed a periodic update of background datasets, which includes incorporation of additional background data, to improve statistical power and accuracy by providing a more conservative estimate of the true background populations. The CCR Rule Groundwater Monitoring Program Implementation Manual (GMPIM, Golder 2017) allows for the statistical limits to be updated after four to eight new measurements are available (i.e., every two to four years of semi-annual monitoring). Golder incorporated the new data into the background dataset, updated the GWPS, in March 2020.

2.4 Detection Monitoring

Golder performed the first Detection Monitoring event in October 2017, followed by a statistical evaluation and data analysis in January 2018. Golder collected groundwater samples from the CCR Unit background and downgradient monitoring wells for analysis of Appendix III constituents per 40 CFR §257.94 and included the results in the 2017 Annual Report. Following receipt and validation of laboratory results, Golder evaluated the results of the first Detection Monitoring sampling event to compare the concentration of 40 CFR Part 257 Appendix III constituents relative to facility background concentrations. Using Sanitas™ software, Golder pooled the background data to calculate prediction limits and compared the October 2017 results to the calculated prediction limits to identify SSIs. Due to the identification of SSIs, NIPSCO established an Assessment Monitoring program in April 2018.

2.5 Assessment Monitoring

Golder performed the first Assessment Monitoring event (i.e., Assessment and Verification sampling) in March and April 2018, followed by a statistical evaluation and data analysis in August 2018. In March 2018, Golder collected groundwater samples from each background and downgradient monitoring well for analysis of Appendix IV constituents per 40 CFR §257.95. In April 2018, groundwater samples were collected at the downgradient monitoring well locations and analyzed for Appendix III and detected Appendix IV constituents per 40 CFR §257.95. In August 2018, Golder developed GWPS to compare with the Assessment Monitoring results. Following receipt and validation of laboratory results, Golder evaluated the 40 CFR Part 257 Appendix IV constituent results relative to CCR Unit-specific GWPS (see Table 4). At the time of the statistical evaluation the GWPS was the higher value of either the Maximum Contaminant Level (MCL) or the CCR Unit-specific background concentration for each analyte calculated using a tolerance/prediction limit procedure in accordance with 40 CFR §257.95(h)(2). Results from the downgradient monitoring wells were evaluated by comparing the lower confidence limit (LCL) to the CCR Unit-specific GWPS for each 40 CFR Part 257 Appendix IV analyte at each well. If the LCL exceeds the GWPS, there is statistical evidence of a statistically significant level (SSL). Golder determined that SSLs existed for the MSRB, MCWB, and Drying Area in August 2018 and initiated the assessment of corrective measures in November 2018.

Golder performed additional Assessment Monitoring events by collecting groundwater samples from each background and downgradient monitoring well per 40 CFR §257.95 including:

- Second Assessment Monitoring Event – October 2018: Golder performed the second Assessment Monitoring event by collecting groundwater samples for analysis of Appendix III and detected Appendix IV constituents. Golder performed the statistical evaluation of the analytical results of the second Assessment Monitoring sampling event in February 2019. The results identified an SSL for cobalt at GAMW-08. The results from the first and second Assessment Monitoring events are included in the 2018 Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2019 (2018 Annual Report, Golder 2019).
- Third Assessment Monitoring Event – April 2019: Golder performed the third Assessment Monitoring event by collecting groundwater samples for analysis of Appendix III and Appendix IV constituents. Golder performed the statistical evaluation of the analytical results of the third Assessment Monitoring sampling event in August 2019. The results confirmed the SSLs cobalt at GAMW-08.
- Fourth Assessment Monitoring Event – November 2019: Golder performed the fourth Assessment Monitoring event by collecting groundwater samples for analysis of Appendix III and detected Appendix IV constituents. Golder performed the statistical evaluation of the analytical results of the second Assessment Monitoring sampling event in March 2020. The groundwater results confirmed the SSL for cobalt at well GAMW-08. The results from the third Assessment Monitoring event are included in the 2019 Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2020 (2019 Annual Report, Golder 2020).
- Boundary Well Sampling – 2019: Golder collected groundwater samples from property boundary Assessment Monitoring wells GAMW-46/46B (see Figure 2) in March, April, June, July, August, October, and November 2019. SSLs were not identified in these groundwater samples. These results are included in the 2019 Annual Report (Golder, 2020).

- Fifth Assessment Monitoring Event – April/May 2020: Golder performed the fifth Assessment Monitoring event by collecting groundwater samples for analysis of Appendix III and Appendix IV constituents. Golder performed the statistical evaluation of the analytical results of the third Assessment Monitoring sampling event in September 2020. The results confirmed the SSLs cobalt at GAMW-08.
- Sixth Assessment Monitoring Event – October 2020: Golder performed the sixth Assessment Monitoring event by collecting groundwater samples for analysis of Appendix III and detected Appendix IV constituents. Golder performed the statistical evaluation of the analytical results of the second Assessment Monitoring sampling event in February 2021. The groundwater results confirmed the SSL for cobalt at well GAMW-08. The results from the fifth and sixth Assessment Monitoring events are included in the 2020 Annual Report (Golder 2021).
- Seventh Assessment Monitoring Event – April 2021: Golder performed the seventh Assessment Monitoring event by collecting groundwater samples for analysis of Appendix III and Appendix IV constituents. Golder performed the statistical evaluation of the analytical results of the third Assessment Monitoring sampling event in August 2021. The results confirmed the SSLs cobalt at GAMW-08.
- Eighth Assessment Monitoring Event – September/October 2021: Golder performed the eighth Assessment Monitoring event by collecting groundwater samples for analysis of Appendix III and detected Appendix IV constituents. Golder will perform the statistical evaluation of the analytical results of the eighth Assessment Monitoring sampling event in January 2022.

2.6 Corrective Action

NIPSCO is evaluating the feasibility and design of the potential groundwater remedial alternatives presented in the Assessment of Corrective Measures (ACM) report (Golder, 2019). As discussed in the ACM, NIPSCO plans to close this CCR Unit by removal in accordance with 40 CFR §257.102(c). NIPSCO submitted a Closure Application to the Indiana Department of Environmental Management (IDEM) in April 2019. In November 2020, Golder submitted Addendum #1 to the Assessment of Corrective Measures Report that provided further details of Golder's evaluation of the potential corrective measures. Golder performed the following remedy selection-related activities in 2021:

- NIPSCO continued to refine the Closure Application/Design of the MCU in response to IDEM comments and submitted the final Closure Application on May 13, 2021.
- Following submittal of the final Closure Application and confirmation that IDEM was in general agreement with the modified cap design, Golder prepared the MCU Assessment of Corrective Measures - Addendum #2 to reevaluate the list of potential corrective measures identified in the ACM based on their compatibility with the modified cap design. ACM Addendum #2 revised and updated information provided in the predecessor documents and incorporated the low permeability cap design in all corrective measure alternatives identified in the ACM and in Addendum #1, effectively eliminating four of the ACM alternatives from further consideration.
- Golder performed additional engineering evaluations of the four remaining alternatives accounting for the low permeability cap design and its impact on the selection of remedy for groundwater Corrective Measures.

In 2022, Golder will continue to prepare a detailed evaluation/comparison of the groundwater corrective measure alternatives, including conceptual designs and engineering cost estimates, that will provide NIPSCO with sufficient

information to select a remedy that effectively meets the requirements of 40 CFR §257.97 including protection of public health and the environment. This detailed evaluation/comparison of corrective measures will be documented in a future Selection of Remedy Report for the CCR Unit.

2.7 Statistical Evaluation

After each monitoring event, Golder assessed the analytical data for outliers, anomalies, and trends that might be an indication of a sampling or analytical error. Outliers and anomalies are generally defined as inconsistently large or small values that can occur because of sampling, laboratory, transportation, or transcription errors, or even by chance alone. Significant trends may indicate natural geochemical variability, a source of systematic error, influence of an upgradient/off-site source, or an actual occurrence of CCR Unit influence upon groundwater quality. Appropriate statistical methods are used to remove outliers from the database and manage trends with detrending routines, prior to the calculation of statistical limits. To assess the data for outliers, anomalies, and trends, Golder assessed the data using time vs. concentration graphs, and statistical routines included in the Sanitas™ statistical analysis software package.

In addition to the outliers identified in the 2018 Annual Report and 2020 Annual Report, Golder identified the following outliers in 2021 (no outliers were identified in the 2019 Annual Report).

Golder identified all groundwater data obtained from GAMW-15, GAMW-15B, GAMW-16R, and GAMW-16BR in October 2020 and April 2021 as outliers and removed these data from the data set for the following reasons:

- Statistical testing, including the Dixon outlier test, identified several of the results from each event as outliers; and
- In Summer 2020, NIPSCO performed planned dewatering activities in near these wells during construction activities to divert discharges to the MCU. Trend charts indicate that the dewatering activities drastically affected the October 2020 data. The April 2021 data indicate that the results are trending toward preconstruction concentrations.

Golder identified the April 2021 pH results from GAMW-09, GAMW-09B, and GAMW-18 as outliers and removed these data from the data set for the following reasons:

- Statistical testing, including the Dixon outlier test, identified these results as outliers;
- Trend charts indicated that these results were inconsistent with other concentrations detected in these wells; and
- The pH field calibration check associated with these samples failed.

Golder evaluated the background data set for trends using Sanitas™ software. Golder will continue to monitor trends and apply detrending routines, if applicable, before using these data to calculate GWPS. Golder identified the following 40 CFR Part 257 Appendix IV parameter trends in background monitoring wells:

- Antimony concentrations detected in groundwater samples collected from GAMW-07 show a decreasing trend. Antimony has never been detected at concentrations above the laboratory reporting limit in groundwater samples collected from this well and all background results are below the MCL, therefore, the GWPS is equal to the MCL. No detrending routines are required.

- Arsenic concentrations detected in groundwater samples collected from wells GAMW-07 and GAMW-15B show a decreasing trend, arsenic has never been detected at concentrations above the above the MCL, therefore, the GWPS is equal to the MCL. No detrending routines are required.
- Barium concentrations detected in groundwater samples collected from well GAMW-15B show an increasing trend. All barium background results are below the MCL, therefore, the GWPS is equal to the MCL. No detrending routines are required.
- Beryllium concentrations detected in groundwater samples collected from wells GAMW-07, GAMW-15, and GAMW-15B show a decreasing trend. Beryllium has never been detected at concentrations above the laboratory reporting limit in these wells and all background results are below the MCL, therefore, the GWPS is equal to the MCL. No detrending routines are required.
- Cadmium concentrations detected in groundwater samples collected from wells GAMW-04, GAMW-15, and GAMW-15B show a decreasing trend. All background results are below the MCL, therefore, the GWPS is equal to the MCL. No detrending routines are required.
- Lead concentrations detected in groundwater samples collected from well GAMW-15B show a decreasing trend. Lead has never been detected at concentrations above the laboratory reporting limit in this well and all background results are below the health-based standard, therefore, the GWPS is equal to the health-based standard. No detrending routines are required.
- Lithium concentrations detected in groundwater samples collected from well GAMW-15B show an increasing trend. All results are below the health-based standard, therefore, the GWPS is equal to the health-based standard. No detrending routines are required.
- Thallium concentrations detected in groundwater samples collected from wells GAMW-04, GAMW-07, and GAMW-15 show a decreasing trend. All results are below the laboratory reporting limit and the MCL, therefore, the GWPS is equal to the MCL. No detrending routines are required.

2.8 Problems Encountered and Follow-Up Corrective Actions

One cooler containing the radium samples collected from GAMW-54 and GAMW-54B in the seventh Assessment Monitoring event (April 2021), was delayed during shipping. The samples were received approximately one month after collection. Since the radium analyses have no temperature requirements and the samples were received within the method holding time, the samples were analyzed despite the shipping delay. No follow-up corrective action was required.

During the seventh Assessment Monitoring event (April 2021), the pH calibration check failed on April 20, 2021. Samples were collected from wells GAMW-09, GAMW-09B, and GAMW-18 on this date. The pH values for these samples were 1 to 3 standard pH units higher than all previous events and were removed from the dataset as outliers. Golder performed maintenance on the groundwater quality meter used for sampling on April 20, 2021 and subsequent calibration checks passed.

During the seventh Assessment Monitoring event (April 2021), Golder collected groundwater from monitoring wells GAMW-15, GAMW-16BR, GAMW-54, GAMW-54B, and GAMW-56B at turbidity levels of approximately 9.82, 7.82, 6.79, 6.74, and 6.72 nephelometric turbidity units (NTUs), respectively. During the eighth Assessment Monitoring event (September/October 2021), groundwater was sampled from monitoring wells GAMW-04, GAMW-15, GAMW-16BR at turbidity levels of approximately 7.06, 6.36, and 20.19NTUs, respectively. According

to the CCR Groundwater Monitoring Program Implementation Manual (Golder 2017), groundwater samples will be collected once groundwater has achieved a turbidity level below 5 NTUs. Due to time constraints in the field, Golder purged groundwater from the wells for a minimum of two hours and sampled when turbidity appeared to stabilize (e.g., no downward or upward trend over three consecutive readings five minutes apart). Evaluation of the analytical results from these wells suggests that the slightly elevated turbidity levels had no significant effect on the representativeness of the samples of groundwater quality. During future monitoring events, Golder will purge groundwater for two hours or five well volumes, whichever is shorter. Golder will use professional judgement to assess whether purge water is representative of groundwater for sampling. If an acceptable turbidity level cannot be achieved within a reasonable timeframe (e.g., three hours), Golder will redevelop the affected monitoring wells prior to the next sampling event.

3.0 KEY ACTIVITIES PROJECTED FOR 2022

During calendar year 2022, NIPSCO anticipates conducting the following key CCR Rule groundwater monitoring activities for the MSRB, MCWB, and Drying Area:

- Prepare and submit the appropriate notifications according to the CCR Rule;
- Continue semi-annual Assessment Monitoring groundwater sampling per CCR Rule requirements;
- Continue to evaluate potential remedial alternatives and prepare semi-annual reports describing the progress in selecting and designing the remedy; and
- Inspect and maintain the monitoring system including wells, pumps, and equipment.

4.0 REFERENCES

Golder Associates, “2017 Annual Groundwater Monitoring and Corrective Action Report- Material Storage Runoff Basin, Metal Cleaning Waste Basin, and Drying Area NIPSCO R. M. Schahfer Generating Station”, January 31, 2018.

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TABLES

Table 1 Monitoring Well Network
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

CCR Unit	Well Purpose	Monitoring Well ID	Installation Date	Decommission Date (If Applicable)	Basis For Action
Material Storage Runoff Basin, Metal Cleaning Waste Basin, and Drying Area	Background Monitoring Well	GAMW-04	6/27/2015	-	Installed for groundwater quality monitoring[1]
		GAMW-07	6/29/2015	-	
		GAMW-15	5/25/2016	-	
		GAMW-15B	5/24/2016	-	
		GAMW-07B	7/25/2018	-	Installed to provide additional groundwater quality data
	Downgradient Monitoring Well	GAMW-08	6/28/2015	-	Installed for groundwater quality monitoring[1]
		GAMW-09	6/28/2015	-	
		GAMW-09B	5/24/2016	-	
		GAMW-16	5/26/2016	NA	Removed during construction activities[5]
		GAMW-16R	9/23/2020	-	Installed to replace GAMW-16[5]
		GAMW-16B	5/25/2016	9/22/2020	Decommissioned due to construction activities[6]
		GAMW-16BR	9/22/2020	-	Installed to replace GAMW-16B[6]
		GAMW-17	5/25/2016	-	Installed for groundwater quality monitoring[1]
		GAMW-17B	5/25/2016	-	
		GAMW-18	5/24/2016	-	
		GAMW-08B	7/25/2018	-	Installed to characterize the nature and extent of a potential release[2]
		GAMW-18B	7/26/2018	-	
		GAMW-52	7/30/2018	-	
		GAMW-52B	7/30/2018	-	
		GAMW-53	7/30/2018	-	
		GAMW-53B	7/30/2018	-	
		GAMW-54	7/30/2018	-	
		GAMW-54B	7/27/2018	-	
		GAMW-55	7/26/2018	6/8/2019	Decommissioned due to well casing damage[4]
		GAMW-55R	6/8/2019	-	Installed to replace GAMW-55[4]
		GAMW-55B	7/26/2018	-	Installed to characterize the nature and extent of a potential release[2]
		GAMW-56	7/27/2018	-	
		GAMW-56B	7/27/2018	-	
		GAMW-46	5/15/2018	-	Installed to monitor groundwater quality at the property boundary[3]
		GAMW-46B	5/15/2018	-	

Notes:

1) Per 40 CFR §257.93, Golder collected eight rounds of background data prior to October 17, 2017.

2) Per 40 CFR §257.95(g)(1)(i) Rule requirements, Golder collected additional data to further characterize the nature and extent of potential groundwater impacts.

3) Per 40 CFR §257.95(g)(1)(iii), Golder collected data to monitor groundwater quality in the direction of flow at the property boundary

4) Golder field personnel were unable to collect a groundwater sample from monitoring well GAMW-55 during the April 2019 Assessment Monitoring sampling event due to surface damage (i.e., tubing above the permanent pump was pinched at less than 10 feet below ground surface). The well was replaced with GAMW-55R in June 2019.

5) Monitoring well GAMW-16 was completely removed during construction excavation activities in 2020. No decommissioning was required. The well was replaced with GAMW-16R in September 2020.

6) Monitoring well GAMW-16B was decommissioned during construction activities in 2020. The well was replaced with GAMW-16BR in September 2020.

NA= Not applicable

Prepared by: KMC
Checked by: DFSC
Reviewed by: JSP

Table 2: Summary of Sampling Events
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Well Purpose	Monitoring Well ID	Sample Event #16	Sample Event #17	Total Number of Samples
Purpose of Sample		Annual Assessment Monitoring	Semi-Annual Assessment Monitoring	
Sample Parameters		Appendix III and Appendix IV	Appendix III and Detected Appendix IV	
Background Monitoring Well	GAMW-04	4/15/2021	9/23/2021	2
	GAMW-07	4/16/2021	9/21/2021	2
	GAMW-07B	4/16/2021	9/23/2021	2
	GAMW-15	4/16/2021	9/22/2021	2
	GAMW-15B	4/16/2021	9/22/2021	2
Downgradient Monitoring Well	GAMW-08	4/22/2021	9/24/2021	2
	GAMW-08B	4/22/2021	9/24/2021	2
	GAMW-09	4/20/2021	9/23/2021	2
	GAMW-09B	4/20/2021	9/23/2021	2
	GAMW-16R	4/22/2021	9/21/2021	2
	GAMW-16BR	4/22/2021	9/21/2021	2
	GAMW-17	4/14/2021	9/22/2021	2
	GAMW-17B	4/14/2021	9/22/2021	2
	GAMW-18	4/20/2021	9/16/2021	2
	GAMW-18B	4/21/2021	9/17/2021	2
	GAMW-46	4/27/2021	9/15/2021	2
	GAMW-46B	4/27/2021	9/15/2021	2
	GAMW-52	4/16/2021	9/30/2021	2
	GAMW-52B	4/16/2021	9/30/2021	2
	GAMW-53	4/16/2021	9/30/2021	2
	GAMW-53B	4/16/2021	9/30/2021	2
	GAMW-54	4/19/2021	10/1/2021	2
	GAMW-54B	4/19/2021	10/1/2021	2
	GAMW-55R	4/20/2021	10/1/2021	2
	GAMW-55B	4/20/2021	10/1/2021	2
	GAMW-56	4/20/2021	10/4/2021	2
	GAMW-56B	4/21/2021	10/4/2021	2
Total Number of Samples		27	27	54

Notes:
Sample counts do not include QA/QC samples.
(1) Sample events #1-#15 were completed prior to 2021. The purpose, sample parameters, and sample dates are included in the 2017, 2018, 2019, and 2020 Annual Reports.
(2) Semi-annual assessment monitoring parameters did not include radium.
(3) Sample events #16 and 17 correspond to the seventh and eighth Assessment Monitoring events, respectively.

Prepared by: KMC
Checked by: DFSC
Reviewed by: JSP

Table 3: Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW04			GAMW07			GAMW07B		GAMW08		GAMW08B		GAMW09		GAMW09B			GAMW15	
Sample Date		2021-04-15	2021-09-23		2021-04-16	2021-09-21		2021-04-16	2021-09-23	2021-04-22	2021-09-24	2021-04-22	2021-09-24	2021-04-20	2021-09-23	2021-04-20		2021-09-23	2021-04-16	2021-09-22
Sample Type		N	FD	N	N	FD	N	N	N	N	N	N	N	N	N	FD	N	N	N	N
Chemical Name	Unit																			
CCR Appendix III																				
Boron	mg/L	1.1	0.36	0.35	0.81	0.91	0.85	5.9	6.9	0.89	1.1	7.7	8.4	3.5	3.8	6.1	6.2	6.7	8 O	3.5
Calcium	mg/L	178	108	107	198	215	212	327	373	266	260	198	235	168	227	169	171	163	160 O	136
Chloride	mg/L	6.2	3.7	3.6	11.7	11.9	12	38	60.3	50	14.9	178	179	41.6	54.7	102	94	113	99.3 O	49.8
Fluoride	mg/L	0.2	0.35	0.35	0.66	0.85	0.85	0.79	0.95	0.97	0.44	0.9	0.73	0.26	0.34	1.4	1.4	1.3	0.76 O	0.77 J-
pH	SU	7.26		7.4	7.14		7.14	7.94	7.58	7.04	7.04	7.49	7.44	8.48 O	7.51		10.49 O	7.56	7.1 O	7.12
Sulfate	mg/L	375	116	121	352	362	359	1010	1060	477	841	751	1060	418	509	582 J	1040 J	773	371 O	265
Total Dissolved Solids	mg/L	726	381	380	846	887	894	1700	1790	1120	2380	1620	2040	659	1040	1030	982	1430	770 O	675
CCR Appendix IV																				
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 UO	0.001 U
Arsenic	mg/L	0.0019	0.0041	0.0036	0.001 U	0.0012	0.0013	0.0022	0.0022	0.001 U	0.0013	0.001 U	0.001 U	0.001 U	0.001 U	0.0033	0.0034	0.0031	0.046 O	0.09
Barium	mg/L	0.079	0.057	0.056	0.046	0.053	0.052	0.041	0.037	0.07	0.076	0.039	0.046	0.037	0.053	0.036	0.035	0.059	0.058 O	0.05
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UO	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00022	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UO	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 UO	0.002 U
Cobalt	mg/L	0.0016	0.001 U	0.001 U	0.0056	0.0061	0.006	0.0011	0.001 U	0.017	0.015	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003 O	0.0021
Fluoride	mg/L	0.2	0.35	0.35	0.66	0.85	0.85	0.79	0.95	0.97	0.44	0.9	0.73	0.26	0.34	1.4	1.4	1.3	0.76 O	0.77 J-
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 UO	0.001 U
Lithium	mg/L	0.008 U	0.008 U	0.008 U	0.008 U	0.0091	0.0088	0.008 U	0.013	0.012	0.015	0.012	0.014	0.008 U	0.008 U	0.008 U	0.008 U	0.0095	0.008 UO	0.01
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UO	0.0002 U
Molybdenum	mg/L	0.066	0.015	0.016	0.0078	0.01	0.01	0.029	0.023	0.034	0.043	0.011	0.011	0.04	0.058	0.012	0.012	0.015	0.028 O	0.027
Radium, Total	pci/l	0.659 U			1.29 U			2.16		1.57		2.53		0.649 U		0.924 U	1.67 U		0.191 UO	
Selenium	mg/L	0.0033	0.001 U	0.001 U	0.0069	0.0044	0.0039	0.001 U	0.001 U	0.01	0.005	0.001 U	0.001 U	0.0053	0.0079	0.001 U	0.001 U	0.001 U	0.0036 O	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 UO	0.001 U
Field Parameters																				
Dissolved Oxygen	mg/L	1.71		0.31	0.39		0.25	0.23	0.26	1	0.35	0.29	0.27	3.42	6.2		0.2	0.31	0.2	0.28
Oxidation-Reduction Potential	millivolts	-29		0.149	55.5		0.1	-124.1	0.224	22	19.3	-120.1	0.218	-20.6	0.2		-113.1	0.204	-64.1	0.193
pH	SU	7.26		7.4	7.14		7.14	7.94	7.58	7.04	7.04	7.49	7.44	8.48	7.51		10.49	7.56	7.1	7.12
Specific Conductance	uS/cm	950		595	1064		123	1970	222.4	1432	167.2	2151	286.3	970	138.4		1459	201.2	1153	104.8
Temperature	deg c	9.24		15.9	11.06		17	12.2	14.7	11.2	18.8	13	15.2	10.6	18.7		13.4	16.4	14.38	19.2
Turbidity	ntu	4.67		7.06	3.4		2.65	2.6	4.84	1.99	1.48	2.78	3.9	1.02	2.95		4.26	3.02	9.82	6.36

Notes:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
pCi/L = picocuries per liter
SU = Standard Units
"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"R" = Indicates the result is unusable. The sample result was rejected due to serious deficiencies in meeting quality control criteria, the analyte may or may not be present in the sample.
"O" = Indicates result is an outlier.

Table 3: Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW15B			GAMW16R		GAMW16BR		GAMW17		GAMW17B		GAMW18		GAMW18B			GAMW46	
Sample Date		2021-04-16		2021-09-22	2021-04-22	2021-09-21	2021-04-22	2021-09-21	2021-04-14	2021-09-22	2021-04-14	2021-09-22	2021-04-20	2021-09-16	2021-04-21	2021-09-17		2021-04-27	2021-09-15
Sample Type		FD	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N
Chemical Name	Unit																		
CCR Appendix III																			
Boron	mg/L	32.7 O	32.5 O	28.1	3.6 O	4.1	24.8 O	25.3	4.3	12.5	10.2	7.3	3.1	5.9	8.4	8.2	8.2	0.1 U	0.1 U
Calcium	mg/L	335 O	321 O	352	410 O	275	380 O	265	139	346	164	155	436	456	317	325	323	29.1	29.3
Chloride	mg/L	372 O	396 O	269	81.1 O	112	331 O	516	79	175	135	105	40.3	97	112	85.8	86.3	2.1	2.1
Fluoride	mg/L	0.37 O	0.35 O	0.44 J-	0.39 O	0.57	0.41 O	2.6	1.2	1.3 J-	0.3	0.49 J-	0.16	0.16 J-	0.35	0.6	0.6	0.078	0.11
pH	SU		7.15 O	7.08	7.16 O	7.1	7.21 O	7.5	7.3	7.16	7.84	7.6	10.36 O	7.1	7.51		7.34	8.36	8.16
Sulfate	mg/L	596 O	643 O	900	1060 O	633	723 O	2970	358	964	549	365	1310	1160	1260	1100	1120	33 J+	31.8
Total Dissolved Solids	mg/L	1740 O	1870 O	2030	1850 O	1370	2080 O	5970	806	1890	1250	928	1440	2020	3340	1930	2010	112	137
CCR Appendix IV																			
Antimony	mg/L	0.001 UO	0.001 UO	0.001 U	0.001 UO	0.001 U	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.001 UO	0.001 UO	0.001 U	0.0042 O	0.0088	0.001 UO	0.0042	0.0024	0.0027	0.0012	0.0021	0.001 U	0.001 U	0.0025	0.0028	0.0027	0.001 U	0.001 U
Barium	mg/L	0.18 O	0.18 O	0.17	0.074 O	0.06	0.073 O	0.041	0.059	0.17	0.094	0.053	0.044	0.057	0.041	0.028	0.029	0.005	0.0044
Beryllium	mg/L	0.0002 UO	0.0002 UO	0.0002 U	0.0002 UO	0.0002 U	0.0002 UO	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 UO	0.0002 UO	0.0002 U	0.0002 UO	0.0002 U	0.0002 UO	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 UO	0.002 UO	0.002 U	0.002 UO	0.002 U	0.002 UO	0.0023	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.0011 O	0.001 O	0.001 U	0.0064 O	0.0038	0.001 UO	0.001 U	0.0012	0.001 U	0.0015	0.001 U	0.001 U	0.0011	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	0.37 O	0.35 O	0.44 J-	0.39 O	0.57	0.41 O	2.6	1.2	1.3 J-	0.3	0.49 J-	0.16	0.16 J-	0.35	0.6	0.6	0.078	0.11
Lead	mg/L	0.001 UO	0.001 UO	0.001 U	0.001 UO	0.001 U	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.011 O	0.012 O	0.026	0.008 UO	0.011	0.033 O	0.031	0.008 U	0.021	0.008 U	0.008 U	0.008 U	0.011	0.037	0.031	0.028	0.008 U	0.008 U
Mercury	mg/L	0.0002 UO	0.0002 UO	0.0002 U	0.0002 UO	0.0002 U	0.0002 UO	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.0012 O	0.0012 O	0.0029	0.027 O	0.019	0.001 UO	0.043	0.012	0.01	0.0058	0.012	0.082	0.14	0.074	0.03	0.031	0.001 U	0.001 U
Radium, Total	pci/l	2.96 O	2.15 O		0.968 UO		2.06 O		1.05 U		1.47 U		0.538 U		2.14			1.28 U	
Selenium	mg/L	0.001 UO	0.001 UO	0.001 U	0.001 UO	0.001 U	0.001 UO	0.0013	0.01	0.0036	0.001 U	0.001 U	0.042	0.028	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 UO	0.001 UO	0.001 U	0.001 UO	0.001 U	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																			
Dissolved Oxygen	mg/L		0.26	0.32	0.27	0.29	0.28	0.31	2.52	3.75	0.21	0.29	6.82	5.39	0.25		0.19	1.59	1.26
Oxidation-Reduction Potential	millivolts		-65.7	0.164	-78.9	0.208	-95.1	0.212	29.8	10.2	-117.5	0.215	-64.3	56.8	-104.5		0.192	109.8	-130
pH	SU		7.15	7.08	7.16	7.1	7.21	7.5	7.3	7.16	7.84	7.6	10.36	7.1	7.51		7.34	8.36	8.16
Specific Conductance	uS/cm		2491	286.6	2025	185	2510	795.5	1152	236.5	1778	138.8	1699	245.9	2494		247.3	238.2	238
Temperature	deg c		17.6	17	15.08	25	16.38	19.5	11.95	21.8	15.19	16.7	10.29	21.4	12.15		15.8	10.7	15.1
Turbidity	ntu		1.1	1.7	4.65	1.79	7.82	20.19	1.25	1.47	1.44	4.22	2.84	3.74	4.19		4.59	1.73	3.21

Notes:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
pCi/L = picocuries per liter
SU = Standard Units
"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"R" = Indicates the result is unusable. The sample result was rejected due to serious deficiencies in meeting quality control criteria, the analyte may or may not be present in the sample.
"O" = Indicates result is an outlier.

Table 3: Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW46B		GAMW52		GAMW52B		GAMW53		GAMW53B		GAMW54		GAMW54B		GAMW55R	
	Sample Date	2021-04-27	2021-09-15	2021-04-16	2021-09-30	2021-04-16	2021-09-30	2021-04-16	2021-09-30	2021-04-16	2021-09-30	2021-04-19	2021-10-01	2021-04-19	2021-10-01	2021-04-20	2021-10-01
	Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Chemical Name	Unit																
CCR Appendix III																	
Boron	mg/L	0.1 U	0.1 U	0.1	0.1	1.2	0.64	0.1 U	0.1 U	1.9	2.7	0.5	0.63	3.1	3.1	0.87	1.7
Calcium	mg/L	54.3	51	59.9	62.5	94.9	120	17.5	28.3	142	128	164	114	236	190	237	197
Chloride	mg/L	5.5	5.4	18.7	15.9	131	135	2.4	2.7	84.8	66.4	53.9	24.6	83.9	70.4	51.4	44.1
Fluoride	mg/L	0.077	0.12	0.22	0.31	0.24	0.38	0.05 U	0.05 U	0.4	0.46	0.2	0.3	0.53	0.52	0.46	0.51
pH	SU	7.69	7.73	7.5	7.6	7.46	7.57	5.76	6.17	7.28	7.48	6.52	6.82	7.3	7.36	7.6	7.27
Sulfate	mg/L	61.6 J+	55.3	55.8	50.1	181	156	35.2	49.4	304	295	492	191	891	501	867	389
Total Dissolved Solids	mg/L	190	243	269	276	673	667	97	147	748	802	735	506	1120	1030	842	948
CCR Appendix IV																	
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.0011	0.0011	0.0012	0.0012	0.001 U	0.0014	0.0075	0.024	0.0044	0.004	0.001 U	0.001 U
Barium	mg/L	0.025	0.023	0.011	0.014	0.15	0.14	0.027	0.033	0.067	0.051	0.071	0.048	0.063	0.056	0.032	0.038
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0011	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	0.077	0.12	0.22	0.31	0.24	0.38	0.05 U	0.05 U	0.4	0.46	0.2	0.3	0.53	0.52	0.46	0.51
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.01
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.0018	0.0018	0.0021	0.0025	0.013	0.011	0.0052	0.0097	0.015	0.011	0.011	0.025	0.017	0.025	0.013	0.017
Radium, Total	pci/l	1.65 U		0.23 U		1.05 U		0 U		1.21 U		0.694 U		1.43		1.47 R	
Selenium	mg/L	0.001 U	0.001 U	0.0011	0.001 U	0.001 U	0.001 U	0.001 U	0.0019	0.001 U	0.001 U	0.0044	0.001 U	0.001 U	0.001 U	0.0029	0.0046
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																	
Dissolved Oxygen	mg/L	0.64	0.2	0.91	0.56	0.42	0.28	1.99	0.92	0.39	0.24	0.68	0.29	0.45	0.26	1.19	0.47
Oxidation-Reduction Potential	millivolts	-101.3	-241	-23.1	0.38	-123.5	0.241	111.7	94.9	-104	-232.6	81.2	-153.9	-105.3	-211.7	32.3	-16.8
pH	SU	7.69	7.73	7.5	7.6	7.46	7.57	5.76	6.17	7.28	7.48	6.52	6.82	7.3	7.36	7.6	7.27
Specific Conductance	uS/cm	351	388	545	501	1159	110.4	173	204	1227	125.6	1097	782	1626	149.4	1319	139.1
Temperature	deg c	11.37	12.2	12	20	15.8	18	13	20.4	17.6	20	11.8	20.1	14.3	17.3	11.3	20.6
Turbidity	ntu	4.58	4.3	1.79	1.39	3.9	1.27	4.56	4.51	3.27	3.62	6.79	3.79	6.74	3.54	2.35	1.59

Notes:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
pCi/L = picocuries per liter
SU = Standard Units
"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"R" = Indicates the result is unusable. The sample result was rejected due to serious deficiencies in meeting quality control criteria, the analyte may or may not be present in the sample.
"O" = Indicates result is an outlier.

GOLDER
MEMBER OF WSP

Table 3: Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW55B		GAMW56		GAMW56B	
	Sample Date	2021-04-20	2021-10-01	2021-04-20	2021-10-04	2021-04-21	2021-10-04
	Sample Type	N	N	N	N	N	N
Chemical Name	Unit						
CCR Appendix III							
Boron	mg/L	9.9	8.3	0.23	0.19	1.6	1.4
Calcium	mg/L	254	205	130	108	157	160
Chloride	mg/L	120	79.4	2.9	1.7	70.8	73.7
Fluoride	mg/L	0.3	0.3	0.05 U	1	0.41	0.46
pH	SU	7.7	7.44	7.05	7.09	7.55	7.34
Sulfate	mg/L	985	496	57.6	64.8	277	268
Total Dissolved Solids	mg/L	1370	1120	480	379	738	802
CCR Appendix IV							
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.001 U	0.001 U	0.007	0.0018	0.001 U	0.001 U
Barium	mg/L	0.061	0.05	0.042	0.04	0.071	0.081
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.001 U	0.016	0.0045	0.001 U	0.001 U
Fluoride	mg/L	0.3	0.3	0.05 U	1	0.41	0.46
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.008 U	0.012	0.008 U	0.008 U	0.008 U	0.0091
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.0068	0.0058	0.0083	0.011	0.0074	0.0062
Radium, Total	pci/l	1.49 U		0.222 U		2.97	
Selenium	mg/L	0.001 U	0.001 U	0.0011	0.001 U	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters							
Dissolved Oxygen	mg/L	0.65	0.26	1	0.37	0.23	0.29
Oxidation-Reduction Potential	millivolts	-97.3	-213.9	65.9	-133.7	-110.5	-214.1
pH	SU	7.7	7.44	7.05	7.09	7.55	7.34
Specific Conductance	uS/cm	1896	162.3	740	655	1100	124.4
Temperature	deg c	15.3	18.7	9	17.2	12	14.3
Turbidity	ntu	4.78	4.48	2.67	3.48	6.72	4.65

Notes:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
pCi/L = picocuries per liter
SU = Standard Units
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"R" = Indicates the result is unusable. The sample result was rejected due to serious deficiencies in meeting quality control criteria, the analyte may or may not be present in the sample.
"O" = Indicates result is an outlier.

Prepared by: SLG
Checked by: DFSC
Reviewed by JSP

GOLDER
MEMBER OF WSP

Table 4: Groundwater Protection Standards
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

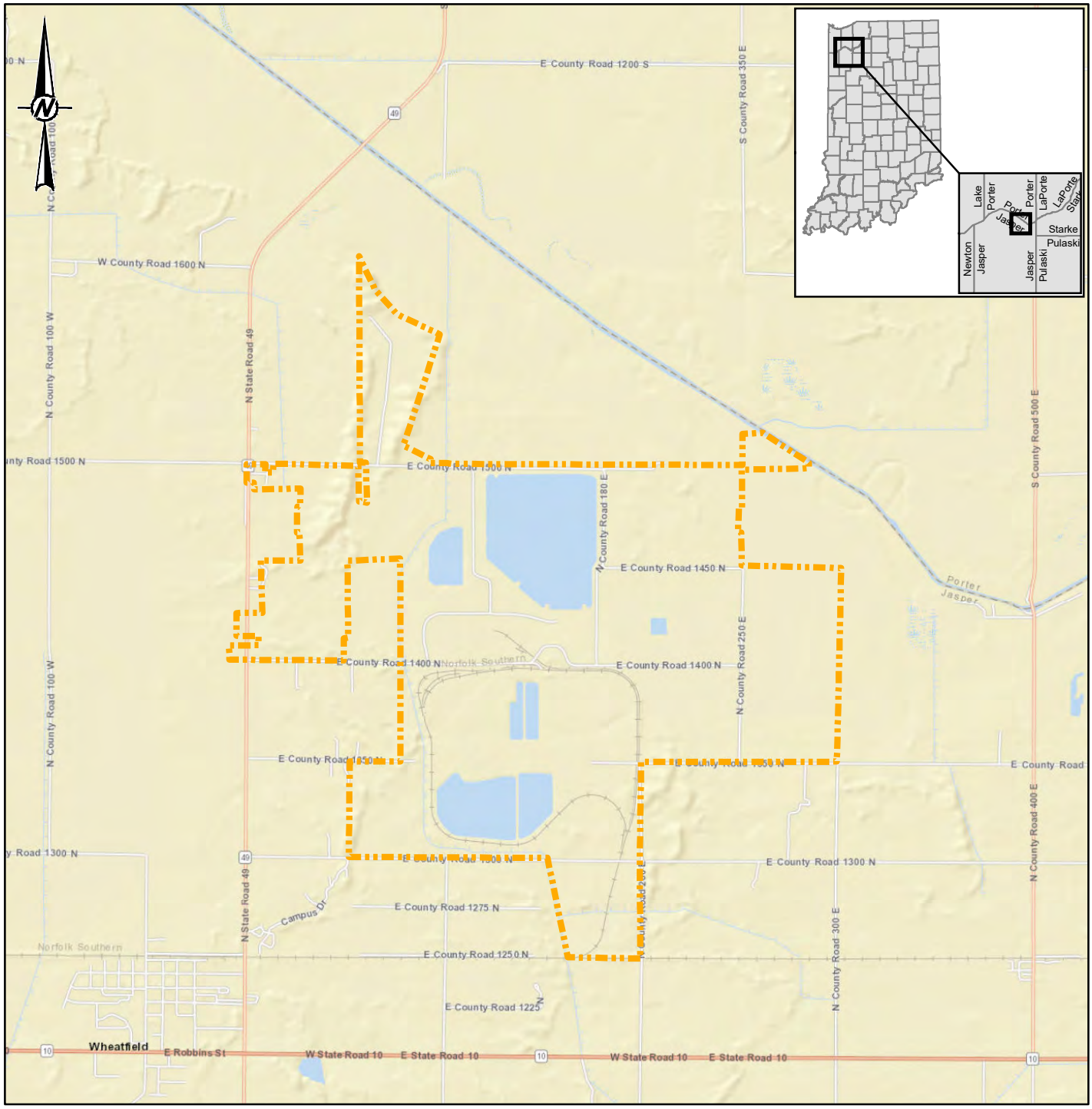
Analyte	MCL (mg/L)	GWPS (mg/L)[2]	GWPS (mg/L)[3]
Antimony	0.006	0.006	0.006
Arsenic	0.01	0.078	0.091
Barium	2	2	2
Beryllium	0.004	0.004	0.004
Cadmium	0.005	0.005	0.005
Chromium	0.1	0.1	0.1
Cobalt[1]	0.006	0.01	0.01
Fluoride	4	4	4
Lead[1]	0.015	0.015	0.015
Lithium[1]	0.04	0.04	0.04
Mercury	0.002	0.002	0.002
Molybdenum[1]	0.1	0.1	0.1
Radium 226+228	5	5	5
Selenium	0.05	0.05	0.05
Thallium	0.002	0.002	0.002

Notes:
MCL= Environmental Protection Agency Maximum Contaminant Level
GWPS= Groundwater Protection Standard
mg/L= milligrams per liter

1) As of August 29, 2018, these four constituents have health-based standards that can be used when calculating the GWPS, these health-based standards are not MCLs but are provided in the MCL column.
2) GWPS calculated in August 2018.
3) GWPS calculated in March 2020.

Prepared by: KMC
Checked by: DFSC
Review by: JSP

FIGURES



LEGEND

Approximate Property Line

0 0.75 1.5

1 " = 0.75 miles Miles

REFERENCE(S)

SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

SITE LOCATION MAP

CONSULTANT

GOLDER
MEMBER OF WSP

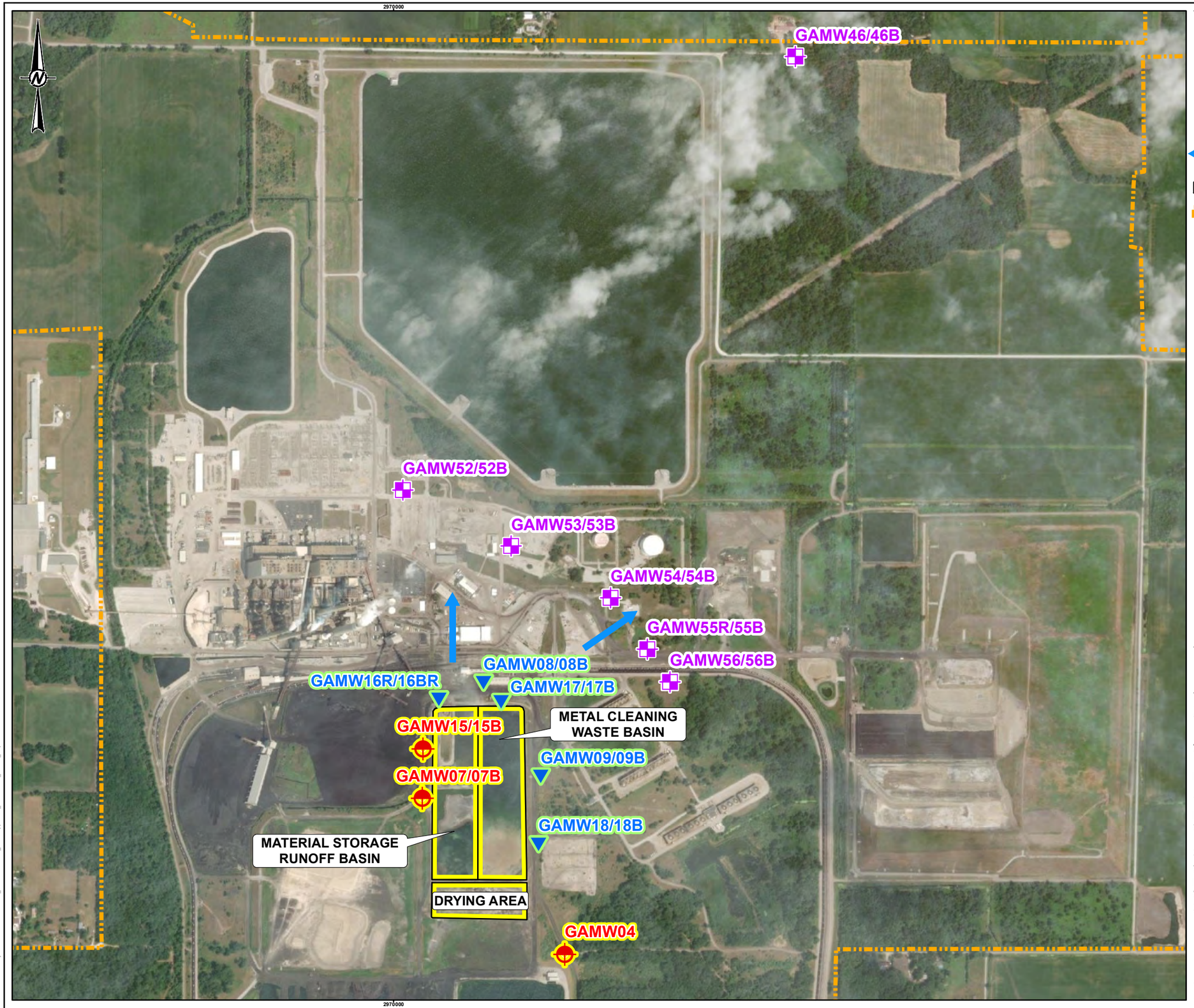
YYYY-MM-DD	1/4/2021
DESIGNED	DFS
PREPARED	SHL
REVIEWED	JSP
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
19121567	A	0	1

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in
0



LEGEND

- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- Generalized Groundwater Flow Direction
- CCR Units
- Approximate Property Line

0 850 1,700

1 " = 850 feet Feet

NOTE(S)

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

WELL LOCATION MAP
MATERIAL STORAGE RUNOFF BASIN, METAL CLEANING WASTE BASIN, AND DRYING AREA

CONSULTANT

GOLDER
MEMBER OF WSP

YYYY-MM-DD	1/8/2021
DESIGNED	DFS
PREPARED	TBH
REVIEWED	DFS
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
19121567	A	0	2

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



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2021 Annual Groundwater Monitoring and Corrective Action Report
Landfill Phase V, Phase VI, and Phase VII

NIPSCO LLC R. M. Schahfer Generating Station

Prepared Pursuant to 40 CFR §257.90(e) and Corresponding Regulations under 329 Indiana Administrative Code 10-9-1

Submitted to:

Northern Indiana Public Service Company LLC
R.M. Schahfer Generating Station
Wheatfield, Indiana

Submitted by:

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191-21567

January 31, 2022

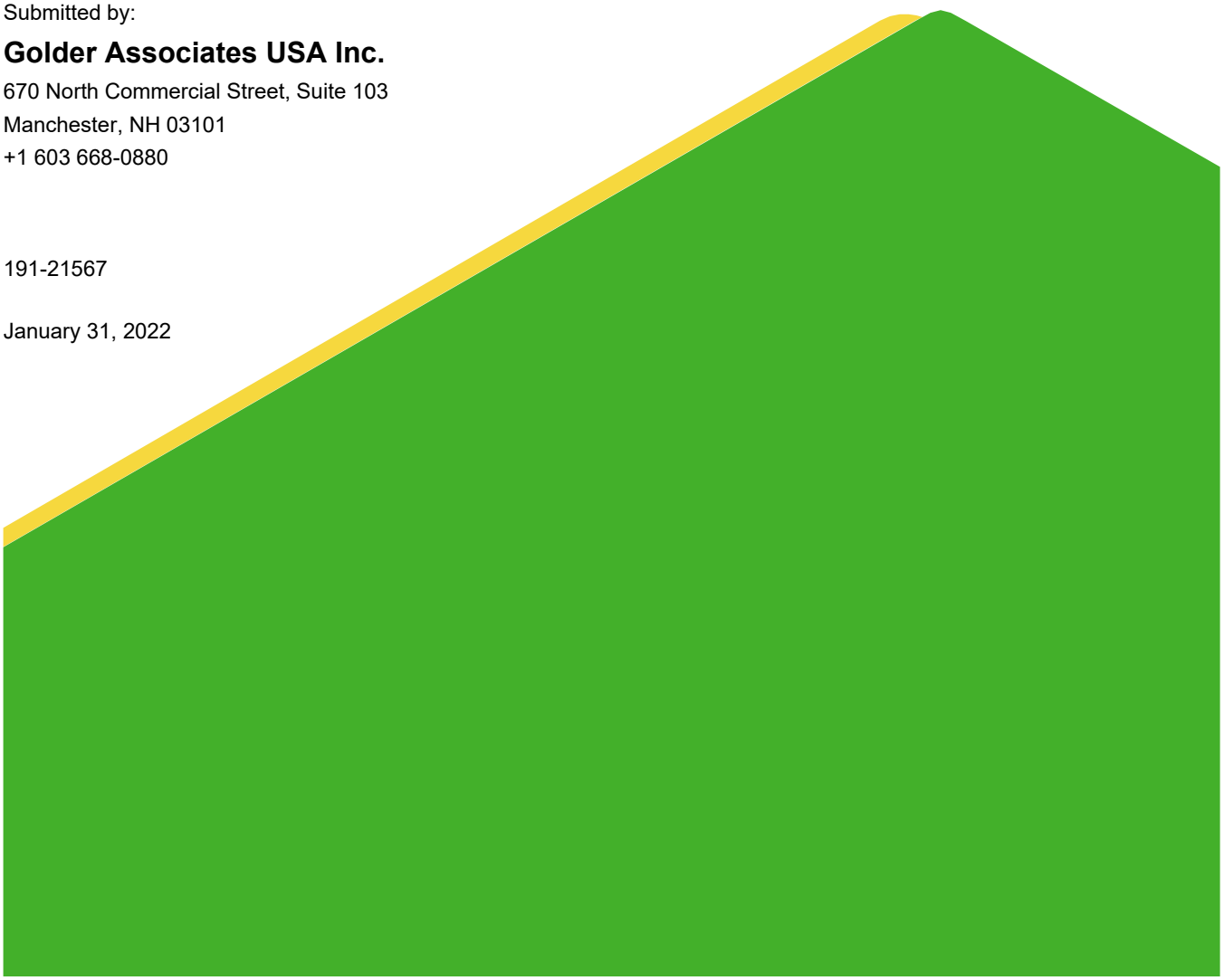


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APPENDICES

APPENDIX A
RMSGS Landfill Phases V, VI, and VII Alternative Source Demonstration March 2021

APPENDIX B
RMSGS Landfill Phases V, VI, and VII Alternative Source Demonstration October 2021

1.0 INTRODUCTION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), Golder Associates USA Inc., *a member of WSP* (Golder), prepared this 2021 Annual Groundwater Monitoring and Corrective Action Report (2021 Annual Report) for the Rollin M. Schahfer Generating Station (RMSGS, Schahfer) Landfill Phases V, VI, and VII (together, the CCR Unit) located at 2723 E 1500 N in Wheatfield, Jasper County, Indiana (Latitude 41° 12' 36" N and Longitude 87° 01' 48" W, see Figure 1). The three landfill phases include:

- Phase V is an approximately 18-acre cell that stopped receiving CCR on April 1, 2017
- Phase VI is an approximately 15-acre cell located due north of Phase V, which began receiving CCR on August 1, 2016 and stopped receiving CCR on June 25, 2021
- Phase VII is an approximately 14-acre lined cell located immediately north of Phase VI, which began receiving waste on June 24, 2021. NIPSCO designed Phase VII to meet the CCR Rule liner requirements.

Closed, non-regulated (under the CCR Rule) Schahfer Landfill Phases I through IV are primarily located east of the CCR Rule-regulated landfill cells as shown in Figure 2. Golder prepared the 2021 Annual Report in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, “Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule” (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

To comply with the CCR Rule, NIPSCO and Golder decided to monitor Phases V, VI, and VII as one CCR Unit due to the design, construction, and proximity of historical non-regulated landfill cells (i.e., Phases II and III) and because there is no practical means of monitoring groundwater between the three CCR landfill cells (i.e., Phases V, VI, and VII). NIPSCO updated the monitoring well network in 2018 concurrent with construction of Phase VII. The CCR Unit is currently in Detection Monitoring pursuant to 40 CFR §257.94. Routine monitoring activities performed during the reporting period include inspection of wells for integrity and security, measurement of groundwater levels prior to sample collection to assess groundwater flow direction, and collection of samples for laboratory analysis.

In conformance with the applicable requirements of 40 CFR §257.90(e)(1) through (5) and corresponding State of Indiana requirements, the 2021 Annual Report:

- Documents the status of the groundwater monitoring and corrective action program
- Provides figures showing the CCR Unit and monitoring well locations
- Summarizes key CCR Rule groundwater activities completed during calendar year 2021
- Includes CCR Rule groundwater monitoring data obtained in calendar year 2021
- Describes any problems encountered during monitoring activities
- Discusses actions taken to resolve the problems, if applicable
- Projects key activities for the upcoming year

2.0 GROUNDWATER MONITORING AND CORRECTIVE ACTION PROGRAM OVERVIEW OF CURRENT STATUS

Starting in 2016 following the installation of a groundwater monitoring system (Table 1) and throughout calendar years 2017 and 2018, Golder collected background groundwater samples and performed Detection Monitoring at the CCR Unit pursuant to the requirements of 40 CFR §257.94. Following the identification of statistically significant increases (SSIs) in January 2018, Golder prepared an alternative source demonstration (ASD) in April 2018, consequently, the CCR Unit remained in Detection Monitoring. Golder performed the fourth and fifth Detection Monitoring sampling events in 2019, the sixth and seventh Detection Monitoring sampling events in 2020, and the eighth and ninth Detection Monitoring events in 2021. The sampling dates, number of groundwater samples collected from each background and downgradient well, and the purpose of sampling associated with the eighth and ninth Detection Monitoring events are provided in Table 2. The 2021 analytical results are presented in Table 3. The SSIs identified in 2021 are summarized in the embedded table below.

Monitoring Well ID	Boron	Calcium	Chloride	Fluoride	Sulfate	pH[1]	TDS
GAMW26				X			
GAMW27	X	X			X		X
GAMW27B	X	X	X		X		X
GAMW38B	X	X			X		X
GAMW39B	X	X	X		X		X
GAMW40	X	X					X
GAMW40B	X		X		X	X	X
GAMW41	X		X		X		X
GAMW41B	X	X	X		X		X

"X" represents an SSI
1 = pH value is based on field water quality meter reading

Pursuant to 40 CFR §257.94, a qualified Indiana-licensed professional engineer recertified the ASD in March and October 2021; thus, the CCR Unit began and ended the current annual reporting period in Detection Monitoring. Based upon groundwater monitoring results collected pursuant to the CCR Rule to date, no corrective measures program requirements as outlined in 40 CFR §257.96-98 have either been triggered or implemented at the CCR Unit.

2.1 Key Actions Completed - 2021

NIPSCO completed the following key actions relative to CCR Rule groundwater monitoring at the CCR Unit during calendar year 2021:

- Preparation of the of 2020 Groundwater Monitoring and Corrective Action Annual Report in January 2021 (2020 Annual Report, 40 CFR §257.90(e))

- Recertification of the RMSGS Landfill Phases V, VI, and VII Alternative Source Demonstration (ASD) in March 2021 (40 CFR §257.94(e))
- Performance of the eighth Detection Monitoring event in April 2021 (40 CFR §257.94)
- Evaluation of the results of the eighth Detection Monitoring event in July 2021 (40 CFR §257.95(d))
- Performance of the ninth Detection Monitoring event in September 2021 (40 CFR §257.94)
- Recertification of the RMSGS Landfill Phases V, VI, and VII ASD in October 2021 (40 CFR §257.94(e))
- Evaluation of the results of the ninth Detection Monitoring event in December 2021 (40 CFR §257.95(d))

2.2 Monitoring System Modifications

The groundwater monitoring system did not require any modifications in 2021 (see Figure 2). Table 1 provides a summary of the well rationale/purpose and date of installation. An overview of the groundwater monitoring network is provided below.

Background Monitoring Wells	Downgradient Monitoring Wells	Decommissioned Monitoring Wells
GAMW-20, GAMW-24, GAMW-24B, GAMW-25, GAMW-25B	GAMW-26, GAMW-26B, GAMW-27, GAMW-27B, GAMW-38, GAMW-38B, GAMW-39, GAMW-39B, GAMW-40, GAMW-40B, GAMW-41, GAMW-41B	GAMW-21, GAMW-21B, GAMW-22, GAMW-22B, GAMW-23, GAMW-23B, GAMW-28, GAMW-28B

2.3 Background Monitoring (2016 to 2017)

Per the requirements of 40 CFR §257.94, Golder collected eight independent background groundwater samples from each background and downgradient well between July 2016 and August 2017. Golder used the results of the background monitoring phase to develop appropriate, statistically valid background values for each constituent/monitoring well. Golder submitted the samples to a contract laboratory, in accordance with chain of custody and quality assurance/quality control procedures, for analysis of 40 CFR Part 257 Appendix III and Appendix IV constituents. In addition, Golder personnel measured field water quality parameters including specific conductance, temperature, dissolved oxygen, turbidity, oxidation-reduction potential, and pH. The background data set is included in the 2017 Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2018 (2017 Annual Report, Golder 2018).

Golder performed a periodic update of background datasets, which includes incorporation of additional background data, to improve statistical power and accuracy by providing a more conservative estimate of the true background populations. The CCR Rule Groundwater Monitoring Program Implementation Manual (GMPIM, Golder 2017) allows for the statistical limits to be updated after four to eight new measurements are available (i.e., every two to four years of semi-annual monitoring). Golder incorporated new data into the background dataset, updating the prediction limits, in June 2019 and July 2021.

2.4 Detection Monitoring

Golder performed the first Detection Monitoring event in October 2017, followed by a statistical evaluation and data analysis in January 2018. Golder collected groundwater samples from Landfill Phases V and VI background and downgradient monitoring wells for analysis of Appendix III constituents per 40 CFR §257.94 and included the results in the 2017 Annual Report. Following receipt and validation of laboratory results, Golder evaluated the results of the first Detection Monitoring sampling event to compare the concentration of 40 CFR Part 257 Appendix III constituents relative to facility background concentrations. Using Sanitas™ software, Golder pooled the background data to calculate prediction limits and compared the October 2017 results to the calculated prediction limits to identify SSIs.

Golder determined that SSIs existed for Phases V and VI in January 2018. Golder identified a potential alternative source that could explain the SSIs and prepared an ASD. A qualified Indiana-licensed professional engineer certified the ASD in April 2018. The ASD supports the findings that the SSIs determined in January 2018 do not result from a release from the CCR Unit. The key supporting lines of evidence described in the ASD indicate that the closed, non-regulated phases of the landfill (i.e., Phases I and II) are the source of the SSIs. Therefore, no further action (i.e., Assessment Monitoring) was warranted, and Phases V and VI appropriately remained in Detection Monitoring. The ASD is presented in Appendix A of the 2018 Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2019 (2018 Annual Report, Golder 2019).

Golder performed the second and third Detection Monitoring events in 2018, the fourth and fifth detection monitoring events in 2019, and the sixth and seventh Detection Monitoring events in 2020. After each Detection Monitoring event, Golder determined that SSIs existed. Consistent with the previous evaluation, Golder identified a potential alternative source that explained the SSIs and a qualified Indiana-licensed professional engineer recertified the ASD, confirming that Phases V, VI, and VII remain in Detection Monitoring.

Golder performed the seventh Detection Monitoring event in September 2020 followed by a statistical evaluation and data analysis in December 2020 that determined that SSIs existed for Phases V, VI, and VII. Consistent with previous evaluations, Golder identified a potential alternative source that explained the SSIs. A qualified Indiana-licensed professional engineer recertified the ASD in March 2021 (Appendix A), confirming Phases V, VI, and VII appropriately remain in Detection Monitoring. The results from the second to seventh Detection Monitoring events and the corresponding ASDs are included in the 2018, 2019, and 2020 Annual Groundwater Monitoring and Corrective Action Reports (Golder 2019, 2020, 2021).

Golder performed the eighth Detection Monitoring event in April 2021 followed by a statistical evaluation and data analysis in July 2021 that determined that SSIs existed for Phases V, VI, and VII. Consistent with previous evaluations, Golder identified a potential alternative source that explained the SSIs. A qualified Indiana-licensed professional engineer recertified the ASD in October 2021 (Appendix B), confirming Phases V, VI, and VII appropriately remain in Detection Monitoring. The SSIs from the eighth Detection Monitoring event are summarized in the table below by downgradient monitoring well and constituent.

Monitoring Well ID	Boron	Calcium	Chloride	Fluoride	Sulfate	pH[1]	Total Dissolved Solids
GAMW26				X			
GAMW27	X	X			X		X
GAMW27B	X	X	X		X		X
GAMW38B	X	X			X		X
GAMW39B	X	X	X		X		X
GAMW40		X					X
GAMW40B	X		X		X	X	X
GAMW41	X		X		X		X
GAMW41B	X		X		X		X

"X" represents an SSI
1 = pH value is based on field water quality meter reading

Golder performed the ninth Detection Monitoring event in September 2021 followed by a statistical evaluation and data analysis in December 2021 that determined that SSIs existed for Phases V, VI, and VII. The SSIs are summarized in the table below by downgradient monitoring well and constituent.

Monitoring Well ID	Boron	Calcium	Chloride	Fluoride	Sulfate	pH[1]	Total Dissolved Solids
GAMW-27	X	X			X		X
GAMW-27B	X	X	X		X		X
GAMW-38B	X	X			X		X
GAMW-39B	X	X	X		X		X
GAMW-40	X	X					X
GAMW-40B	X		X		X		X
GAMW-41	X				X		X
GAMW-41B	X	X	X		X		X

"X" represents an SSI
1 = pH value is based on field water quality meter reading

2.5 Statistical Evaluation

Subsequent to each monitoring event, Golder assessed the analytical data for outliers, anomalies, and trends that may be an indication of a sampling or analytical error. Outliers and anomalies are generally defined as inconsistently large or small values that can occur because of sampling, laboratory, transportation, or transcription errors, or even by chance alone. Significant trends may indicate natural geochemical variability, a source of systematic error, influence of an upgradient/off-site source, or an actual occurrence of CCR Unit influence upon groundwater quality. Appropriate statistical methods are used to remove outliers from the database and manage trends with detrending routines, prior to the calculation of statistical limits. To assess the data for outliers, anomalies, and trends, Golder assessed the data using time vs. concentration graphs, and statistical routines included in the Sanitas™ statistical analysis software package. Golder did not identify any new outliers since the 2020 Annual Report.

Golder will continue to monitor trends and, if the CCR Unit enters Assessment Monitoring, detrending routines will be performed before using these data to calculate groundwater protection standards (GWPS).

2.6 Problems Encountered and Follow-Up Corrective Actions

In the eighth Detection Monitoring event (April 2021), Golder collected a groundwater sample from GAMW-24B at a turbidity level of approximately 7.77 nephelometric turbidity units (NTUs) and from GAMW-38 at approximately 7.49 NTUs. In the ninth Detection Monitoring event (September 2021), Golder collected a groundwater sample from GAMW-20 at a turbidity of approximately 5.22 NTUs and from GAMW-24B at approximately 5.64 NTUs. According to the CCR Groundwater Monitoring Program Implementation Manual (Golder 2017), groundwater samples are to be collected once a well has achieved a turbidity level below 5 NTUs. Due to time constraints in the field, groundwater is purged for a minimum of two hours and sampled when turbidity appeared to stabilize (e.g., no downward or upward trend over three consecutive readings five minutes apart). Evaluation of the analytical results from these wells suggests that the slightly elevated turbidity levels had no significant effect on the representativeness of the samples of groundwater quality. During future monitoring events, Golder will purge groundwater for two hours or five well volumes, whichever is shorter. Golder will use professional judgement to assess when the purge water is representative of groundwater for sampling. If an acceptable turbidity level cannot be achieved within a reasonable timeframe (e.g., three hours), Golder will redevelop the affected monitoring wells prior to the next sampling event.

3.0 KEY ACTIVITIES PROJECTED FOR 2022

During calendar year 2022, NIPSCO anticipates conducting the following key CCR Rule groundwater monitoring activities for the RMSGS Landfill Phases V, VI, and VII:

- Prepare and submit the appropriate notifications according to the CCR Rule
- Continue semi-annual Detection Monitoring groundwater sampling per CCR Rule requirements
- Inspect and maintain the monitoring system including wells, pumps, and equipment.

4.0 REFERENCES

Golder Associates, “2017 Annual Groundwater Monitoring and Corrective Action Report- Landfill Phase V and Phase VI NIPSCO R. M. Schahfer Generating Station”, January 31, 2018.

Golder Associates, “2018 Annual Groundwater Monitoring and Corrective Action Report- Landfill Phase V and Phase VI NIPSCO R. M. Schahfer Generating Station”, January 31, 2019.

Golder Associates, “2019 Annual Groundwater Monitoring and Corrective Action Report- Landfill Phase V and Phase VI NIPSCO LLC R. M. Schahfer Generating Station”, January 31, 2020.

Golder Associates, “2020 Annual Groundwater Monitoring and Corrective Action Report- Landfill Phase V, Phase VI, and Phase VII NIPSCO LLC R. M. Schahfer Generating Station”, January 31, 2021.

Golder Associates, “CCR Groundwater Monitoring Program Implementation Manual,” October 2017.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, August 28, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, April 13, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, March 21, 2019.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 6, 2019.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI – Alternative Source Demonstration”, May 7, 2020.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI – Alternative Source Demonstration”, September 29, 2020.

TABLES

Table 1: Monitoring Well Network
CCR Unit Schahfer Landfill Phases V, VI, and VII
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

CCR Unit	Well Purpose	Monitoring Well ID	Installation Date	Decommission Date (If Applicable)	Basis For Action
LANDFILL Phase V, Phase VI, and Phase VII	Background Monitoring Well	GAMW-20	5/27/2016	-	Installed for Groundwater Quality Monitoring[1]
		GAMW-24	9/26/2016	-	
		GAMW-24B	9/26/2016	-	
		GAMW-25	10/4/2016	-	
		GAMW-25B	10/5/2016	-	
	Downgradient Monitoring Well	GAMW-21	5/31/2016	4/5/2018	Abandoned due to Landfill Construction Activities[2]
		GAMW-21B	5/31/2016	4/5/2018	
		GAMW-22	5/31/2016	4/5/2018	
		GAMW-22B	6/2/2016	4/5/2018	
		GAMW-23	6/2/2016	4/6/2018	
		GAMW-23B	6/2/2016	4/6/2018	
		GAMW-28	9/29/2016	4/6/2018	
		GAMW-28B	9/29/2016	4/6/2018	
		GAMW-26	10/4/2016	-	Installed for Groundwater Quality Monitoring[1]
		GAMW-26B	10/4/2016	-	
		GAMW-27	10/3/2016	-	
		GAMW-27B	10/4/2016	-	
		GAMW-38	4/4/2018	-	Installed to Replace Abandoned Well[3]
		GAMW-38B	4/3/2018	-	
		GAMW-39	4/4/2018	-	
		GAMW-39B	4/4/2018	-	
		GAMW-40	4/5/2018	-	
		GAMW-40B	4/4/2018	-	
		GAMW-41	5/17/2018	-	
		GAMW-41B	5/17/2018	-	

Notes:
1) Per the CCR Rule requirements, Golder collected eight rounds of background data prior to October 17, 2017.
2) Monitoring well was abandoned due to the construction of landfill Phase VII.
3) Monitoring well was installed to replace an abandoned monitoring well. Well was first sampled in September 2018.

Prepared by: KMC
Checked by: DFSC
Reviewed by: MAH

Table 2: Summary of Sampling Events
CCR Unit Schahfer Landfill Phases V, VI, and VII
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Well Purpose	Monitoring Well ID	Sample Event #18	Sample Event #19	Total Number of Samples
Purpose of Sample		Detection Monitoring	Detection Monitoring	
Sample Parameters		Appendix III	Appendix III	
Background Monitoring Well	GAMW-20	4/12/2021	9/13/2021	2
	GAMW-24	4/12/2021	9/13/2021	2
	GAMW-24B	4/13/2021	9/13/2021	2
	GAMW-25	4/12/2021	9/10/2021	2
	GAMW-25B	4/12/2021	9/10/2021	2
	GAMW-26	4/12/2021	9/10/2021	2
	GAMW-26B	4/12/2021	9/10/2021	2
	GAMW-27	4/13/2021	9/10/2021	2
	GAMW-27B	4/13/2021	9/13/2021	2
	GAMW-38	4/13/2021	9/11/2021	2
	GAMW-38B	4/13/2021	9/11/2021	2
	GAMW-39	4/13/2021	9/11/2021	2
	GAMW-39B	4/13/2021	9/11/2021	2
	GAMW-40	4/14/2021	9/13/2021	2
	GAMW-40B	4/14/2021	9/13/2021	2
	GAMW-41	4/14/2021	9/13/2021	2
	GAMW-41B	4/13/2021	9/13/2021	2
Total Number of Samples		17	17	34

Notes:
Sample counts do not include QA/QC samples.

(1) Sample events #1-17 were completed prior to 2021. The purpose, sample parameters, and sample dates are included in the 2017, 2018, 2019, and 2020 Annual Reports.

(2) Sample events #18 and 19 correspond to the eighth and ninth Detection Monitoring events, respectively.

Prepared by: KMC
Checked by: DFSC
Reviewed by: JSP

Table 3: Analytical Data
CCR Unit R. M. Schahfer Landfill Phases V, VI, and VII
NIPSCO LLC R. M. Schahfer Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW20		GAMW24			GAMW24B		GAMW25		GAMW25B			GAMW26		GAMW26B		GAMW27		
Sample Date		2021-04-12	2021-09-13	2021-04-12	2021-09-13		2021-04-13	2021-09-13	2021-04-12	2021-09-10	2021-04-12	2021-09-10		2021-04-12	2021-09-10	2021-04-12	2021-09-10	2021-04-13	2021-09-10	
Sample Type		N	N	N	FD	N	N	N	N	N	FD	N	N	N	N	N	N	FD	N	N
Chemical Name	Unit																			
CCR Appendix III																				
Boron	mg/L	2.8	3.7	0.1 U	0.12	0.1 U	0.1 U	0.1 U	0.17	0.15	0.13	0.13	0.13	0.18	0.22	0.21	0.21	4.2	4.1	4.1
Calcium	mg/L	164	249	80.2	83.3	86.8	46.9	51.3	76.4	72.5	94	94.2	97.4	84.7	92.6	93.3	103	276	279	277
Chloride	mg/L	11.4	11.2	18.5	21.6	22	3.3	4.1	4.3	2.7	8.7	8.6	7.2	11.5	4.2	14.6	23.1	20.9	20.4	14.2
Fluoride	mg/L	0.19	0.22	0.083	0.067	0.15	0.12	0.19	1.1	1.2 J-	0.18	0.18	0.13 J-	2.9	2.8 J-	0.18	0.11 J-	0.66	0.63	0.56 J-
pH	SU	7.17	7.2	7.68		7.34	7.58	7.91	7.27	7.4		7.16	7.36	7.51	7.54	7.79	7.8		7.55	7.65
Sulfate	mg/L	500	529	70	70	69.6	26.7	24	44.9	48.5	67.2	67.2	88.9	55.2	80.2	86.6	189	693	701	756
Total Dissolved Solids	mg/L	1050	1170	318	351	349	184	190	288	329	378	377	417	350	449	437	624	1250	1270	1400
Field Parameters																				
Dissolved Oxygen	mg/L	0.87	0.12	0.14		0.14	0.65	0.24	3.81	1.65		0.49	0.27	0.66	0.33	1.31	3.45		0.45	0.21
Oxidation-Reduction Potential	millivolts	-94	0.188	-14.8		0.129	-114.6	0.23	154.4	96.6		-127	0.185	59.2	-309.6	-0.1	-96.1		-118	0.18
pH	SU	7.17	7.2	7.68		7.34	7.58	7.91	7.27	7.4		7.16	7.36	7.51	7.54	7.79	7.8		7.55	7.65
Specific Conductance	uS/cm	1530	163.7	561		609	312.5	340	472.3	514		599	653	604	603	711	737		1558	170
Temperature	deg c	10.6	17.1	9.95		16.8	10.9	13.5	8.8	16		11	12.1	10	18.74	11.53	13.63		11.5	16.8
Turbidity	ntu	2.71	5.22	4.6		4.84	7.77	5.64	1.99	1.9		3	1.88	1.45	4.47	3.85	2.98		4.24	1.26

Notes:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.

"J-" = Indicates the result is estimated and may be biased low.

Table 3: Analytical Data
CCR Unit R. M. Schahfer Landfill Ph
NIPSCO LLC R. M. Schahfer Schahf
Wheatfield, Indiana

Location		GAMW27B		GAMW38		GAMW38B			GAMW39		GAMW39B		GAMW40		GAMW40B	
Sample Date		2021-04-13	2021-09-13	2021-04-13	2021-09-11	2021-04-13	2021-09-11		2021-04-13	2021-09-11	2021-04-13	2021-09-11	2021-04-14	2021-09-13	2021-04-14	2021-09-13
Sample Type		N	N	N	N	N	FD	N	N	N	N	N	N	N	N	N
Chemical Name	Unit															
CCR Appendix III																
Boron	mg/L	12.1	13.1	0.87	1	6.2	6.9	6.9	1.1	1.4	10.1	9.8	2.8	4.1	30	29.9
Calcium	mg/L	364	367	90.4	77.3	249	274	268	173	162	409	443	273	276	225	195
Chloride	mg/L	408	438	4.7	4.2	35.1	37.4	39.9	10.2	9.7	61.9	85.7	12.8	11.8	859	700
Fluoride	mg/L	0.05 U	0.05 U	0.15	0.15	0.05 U	0.05 U	0.05 U	0.14	0.12	0.05 U	0.5 U	0.067	0.072	0.79	0.05 U
pH	SU	7.41	7.36	7.44	7.03	7.11		6.68	7.12	6.83	7.16	6.68	7.19	6.62	8.5	7.87
Sulfate	mg/L	6190	6530	211	164	687	726	785	359	396	1140	1330	388	501	6420	6580
Total Dissolved Solids	mg/L	9980	10800	522	471	1400	1590	1550	816	865	2230	2690	1360	1550	9860	11500
Field Parameters																
Dissolved Oxygen	mg/L	1.27	1.19	0.15	0.53	0.21		0.33	0.14	0.43	0.16	0.48	0.3	0.46	0.23	0.3
Oxidation-Reduction Potential	millivolts	-95.5	-272.6	-82.5	-229.7	-65.2		-329.8	-42.6	-284	-47.6	310.6	-39.8	-304	-162.9	-288.3
pH	SU	7.41	7.36	7.44	7.03	7.11		6.68	7.12	6.83	7.16	6.68	7.19	6.62	8.5	7.87
Specific Conductance	uS/cm	12351	10440	816	716	1913		1747	1248	1109	2863	2813	1968	1933	13406	11500
Temperature	deg c	12.6	14.15	9.83	18.94	11.41		14.37	11.05	17.47	12.32		10	17.03	11.97	14.28
Turbidity	ntu	2.35	3.59	7.49	2.73	4.62		2.92	4.27	1.25	4.4	2.47	2.46	0.63	1.37	1.18

Notes:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.

"J-" = Indicates the result is estimated and may be biased low.

Table 3: Analytical Data
CCR Unit R. M. Schahfer Landfill Ph
NIPSCO LLC R. M. Schahfer Schahf
Wheatfield, Indiana

Location		GAMW41		GAMW41B	
Sample Date		2021-04-14	2021-09-13	2021-04-13	2021-09-13
Sample Type		N	N	N	N
Chemical Name	Unit				
CCR Appendix III					
Boron	mg/L	10	9.4	26.2	28.8
Calcium	mg/L	123	134	223	231
Chloride	mg/L	119	44.4	571	687
Fluoride	mg/L	0.2	0.33	0.79	0.05 U
pH	SU	8.08	7.48	8.05	7.94
Sulfate	mg/L	2220	1750	6320	6250
Total Dissolved Solids	mg/L	3250	2750	10500	10800
Field Parameters					
Dissolved Oxygen	mg/L	0.14	0.21	0.42	0.19
Oxidation-Reduction Potential	millivolts	-137.2	-247	-187.2	-291.7
pH	SU	8.08	7.48	8.05	7.94
Specific Conductance	uS/cm	4602	3312	13006	11430
Temperature	deg c	10.15	19.2	13	15.88
Turbidity	ntu	4.43	1.91	3.81	1.8

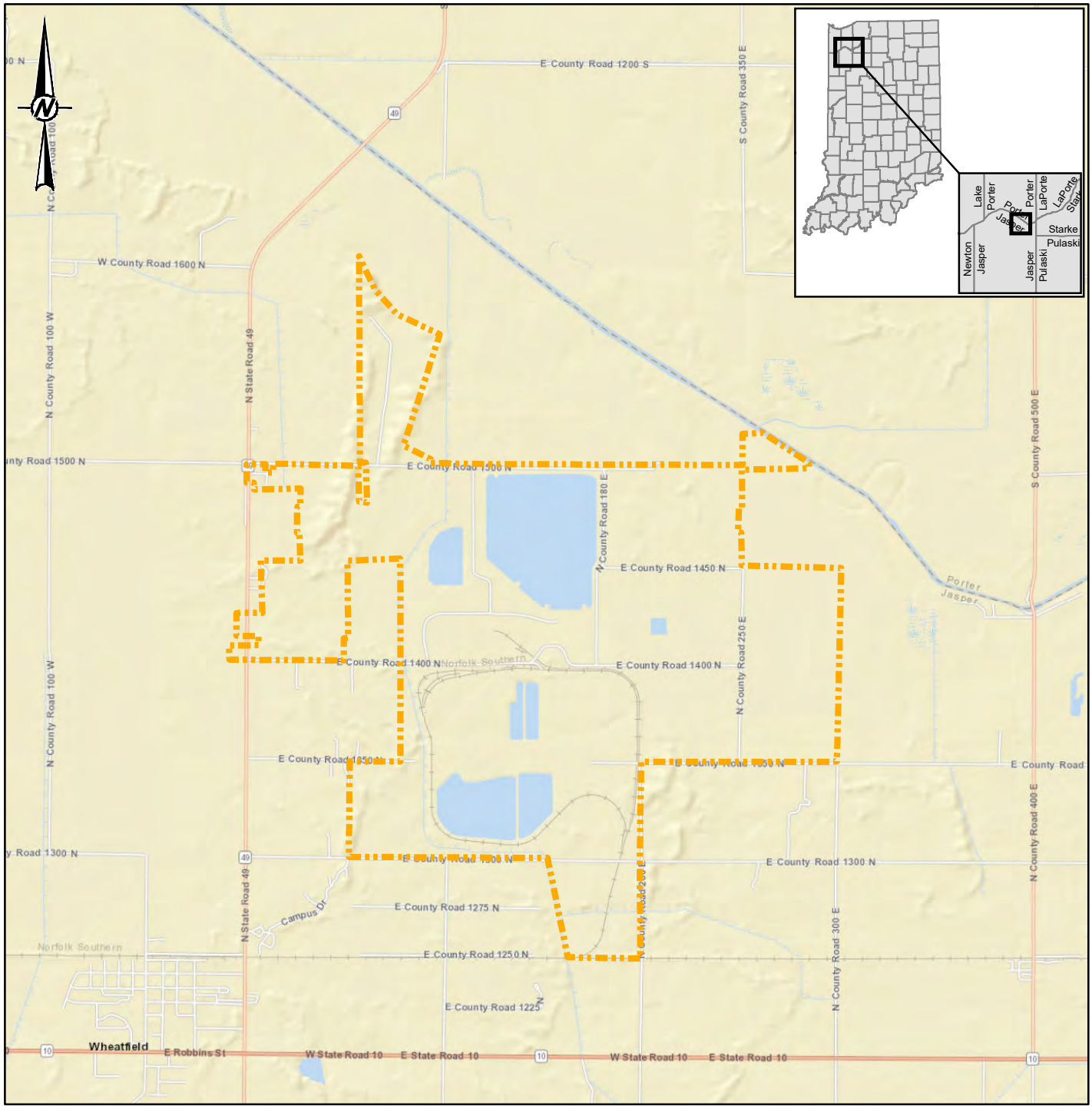
Notes:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.

"J-" = Indicates the result is estimated and may be biased low.

Prepared by: SLG
Checked by: DFSC
Reviewed by: JSP

FIGURES



LEGEND

Approximate Property Line

0 0.75 1.5

1 " = 0.75 miles Miles

REFERENCE(S)

SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

SITE LOCATION MAP

CONSULTANT

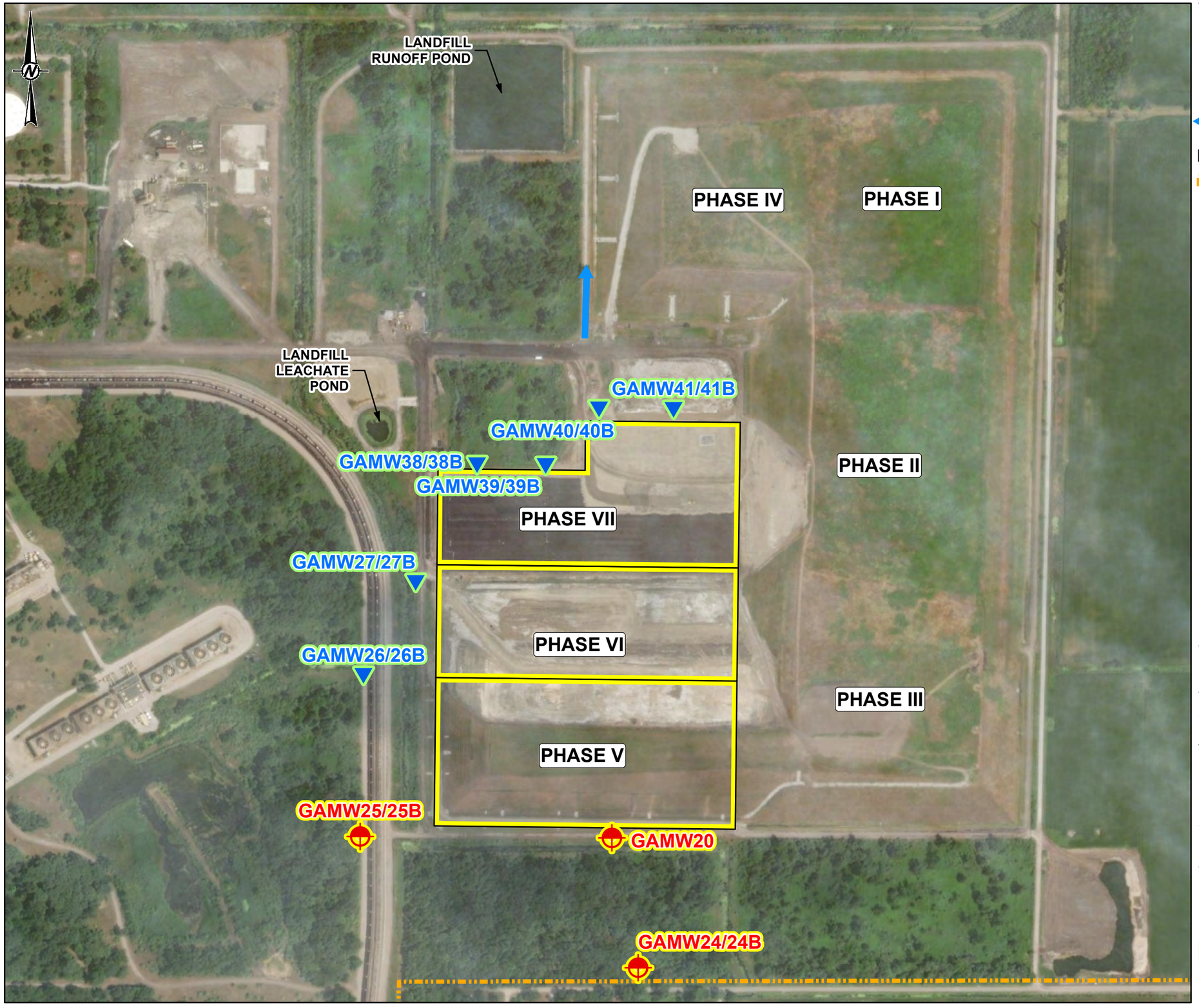
GOLDER
MEMBER OF WSP

YYYY-MM-DD	1/04/2021
DESIGNED	DFS
PREPARED	SHL
REVIEWED	JSP
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0



LEGEND

- Background Monitoring Well
- Downgradient Monitoring Well
- Generalized Groundwater Flow Direction
- CCR Units
- Approximate Property Line

0 400 800

1 " = 400 feet Feet

NOTE(S)

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

WELL LOCATION MAP
SCHAHFER LANDFILL PHASES V, VI, AND VII

CONSULTANT

GOLDER
MEMBER OF WSP

YYYY-MM-DD	1/8/2021
DESIGNED	DFS
PREPARED	TBH
REVIEWED	DFS
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

APPENDIX A

RMSGS Landfill Phases V, VI, and VII Alternative Source Demonstration March 2021

Northern Indiana Public Service Company LLC
(NIPSCO LLC)

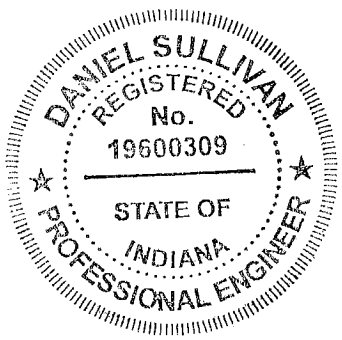
R. M. Schahfer Generating Station

Wheatfield, Indiana

Schahfer Landfill Phase V, Phase VI, and Phase VII

Certification of Alternative Source Demonstration

I, Daniel Sullivan, being a Professional Engineer in accordance with the laws of the State of Indiana, and having experience in the design, construction, and operation of restricted waste landfills and groundwater monitoring systems for them, do hereby state that I am qualified in the subject matter of CCR management, groundwater monitoring, data interpretation, and groundwater impacts. I have personally examined and am familiar with this alternative source demonstration (ASD) for the NIPSCO LLC R. M. Schahfer Generating Station, prepared by Golder, and dated March 2021. Based on an inquiry of those individuals immediately responsible, and on supporting data which I understand to be true, accurate and complete, I verify the information in this ASD is accurate and meets the applicable requirements of the CCR Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the ASD for the regulated CCR management unit referred to as Phase V, Phase VI, and Phase VII has been prepared and meets the applicable requirements of 40 CFR §257.94(e)(2).



Daniel Sullivan
Indiana Professional Engineer
License # 19600309

3-31-2021
Date

TECHNICAL MEMORANDUM

DATE March 31, 2021 **Project No.** 19121567

TO Dan Sullivan, Jeff Loewe NIPSCO LLC

CC Maggie Rice, Maureen Turman, Craig Myers, Joe Kutch, Mark Haney, Jim Peace, Danielle Sylvia Cofelice

FROM Krysta Cione **EMAIL kcione@golder.com**

RE: R.M. SCHAHFER LANDFILL PHASES V, VI, AND VII ALTERNATIVE SOURCE DEMONSTRATION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO LLC), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the seventh (September 2020) groundwater Detection Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS) Landfill Phase V, Phase VI, and Phase VII (CCR Unit) in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule" (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

Statistical analyses of Appendix III groundwater Detection Monitoring results indicated statistically significant increases (SSIs) for seven analytes detected in groundwater samples collected from downgradient wells compared to background levels. Although determination of an SSI generally indicates that the groundwater monitoring program should transition from Detection Monitoring to Assessment Monitoring, 40 CFR §257.94(e)(2) allows the owner or operator (i.e., NIPSCO LLC) to demonstrate that a source other than the CCR unit or another condition caused the apparent SSI(s). Golder identified similar SSIs after the first (October 2017) Detection Monitoring event at the RMSGS Landfill Phase V and Phase VI and submitted an Alternative Source Demonstration (ASD) on April 13, 2018. As described in that ASD, the conceptual site model, historical groundwater data, and Phase V and Phase VI landfill design indicate the source of the identified SSIs is the unlined portion of the landfill, Phases I and II, which is not regulated by the CCR Rule. Golder recertified the ASD based on the second (February/March 2018) Detection Monitoring Event, on August 28, 2018; the third (September 2018) Detection Monitoring Event, on March 21, 2019; the fourth (March 2019) Detection Monitoring Event, on September 6, 2019; the fifth (October 2019) Detection Monitoring Event, on May 7, 2020; and the sixth (March 2020) Detection Monitoring Event, on September 29, 2020.

NIPSCO constructed a new landfill cell (Phase VII) immediately north of Phase VI in 2018. Due to the proximity of Phase VII to Phase VI and landfill construction activities, Golder decommissioned monitoring wells GAMW-21/21B, GAMW-22/22B, GAMW-23/23B, and GAMW-28/28B, which were part of the original CCR Rule-required landfill monitoring network. Golder collected groundwater samples from these original four well pairs from July 2016 to March 2018. To replace the decommissioned wells, Golder installed monitoring wells GAMW-38/38B, GAMW-39/39B, GAMW-40/40B, and GAMW-41/41B downgradient and along the waste boundary of Phase VII in April and May 2018.

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Golder collected groundwater samples from existing and replacement monitoring wells during the September 2020 semi-annual monitoring event. Groundwater analytical data obtained from groundwater samples collected from the downgradient wells in these subsequent events were consistent with historical analytical results. As discussed in the ASD recertification dated September 6, 2019, Golder calculated new prediction limits in June 2019 using all background data collected through March 2019. The table below provides the original prediction limits calculated in January 2018 and the revised prediction limits calculated in June 2019. Golder will re-evaluate the background dataset following collection of an additional four rounds of groundwater data from the background wells.

1.0 SUMMARY OF RESULTS

The results of the seventh Detection Monitoring event are included in the 2020 Annual Report and the results of the statistical analysis are summarized below. SSIs were detected in groundwater samples collected from monitoring wells downgradient of the RMSGS Landfill Phase V, Phase VI, and Phase VI, for all Appendix III parameters. Overall, results are consistent with those collected previously and indicate few differences from the SSIs detected during the previous Detection Monitoring events. The differences are likely due to normal or temporal fluctuations in groundwater quality. The SSI results are summarized in the table below by well location and timeframe of the SSI exceedance.

Monitoring Well ID	Boron	Calcium	Chloride	Fluoride	Sulfate	pH	TDS
Prediction Level (2018)	**1.7**	**116.1**	**34.91**	**2.3**	**300**	**6.465-7.739**	**653.4**
Prediction Level (2019)	**3.2**	**130.9**	**39.93**	**2.3**	**470**	**6.353-7.82**	**1100**
GAMW21*							
GAMW21B*	1,2	1,2	1		1,2		1,2
GAMW22*		2					
GAMW22B*	1,2	1,2	1,2		1,2		1,2
GAMW23*	1,2	1,2			1,2	1,2	1,2
GAMW23B*	1,2	1,2	1,2		1,2	1,2	1,2
GAMW26				1,3,5,6,7			2
GAMW26B		1,3,7	3,7		1,3,7	3	1,3,7
GAMW27	1,2,3,4,5,6,7	1,2,3,4,5,6,7			1,2,3,4,6,7		1,2,3,4,6,7
GAMW27B	1,2,3,4,5,6,7	1,2,3,5,6,7	1,2,3,4,5,6,7		1,2,3,4,5,6,7	3	1,2,3,4,5,6,7
GAMW28*	1,2	1,2	1		1,2		1,2

Monitoring Well ID	Boron	Calcium	Chloride	Fluoride	Sulfate	pH	TDS
Prediction Level (2018)	**1.7**	**116.1**	**34.91**	**2.3**	**300**	**6.465-7.739**	**653.4**
Prediction Level (2019)	**3.2**	**130.9**	**39.93**	**2.3**	**470**	**6.353-7.82**	**1100**
GAMW28B*	1,2	1,2	1,2		1,2		1,2
GAMW38							
GAMW38B	3,4,5,6,7	3,4,5,6,7	3,4		3,4,5,6,7		3,4,5,6,7
GAMW39	3	3,4,5,6,7			3	5	3
GAMW39B	3,4,5,6,7	3,4,5,6,7	3,4,5,6,7		3,4,5,6,7	5	3,4,5,6,7
GAMW40	3,4,6	3,4,5,6,7			3		3,4,5,6,7
GAMW40B	3,4,5,6,7	3,4,5,6,7	3,4,5,6,7		3,4,5,6,7	3,4,6	3,4,5,6,7
GAMW41	4,5,6,7	4,5,6,7	4,5,6,7		4,5,6,7		4,5,6,7
GAMW41B	4,5,6,7	4,6,7	4,5,6,7		4,5,6,7	6,7	4,5,6,7

“1” Indicates a statistically significant increase detected in the first Detection Monitoring event
“2” Indicates a statistically significant increase detected in the second Detection Monitoring event
“3” Indicates a statistically significant increase detected in the third Detection Monitoring event
“4” Indicates a statistically significant increase detected in the fourth Detection Monitoring event
“5” Indicates a statistically significant increase detected in the fifth Detection Monitoring event
“6” Indicates a statistically significant increase detected in the sixth Detection Monitoring event
“7” Indicates a statistically significant increase detected in the seventh Detection Monitoring event
“*” Indicates monitoring well was decommissioned prior to the third Detection Monitoring event

2.0 ALTERNATIVE SOURCE DEMONSTRATION CONCLUSION

The preceding information indicates the results of the seventh Detection Monitoring event are consistent with the previous Detection Monitoring events, and the rationale behind the ASD dated April 13, 2018 is still applicable. Golder prepared the ASD in accordance with 40 CFR 257.94(e)(2) and it supports the finding that the SSIs determined on December 18, 2020 are not due to a release from the CCR Unit. As described in that 2018 ASD, the conceptual site model, historical groundwater data, and the Phase V, Phase VI, and Phase VII landfill design indicate that a release from the unlined portion of the landfill not subject to the CCR Rule, Phases I and II, is the source of the identified SSIs. Therefore, no further action (i.e., Assessment Monitoring) is warranted, and the Schahfer Landfill Phases V, VI, and VII will remain in Detection Monitoring.

3.0 REFERENCES

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, April 13, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, August 28, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, March 31, 2019.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 6, 2019.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, May 7, 2020.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 29, 2020.

APPENDIX B

RMSGS Landfill Phases V, VI, and VII Alternative Source Demonstration October 2021

Northern Indiana Public Service Company LLC
(NIPSCO LLC)

R. M. Schahfer Generating Station

Wheatfield, Indiana

Schahfer Landfill Phase V, Phase VI, and Phase VII

Certification of Alternative Source Demonstration

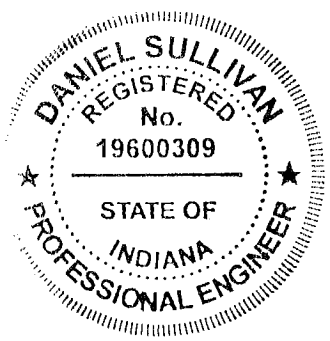
I, Daniel Sullivan, being a Professional Engineer in accordance with the laws of the State of Indiana, and having experience in the design, construction, and operation of restricted waste landfills and groundwater monitoring systems for them, do hereby state that I am qualified in the subject matter of CCR management, groundwater monitoring, data interpretation, and groundwater impacts. I have personally examined and am familiar with this alternative source demonstration (ASD) for the NIPSCO LLC R. M. Schahfer Generating Station, prepared by Golder, and dated October 2021. Based on an inquiry of those individuals immediately responsible, and on supporting data which I understand to be true, accurate and complete, I verify the information in this ASD is accurate and meets the applicable requirements of the CCR Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the ASD for the regulated CCR management unit referred to as Phase V, Phase VI, and Phase VII has been prepared and meets the applicable requirements of 40 CFR §257.94(e)(2).

Daniel Sullivan

Daniel Sullivan
Indiana Professional Engineer
License # 19600309

10.26.2021

Date



TECHNICAL MEMORANDUM

DATE October 26, 2021 **Project No.** 19121567

TO Dan Sullivan, Jeff Loewe NIPSCO LLC

CC Maggie Rice, Maureen Turman, Joe Kutch, Mark Haney, Jim Peace

FROM Danielle Sylvia Cofelice **EMAIL dsylvia@golder.com**

RE: R.M. SCHAHFER LANDFILL PHASES V, VI, AND VII ALTERNATIVE SOURCE DEMONSTRATION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the eighth (April 2021) groundwater Detection Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS) Landfill Phase V, Phase VI, and Phase VII (CCR Unit) in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule" (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

Statistical analyses of Appendix III groundwater Detection Monitoring results indicated statistically significant increases (SSIs) for seven analytes detected in groundwater samples collected from downgradient wells compared to background levels. Although determination of an SSI generally indicates that the groundwater monitoring program should transition from Detection Monitoring to Assessment Monitoring, 40 CFR §257.94(e)(2) allows the owner or operator (i.e., NIPSCO LLC) to demonstrate that a source other than the CCR unit or another condition caused the apparent SSI(s). Golder identified similar SSIs after the first (October 2017) Detection Monitoring event at the RMSGS Landfill Phase V and Phase VI and submitted an Alternative Source Demonstration (ASD) on April 13, 2018. As described in that ASD, the conceptual site model, historical groundwater data, and Phase V and Phase VI landfill design indicate the source of the identified SSIs is the unlined portion of the landfill, Phases I and II, which is not regulated by the CCR Rule. Golder recertified the ASD based on the second (February/March 2018) Detection Monitoring Event, on August 28, 2018; the third (September 2018) Detection Monitoring Event, on March 21, 2019; the fourth (March 2019) Detection Monitoring Event, on September 6, 2019; the fifth (October 2019) Detection Monitoring Event, on May 7, 2020; the sixth (March 2020) Detection Monitoring Event, on September 29, 2020, and the seventh (October 2020) Detection Monitoring Event, on March 31, 2021.

NIPSCO constructed a new landfill cell (Phase VII) immediately north of Phase VI in 2018. Phase VII is constructed in a similar manner to Phase V and Phase VI. Due to the proximity of Phase VII to Phase VI and landfill construction activities, Golder decommissioned monitoring wells GAMW-21/21B, GAMW-22/22B, GAMW-23/23B, and GAMW-28/28B, which were part of the original CCR Rule-required landfill monitoring network. Golder collected groundwater samples from these original four well pairs from July 2016 to March 2018. To replace the decommissioned wells, Golder installed monitoring wells GAMW-38/38B, GAMW-39/39B, GAMW-40/40B, and GAMW-41/41B downgradient and along the waste boundary of Phase VII in April and May 2018.

Golder Associates Inc.
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Golder collected groundwater samples from existing and replacement monitoring wells during the September 2020 semi-annual monitoring event. Groundwater analytical data obtained from groundwater samples collected from the downgradient wells in these subsequent events were consistent with historical analytical results.

As discussed in the ASD recertification dated September 6, 2019, Golder calculated new prediction limits in June 2019 using all background data collected through March 2019. Again, in July 2021, Golder reviewed the analytical data collected to date and considered the option to update the prediction limits. The Groundwater Monitoring Program Implementation Manual (GMPIM, 2017) and the Unified Guidance allow for updating the statistical limits after a minimum of four "new measurements" are available. The periodic update of background datasets improves statistical power and accuracy by providing a more complete approximation of the true background population. The analytical data collected, and groundwater flow directions observed to date, indicate the chosen background wells are still representative of background conditions. The table below provides the original prediction limits calculated in January 2018, the revised prediction limits calculated in June 2019, and the revised prediction limits calculated in July 2021. Golder will re-evaluate the background dataset following collection of an additional four rounds of groundwater data from the background wells.

1.0 SUMMARY OF RESULTS

The results of the eighth Detection Monitoring event will be included in the 2021 Annual Report and the results of the statistical analysis are summarized below. SSIs were detected in groundwater samples collected from monitoring wells downgradient of the RMSGS Landfill Phase V, Phase VI, and Phase VI, for all Appendix III parameters. Overall, results are consistent with those collected previously and indicate few differences from the SSIs detected during the previous Detection Monitoring events. The differences are likely due to normal or temporal fluctuations in groundwater quality. The SSI results are summarized in the table below by well location and timeframe of the SSI exceedance.

Monitoring Well ID	Boron	Calcium	Chloride	Fluoride	Sulfate	pH	TDS
Prediction Level (2018)	**1.7**	**116.1**	**34.91**	**2.3**	**300**	**6.465-7.739**	**653.4**
Prediction Level (2019)	**3.2**	**130.9**	**39.93**	**2.3**	**470**	**6.353-7.82**	**1100**
Prediction Level (2021)	**3.8**	**230**	**50.21**	**2.3**	**670**	**6.184-8.163**	**1210**
GAMW21*							
GAMW21B*	1,2	1,2	1		1,2		1,2
GAMW22*		2					
GAMW22B*	1,2	1,2	1,2		1,2		1,2
GAMW23*	1,2	1,2			1,2	1,2	1,2
GAMW23B*	1,2	1,2	1,2		1,2	1,2	1,2
GAMW26				1,3,5,6,7, 8			2

Monitoring Well ID	Boron	Calcium	Chloride	Fluoride	Sulfate	pH	TDS
Prediction Level (2018)	**1.7**	**116.1**	**34.91**	**2.3**	**300**	**6.465-7.739**	**653.4**
Prediction Level (2019)	**3.2**	**130.9**	**39.93**	**2.3**	**470**	**6.353-7.82**	**1100**
Prediction Level (2021)	**3.8**	**230**	**50.21**	**2.3**	**670**	**6.184-8.163**	**1210**
GAMW26B		1,3,7	3,7		1,3,7	3	1,3,7
GAMW27	1,2,3,4,5,6,7,8	1,2,3,4,5,6,7,8			1,2,3,4,6,7,8		1,2,3,4,6,7,8
GAMW27B	1,2,3,4,5,6,7,8	1,2,3,5,6,7,8	1,2,3,4,5,6,7,8		1,2,3,4,5,6,7,8	3	1,2,3,4,5,6,7,8
GAMW28*	1,2	1,2	1		1,2		1,2
GAMW28B*	1,2	1,2	1,2		1,2		1,2
GAMW38							
GAMW38B	3,4,5,6,7,8	3,4,5,6,7,8	3,4		3,4,5,6,7,8		3,4,5,6,7,8
GAMW39	3	3,4,5,6,7			3	5	3
GAMW39B	3,4,5,6,7,8	3,4,5,6,7,8	3,4,5,6,7,8		3,4,5,6,7,8	5	3,4,5,6,7,8
GAMW40	3,4,6	3,4,5,6,7,8			3		3,4,5,6,7,8
GAMW40B	3,4,5,6,7,8	3,4,5,6,7	3,4,5,6,7,8		3,4,5,6,7,8	3,4,6,8	3,4,5,6,7,8
GAMW41	4,5,6,7,8	4,5,6,7	4,5,6,7,8		4,5,6,7,8		4,5,6,7,8
GAMW41B	4,5,6,7,8	4,6,7	4,5,6,7,8		4,5,6,7,8	6,7	4,5,6,7,8

“1” Indicates a statistically significant increase detected in the first Detection Monitoring event
“2” Indicates a statistically significant increase detected in the second Detection Monitoring event
“3” Indicates a statistically significant increase detected in the third Detection Monitoring event
“4” Indicates a statistically significant increase detected in the fourth Detection Monitoring event
“5” Indicates a statistically significant increase detected in the fifth Detection Monitoring event
“6” Indicates a statistically significant increase detected in the sixth Detection Monitoring event
“7” Indicates a statistically significant increase detected in the seventh Detection Monitoring event
“8” Indicates a statistically significant increase detected in the eighth Detection Monitoring event
“*” Indicates monitoring well was decommissioned prior to the third Detection Monitoring event

2.0 ALTERNATIVE SOURCE DEMONSTRATION CONCLUSION

The preceding information indicates the results of the eighth Detection Monitoring event are consistent with the previous Detection Monitoring events, and the rationale behind the ASD dated April 13, 2018 is still applicable. Golder prepared the ASD in accordance with 40 CFR 257.94(e)(2) and it supports the finding that the SSIs determined on July 28, 2021 are not due to a release from the CCR Unit. As described in that 2018 ASD, the conceptual site model, historical groundwater data, and the Phase V, Phase VI, and Phase VII landfill design indicate that a release from the unlined portion of the landfill not subject to the CCR Rule, Phases I and II, is the source of the identified SSIs. Therefore, no further action (i.e., Assessment Monitoring) is warranted, and the Schahfer Landfill Phases V, VI, and VII will remain in Detection Monitoring.

3.0 REFERENCES

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, April 13, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, August 28, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, March 31, 2019.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 6, 2019.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, May 7, 2020.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 29, 2020.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, March 31, 2021.



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APPENDIX G

Waste Disposal Area Alternative Source Demonstration- December 2020

Northern Indiana Public Service Company LLC (NIPSCO LLC)

R. M. Schahfer Generating Station – Waste Disposal Area

Wheatfield, Indiana

Recertification of Alternative Source Demonstration

40 CFR §257.95

I have personally reviewed this recertification of the alternative source demonstration (ASD), the subject of which is the Waste Disposal Area (WDA) at the NIPSCO LLC R. M. Schahfer Generating Station, prepared by Golder Associates Inc. and dated December 2020. Based on an inquiry of those individuals immediately responsible and on supporting data that I understand to be true, accurate, and complete, I verify the information in this recertification of the ASD is accurate and meets the applicable requirements of the CCR Final Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the ASD for the regulated CCR management unit referred to as the WDA meets the applicable requirements of 40 CFR §257.95.



Joseph Bernard Gormley, Jr.
Indiana Professional Engineer
License #: PE11900213

12/4/2020
Date

TECHNICAL MEMORANDUM

DATE December 4, 2020 **Project No.** 19121567

TO Marc Okin, Dan Sullivan, NIPSCO LLC

CC Maggie Rice, Maureen Turman, Joe Kutch, Mark Haney, Jim Peace, Joe Gormley

FROM Danielle Sylvia Cofelice **EMAIL dsylvia@golder.com**

RE: RECERTIFICATION OF R.M. SCHAHFER WASTE DISPOSAL AREA ALTERNATIVE SOURCE DEMONSTRATION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO LLC), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the fifth (April 2020) groundwater Assessment Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS) Waste Disposal Area (CCR Unit). This evaluation was conducted in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule" (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

The statistical evaluation of the fifth Assessment Monitoring event was completed on September 7, 2020. The results of the statistical evaluation indicated the lower confidence level (LCL) exceeded the background concentration for lithium and molybdenum in assessment monitoring well GAMW51B, which is interpreted as apparent evidence of a statistically-significant level (SSL). Although determination of an SSL generally indicates that the groundwater monitoring program should transition from Assessment Monitoring to Assessment of Corrective Measures, 40 CFR §257.95(g)(3) allows the owner or operator (i.e., NIPSCO LLC) to demonstrate that a source other than the CCR unit or another condition caused the apparent SSL. Golder identified similar concentrations of lithium and molybdenum in groundwater samples collected from GAMW51B after the fourth (October 2019) Assessment Monitoring event at the RMSGS Waste Disposal Area (WDA) and submitted an Alternative Source Demonstration (ASD) on June 9, 2020. As described in the ASD, the source material characteristics and site hydrogeology indicate that the source of the lithium and molybdenum SSLs observed in GAMW51B is not due to a release from the WDA.

1.0 SUMMARY OF RESULTS

The lithium and molybdenum sample results collected from GAMW51B in April 2020 were 0.076 milligram per liter (mg/L) and 0.18 mg/L, respectively. These results are less than two times the GWPS of 0.04 mg/L and 0.1 mg/L for lithium and molybdenum, respectively, which are equal to the risk-based levels included in the CCR Rule, Part 1 Phase 1 Addendum. The most recent molybdenum result is within the range of the previous data, however, the lithium result is slightly above the previous maximum (0.064 mg/L). Overall, the data is consistent with the previous Assessment Monitoring event.

2.0 ALTERNATIVE SOURCE DEMONSTRATION

The information presented above indicates the results of the fifth Assessment Monitoring event are consistent with the previous Assessment Monitoring event, and the rationale presented in the June 9, 2020 ASD is still

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applicable. Golder prepared the current ASD in accordance with 40 CFR 257.95(g)(3) and it supports the finding that the SSLs determined in the September 7, 2020 statistical evaluation are not due to release from the CCR Unit. As described above and in the June 9, 2020 ASD, the source material characteristics and site hydrogeology indicate that the source of the lithium and molybdenum SSLs observed in GAMW51B are due to a different condition and not due to a release from the WDA. Therefore, no further action (i.e., Assessment of Corrective Measures) is warranted, and the WDA will remain in Assessment Monitoring.

3.0 REFERENCES

Golder Associates, “Alternative Source Demonstration- Waste Disposal Area”, June 9, 2020.

APPENDIX H

Waste Disposal Area Alternative Source Demonstration- May 2021

TECHNICAL MEMORANDUM

DATE May 18, 2021 **Project No.** 19121567

TO Jeff Loewe, Dan Sullivan, NIPSCO LLC

CC Maggie Rice, Maureen Turman, Joe Kutch, Mark Haney, Jim Peace, Joe Gormley

FROM Danielle Sylvia Cofelice **EMAIL dsylvia@golder.com**

RE: RECERTIFICATION OF R.M. SCHAHFER WASTE DISPOSAL AREA ALTERNATIVE SOURCE DEMONSTRATION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO LLC), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the sixth (October 2020) groundwater Assessment Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS) Waste Disposal Area (WDA, CCR Unit). This evaluation was conducted in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule" (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

The statistical evaluation of analytical data from the sixth Assessment Monitoring event was completed on February 17, 2021. The results of the statistical evaluation indicated the lower confidence level (LCL) exceeded the background concentrations for lithium and molybdenum in assessment monitoring well GAMW51B and the background concentration for molybdenum in assessment monitoring well GAMW60B, which are interpreted as apparent evidence of a statistically-significant levels (SSLs). Although determination of an SSL generally indicates that the groundwater monitoring program should transition from Assessment Monitoring to Assessment of Corrective Measures, 40 CFR §257.95(g)(3) allows the owner or operator (i.e., NIPSCO LLC) to demonstrate that a source other than the CCR Unit or another condition caused the apparent SSL.

Golder identified similar concentrations of lithium and molybdenum in groundwater samples collected from GAMW51B after the fourth (October 2019) Assessment Monitoring event at the WDA and submitted an Alternative Source Demonstration (ASD) on June 9, 2020 (Golder 2020). As described in the ASD, the source material characteristics and site hydrogeology indicated that the source of the lithium and molybdenum SSLs observed in GAMW51B was not due to a release from the WDA. Golder recertified this ASD after the fifth Assessment Monitoring event (April 2020), which confirmed the molybdenum and lithium results observed in GAMW-51B.

1.0 SUMMARY OF OCTOBER 2020 RESULTS

The lithium and molybdenum concentrations in samples collected from GAMW51B in October 2020 were 0.063 milligrams per liter (mg/L) and 0.17 mg/L, respectively. These results are less than two times the Groundwater Protection Standards (GWPS) of 0.04 mg/L and 0.1 mg/L for lithium and molybdenum, respectively, which are equal to the risk-based levels included in the CCR Rule, Part 1 Phase 1 Addendum. The molybdenum concentrations in the samples collected to date from GAMW60B range from 0.38 mg/L to 0.49 mg/L (approximately four times the GWPS of 0.1 mg/L). The October 2020 Assessment Monitoring event was the fourth

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round of sampling at this location. The most recent molybdenum and lithium results collected at both locations are within the range of the previous data. Overall, the data are consistent with the previous Assessment Monitoring event.

2.0 ALTERNATIVE SOURCE DEMONSTRATION

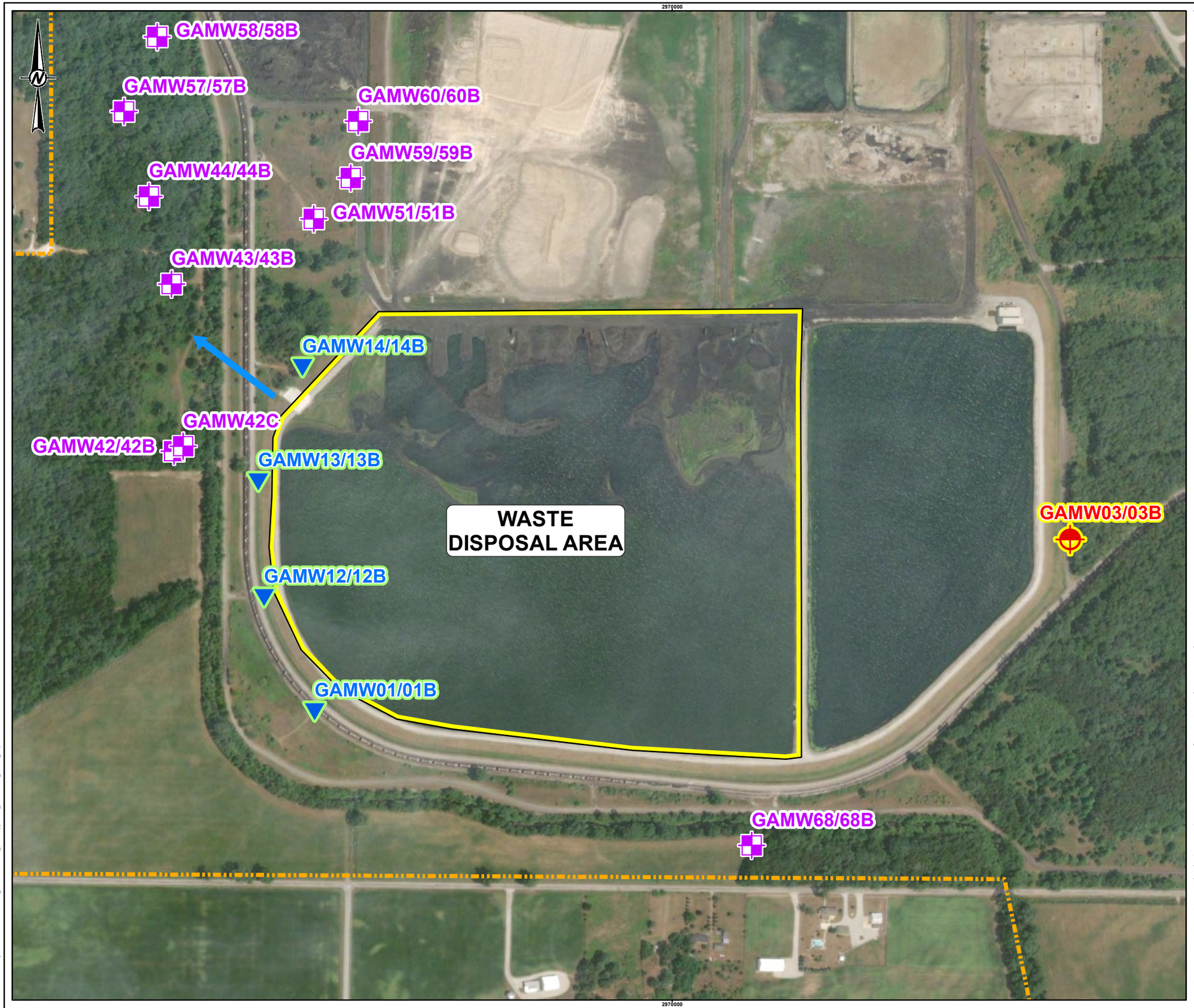
As described in the June 2020 ASD, Assessment Monitoring well GAMW60B was installed downgradient of GAMW51/51B in 2019 to further assess the nature and extent and overall groundwater quality farther downgradient of the WDA. Monitoring wells GAMW14, GAMW14B, GAMW51, and GAMW51B are all located between the WDA and Assessment Monitoring well GAMW60B (see Figure 1). The WDA has generally received and managed the same waste streams and been operated in a consistent manner since its opening more than 35 years ago. Given the lengthy time horizon of operations and geochemical fingerprints of the source materials within the CCR Unit, if the WDA was the source of molybdenum in groundwater at GAMW60B, it would be expected that upgradient wells would have similar or higher concentrations of molybdenum, which they do not.

The 2020 WDA ASD discusses three primary lines of evidence: 1) the low concentrations of molybdenum in the WDA source materials and porewater, 2) the relative major ion abundance in groundwater that demonstrates a distinct difference between WDA porewater and downgradient groundwater samples, with no indications of mixing, and 3) the waste management boundary monitoring wells GAMW14 and GAMW14B, which are located upgradient of monitoring wells GAMW51B and GAMW60B, do not indicate molybdenum above the GWPS, . Considered individually and together, these lines of evidence indicate the CCR Unit is not the source of the molybdenum in the groundwater monitored by GAMW51B and GAMW60B.

The information presented above confirms the results of the sixth Assessment Monitoring event are consistent with the previous Assessment Monitoring event, and the rationale presented in the June 9, 2020 ASD is still applicable. Golder prepared the current ASD in accordance with 40 CFR 257.95(g)(3) and it supports the finding that the SSLs determined in the February 17, 2021 statistical evaluation are not due to release from the CCR Unit. As described above and in the June 9, 2020 ASD, the source material characteristics and site hydrogeology indicate that the source of the lithium and molybdenum SSLs observed in GAMW51B and the molybdenum SSL in GAMW60B are due to a different condition and not due to a release from the WDA. Therefore, no further action (i.e., Assessment of Corrective Measures) is warranted, and the WDA will remain in Assessment Monitoring.

3.0 REFERENCES

Golder 2020. Alternative Source Demonstration - Waste Disposal Area, Golder Associates Inc., June 9, 2020.



LEGEND

- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- Generalized Groundwater Flow Direction
- Approximate Property Line
- CCR Unit

0 400 800

1 " = 400 feet Feet

NOTE(S)

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

WELL LOCATION MAP
WASTE DISPOSAL AREA

CONSULTANT

GOLDER

YYYY-MM-DD	1/8/2021
DESIGNED	DFS
PREPARED	TBH
REVIEWED	DFS
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
19121567	A	0	1

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

APPENDIX I

Waste Disposal Area Alternative Source Demonstration - November 2021

Northern Indiana Public Service Company LLC (NIPSCO LLC)

R. M. Schahfer Generating Station – Waste Disposal Area

Wheatfield, Indiana

Recertification of Alternative Source Demonstration

40 CFR §257.95

I have personally reviewed this recertification of the alternative source demonstration (ASD), the subject of which is the Waste Disposal Area (WDA) at the NIPSCO LLC R. M. Schahfer Generating Station, prepared by Golder Associates Inc. and dated November 2021. Based on an inquiry of those individuals immediately responsible and on supporting data that I understand to be true, accurate, and complete, I verify the information in this recertification of the ASD is accurate and meets the applicable requirements of the CCR Final Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the ASD for the regulated CCR management unit referred to as the WDA meets the applicable requirements of 40 CFR §257.95.



Joseph Bernard Gormley, Jr.
Indiana Professional Engineer
License #: PE11900213

11/12/2021
Date

TECHNICAL MEMORANDUM

DATE November12, 2021 **Project No.** 19121567

TO Jeff Loewe, Dan Sullivan, NIPSCO LLC

CC Maggie Rice, Maureen Turman, Joe Kutch, Mark Haney, Jim Peace, Joe Gormley

FROM Danielle Sylvia Cofelice **EMAIL dsylvia@golder.com**

RE: RECERTIFICATION OF R.M. SCHAHFER WASTE DISPOSAL AREA ALTERNATIVE SOURCE DEMONSTRATION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the seventh (April 2021) groundwater Assessment Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS) Waste Disposal Area (WDA, CCR Unit). This evaluation was conducted in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule" (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

The statistical evaluation of analytical data from the seventh Assessment Monitoring event was completed on August 19, 2021. The results of the statistical evaluation indicated the lower confidence level (LCL) concentrations for lithium and molybdenum in assessment monitoring well GAMW51B and molybdenum in assessment monitoring well GAMW60B exceeded background concentrations, which are interpreted as apparent evidence of statistically-significant levels (SSLs) in those wells. Although determination of apparent SSLs generally indicates that the groundwater monitoring program should transition from Assessment Monitoring to Assessment of Corrective Measures, 40 CFR §257.95(g)(3) allows the owner or operator (e.g., NIPSCO) to demonstrate that a source other than the CCR Unit or another condition caused the apparent SSLs.

Golder identified similar concentrations of lithium and molybdenum in GAMW51B after the fourth (October 2019) Assessment Monitoring event at the WDA and submitted an Alternative Source Demonstration (ASD) on June 9, 2020 (Golder 2020). As described in the ASD, the source material characteristics and site hydrogeology indicated that the apparent lithium and molybdenum SSLs observed in GAMW51B were not due to a release from the WDA. Golder recertified this ASD after the fifth Assessment Monitoring event (April 2020) and sixth Assessment Monitoring event (October 2020), which confirmed the molybdenum and lithium results observed previously in GAMW51B.

1.0 SUMMARY OF APRIL 2021 RESULTS

The lithium and molybdenum concentrations in samples collected from GAMW51B in April 2021 were 0.071 milligrams per liter (mg/L) and 0.16 mg/L, respectively. These results are less than two times the Groundwater Protection Standards (GWPS) of 0.04 mg/L and 0.1 mg/L for lithium and molybdenum, respectively, which are equal to the risk-based levels included in the CCR Rule, Part 1 Phase 1 Addendum. The molybdenum concentrations in the samples collected to date from GAMW60B range from 0.35 mg/L to 0.49 mg/L (approximately four times the GWPS of 0.1 mg/L). The most recent molybdenum and lithium results collected at

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670 North Commercial Street, Suite 103, Manchester, NH 03101 T: +1 603 668-0880 F: +1 603 668-1199

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both locations are within the range of the previous concentrations and are consistent with the previous Assessment Monitoring event.

2.0 ALTERNATIVE SOURCE DEMONSTRATION

As described in the June 2020 ASD, Assessment Monitoring well GAMW60B was installed downgradient of wells GAMW51 and GAMW51B in 2019 to further assess the nature and extent and overall groundwater quality farther downgradient of the WDA. Monitoring wells GAMW14, GAMW14B, GAMW51, and GAMW51B are all located between the WDA and Assessment Monitoring well GAMW60B (see Figure 1). The WDA has generally received and managed the same waste streams and been operated in a consistent manner since its opening more than 35 years ago. Given the lengthy time horizon of operations and geochemical fingerprints of the source materials within the CCR Unit, if the WDA was the source of molybdenum in groundwater at GAMW60B, it would be expected that wells upgradient of GAMW60B would have similar or higher concentrations of molybdenum, which they do not.

The June 2020 WDA ASD discusses three primary lines of evidence: 1) the low concentrations of molybdenum in the WDA source materials and porewater, 2) the relative major ion abundance in groundwater that demonstrates a distinct difference between WDA porewater and downgradient groundwater samples, with no indications of mixing, and 3) the waste management boundary monitoring wells GAMW14 and GAMW14B, which are located upgradient of monitoring wells GAMW51B and GAMW60B, do not indicate molybdenum above the GWPS. Considered individually and together, these lines of evidence indicate the CCR Unit is not the source of the molybdenum in the groundwater monitored by GAMW51B and GAMW60B.

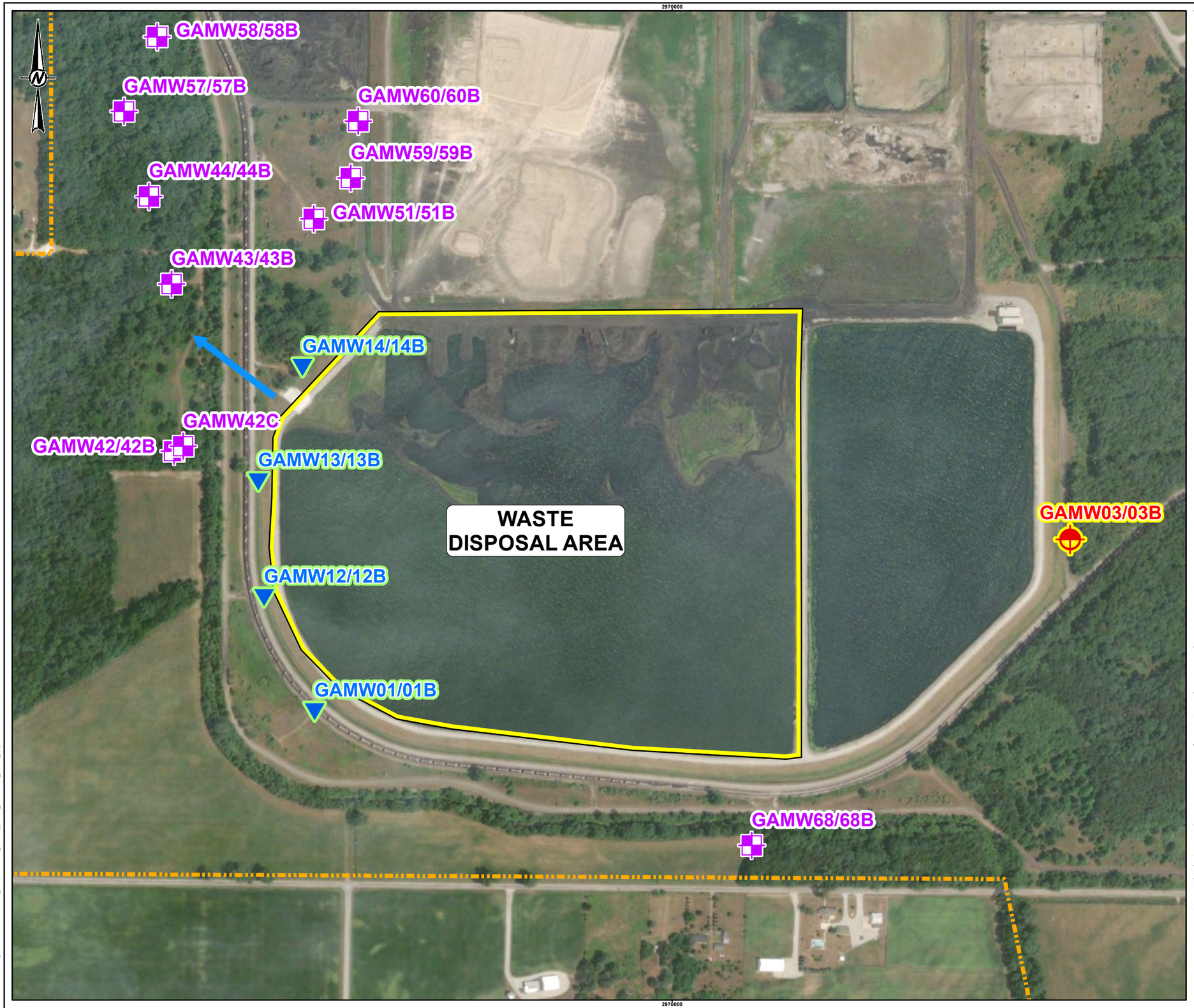
The information presented above confirms the results of the seventh Assessment Monitoring event are consistent with the previous Assessment Monitoring event, and the rationale presented in the June 9, 2020 ASD is still applicable. Golder prepared the current ASD in accordance with 40 CFR 257.95(g)(3) and it supports the finding that the SSLs determined in the August 19, 2021 statistical evaluation are not due to release from the CCR Unit. As described above and in the June 9, 2020 ASD, the source material characteristics and site hydrogeology indicate that the source of the apparent lithium and molybdenum SSLs observed in GAMW51B and the apparent molybdenum SSL in GAMW60B are due to a different condition and not due to a release from the WDA. Therefore, no further action (i.e., Assessment of Corrective Measures) is warranted, and the WDA will remain in Assessment Monitoring.

3.0 REFERENCES

Golder 2020. Alternative Source Demonstration – Waste Disposal Area, Golder Associates Inc., June 9, 2020.

Golder 2020. Recertification of R.M. Schahfer Waste Diposal Area Alternative Source Demonstration, Golder Associates Inc., December 4, 2020.

Golder 2021. Recertification of R.M. Schahfer Waste Disposal Area Alternative Source Demonstration, Golder Associates Inc., May 18, 2021.



LEGEND

- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- Generalized Groundwater Flow Direction
- Approximate Property Line
- CCR Unit

0 400 800

1 " = 400 feet Feet

NOTE(S)

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

WELL LOCATION MAP
WASTE DISPOSAL AREA

CONSULTANT

GOLDER

YYYY-MM-DD	1/8/2021
DESIGNED	DFS
PREPARED	TBH
REVIEWED	DFS
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
19121567	A	0	1

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

APPENDIX J

Waste Disposal Area Alternative Source Demonstration- April 2022

Northern Indiana Public Service Company LLC (NIPSCO LLC)

R. M. Schahfer Generating Station – Waste Disposal Area

Wheatfield, Indiana

Recertification of Alternative Source Demonstration

40 CFR §257.95

I have personally reviewed this recertification of the alternative source demonstration (ASD), the subject of which is the Waste Disposal Area (WDA) at the NIPSCO LLC R. M. Schahfer Generating Station, prepared by Golder Associates USA, Inc. and dated April 15, 2022. Based on an inquiry of those individuals immediately responsible and on supporting data that I understand to be true, accurate, and complete, I verify the information in this recertification of the ASD is accurate and meets the applicable requirements of the CCR Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the ASD for the regulated CCR management unit referred to as the WDA meets the applicable requirements of 40 CFR §257.95.



Joseph Bernard Gormley, Jr.
Indiana Professional Engineer
License #: PE11900213

4/15/2022
Date

TECHNICAL MEMORANDUM

DATE April 15, 2022 **Project No.** 19121567

TO Jeff Loewe, Dan Sullivan, NIPSCO LLC

CC Maggie Rice, Joe Kutch, Mark Haney, Jim Peace

FROM Danielle Sylvia Cofelice, Joseph B. Gormley, Jr., PE **EMAIL dsylvia@golder.com, jgormley@golder.com**

RE: RECERTIFICATION OF R.M. SCHAHFER WASTE DISPOSAL AREA ALTERNATIVE SOURCE DEMONSTRATION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO) and in accordance with 40 CFR §257.95(g)(3), Golder Associates USA Inc, *a member of WSP*. (Golder) has prepared this technical memorandum to confirm that the latest assessment monitoring results 1) are consistent with previous monitoring events, and 2) continue to support the findings of the June 9, 2020 Alternative Source Demonstration (ASD) for the Waste Disposal Area (WDA) Coal Combustion Residual Unit (CCR Unit) at the NIPSCO Rollin M. Schahfer Generating Station (RMSGS).

1.0 BACKGROUND

Following Detection Monitoring and the determination of statistically significant increases (SSIs) over background levels for one or more Appendix III constituents, NIPSCO established an Assessment Monitoring program in January 2018 to assess the nature and extent and overall groundwater quality farther downgradient of the WDA. The WDA and groundwater monitoring network are shown in Figure 1.

As part of the Assessment Monitoring program for the WDA, Golder collects groundwater samples from each background and downgradient monitoring well for analysis of Appendix III and IV constituents per 40 CFR §257.95. Following receipt and validation of laboratory results, Golder evaluates the results to determine the concentration of Appendix IV constituents in the wells relative to groundwater protection standards (GWPS). The GWPS for lithium (0.04 mg/L) and molybdenum (0.1 mg/L) are equal to the risk-based levels included in the CCR Rule, Part 1 Phase 1 Addendum. In addition, Golder's evaluations include statistical analysis of the results that are performed in accordance with40 CFR §257.95(h)(2).

Following the fourth Assessment Monitoring event in October/November 2019, Golder performed a statistical evaluation of analytical data in March 2020. The results of that statistical evaluation indicated an apparent statistically significant level (SSL) for molybdenum in well GAMW51B. While the results did not indicate an apparent SSL for lithium in well GAMW51B, they did show that three of the four samples collected from GAMW51B had detections of lithium above the GWPS. Although determination of apparent SSLs generally indicates that the groundwater monitoring program should transition from Assessment Monitoring to Assessment of Corrective Measures, 40 CFR §257.95(g)(3)(ii) allows the owner or operator (e.g., NIPSCO) to demonstrate that a source other than the CCR Unit or another condition caused the apparent SSLs. NIPSCO tasked Golder with further evaluating the data findings and, if appropriate, performing an ASD for the WDA.

For the ASD, Golder presented a preliminary assessment of the Site history, geologic conditions, and data from porewater, CCR source materials, overburden, bedrock, and groundwater samples that indicated the potential for the SSL to be a result of another condition or a source other than the CCR Unit. Based on the preliminary assessment results, Golder performed additional evaluations to demonstrate that molybdenum and lithium concentrations in well GAMW51B were related to other sources and summarized those evaluations in the June 2020 ASD for the WDA.

As described in the June 2020 ASD, the WDA has generally received and managed the same waste streams and been operated in a consistent manner since its opening more than 35 years ago. Given the lengthy time horizon of operations and geochemical fingerprints of the source materials within the CCR Unit, if the WDA was the source of molybdenum in groundwater at GAMW51B, it would be expected that wells upgradient of GAMW51B would have similar or higher concentrations of molybdenum; however, they do not.

Furthermore, the June 2020 WDA ASD discussed the following three primary lines of evidence that demonstrated that the WDA is not the source of the molybdenum in the groundwater monitored by GAMW51B:

1) The low concentrations of molybdenum in the WDA source materials and porewater.

2) The relative major ion abundance in groundwater that demonstrates a distinct difference between WDA porewater and downgradient groundwater samples, with no indications of mixing.

3) The waste management boundary monitoring wells GAMW14 and GAMW14B, which are located upgradient of monitoring wells GAMW51B, do not indicate molybdenum above the GWPS.

Following the ASD and in accordance with 40 CFR §257.95(g)(3), Golder continued Assessment Monitoring of the WDA. Based on monitoring results from these subsequent monitoring events, Golder confirmed molybdenum and lithium concentrations were consistent with previous results for GAMW51B. As a result, Golder recertified the ASD after the fifth (April 2020), sixth (October 2020), and seventh (April 2021) Assessment Monitoring events.

2.0 SUMMARY OF SEPTEMBER 2021 ASSESSMENT MONITORING RESULTS

Golder performed the eighth Assessment Monitoring event for the WDA in September 2021. The monitoring results from that event showed lithium and molybdenum concentrations in the GAMW51B sample were 0.078 milligrams per liter (mg/L) and 0.15 mg/L, respectively. These results are 1.5 and 1.95 times greater than the GWPS of 0.04 mg/L and 0.1 mg/L for lithium and molybdenum, respectively. In addition, the monitoring results showed that the molybdenum concentration in the GAMW60B sample was 0.38 mg/L, which is 3.8 times the GWPS of 0.1 mg/l for molybdenum. It should be noted, however, that the results for both wells are within the range of the previous concentrations found at these wells.

3.0 DATA EVALUATION AND COMPARISON TO PREVIOUS RESULTS

Consistent with previous monitoring events and in accordance with the CCR Rule, Golder performed a statistical evaluation of groundwater analytical results from the eighth Assessment Monitoring event (September 2021) at the WDA. The statistical evaluation was completed on January 17, 2022 and the statistical evaluation results indicated the lower confidence level (LCL) concentrations for lithium and molybdenum in assessment monitoring well GAMW51B and molybdenum in assessment monitoring well GAMW60B exceeded the GWPS, which are interpreted as apparent evidence of SSLs in those wells.

As noted above, Golder previously identified similar concentrations of lithium and molybdenum in GAMW51B after the fourth (October 2019) Assessment Monitoring event at the WDA. In response, Golder prepared an ASD, dated June 9, 2020 (Golder 2020), that showed the source material characteristics and site hydrogeology indicate that the apparent lithium and molybdenum SSLs observed in GAMW51B were not due to a release from the WDA.

Furthermore, monitoring well GAMW60B was installed downgradient of wells GAMW51 and GAMW51B in 2019 to further assess the nature and extent and overall groundwater quality farther downgradient of the WDA. Since GAMW60B is further downgradient then GAMW51B from the WDA and the ASD determined that previous SSLs observed at GAMW51B were not due to a release from the WDA, it follows that the current apparent SSLs observed at both GAMW51B and GAMW60B are not due to a release from the WDA.

4.0 CONCLUSIONS

Golder's evaluation of the groundwater results for the eighth Assessment Monitoring event confirm that the lithium and molybdenum results are consistent with those from the previous Assessment Monitoring events, and the rationale presented in the June 9, 2020 ASD is still applicable.

As described above and in the ASD, the source material characteristics and site hydrogeology indicate that the source of the apparent lithium and molybdenum SSLs observed in GAMW51B and the apparent molybdenum SSL in GAMW60B are due to a different condition and not due to a release from the WDA. Therefore, no further action (e.g., Assessment of Corrective Measures) is warranted, and the WDA will remain in Assessment Monitoring.

5.0 REFERENCES

Golder 2020. Alternative Source Demonstration – Waste Disposal Area, Golder Associates Inc., June 9, 2020.

Golder 2020. Recertification of R.M. Schahfer Waste Disposal Area Alternative Source Demonstration, Golder Associates Inc., December 4, 2020.

Golder 2021. Recertification of R.M. Schahfer Waste Disposal Area Alternative Source Demonstration, Golder Associates Inc., May 18, 2021.

Golder 2021. Recertification of R.M. Schahfer Waste Disposal Area Alternative Source Demonstration, Golder Associates Inc., November 12, 2021.

APPENDIX K

R. M. Schahfer Landfill Phase V and Phase VI Alternative Source Demonstration- March 2021

Northern Indiana Public Service Company LLC
(NIPSCO LLC)

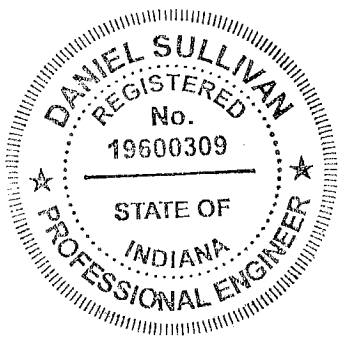
R. M. Schahfer Generating Station

Wheatfield, Indiana

Schahfer Landfill Phase V, Phase VI, and Phase VII

Certification of Alternative Source Demonstration

I, Daniel Sullivan, being a Professional Engineer in accordance with the laws of the State of Indiana, and having experience in the design, construction, and operation of restricted waste landfills and groundwater monitoring systems for them, do hereby state that I am qualified in the subject matter of CCR management, groundwater monitoring, data interpretation, and groundwater impacts. I have personally examined and am familiar with this alternative source demonstration (ASD) for the NIPSCO LLC R. M. Schahfer Generating Station, prepared by Golder, and dated March 2021. Based on an inquiry of those individuals immediately responsible, and on supporting data which I understand to be true, accurate and complete, I verify the information in this ASD is accurate and meets the applicable requirements of the CCR Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the ASD for the regulated CCR management unit referred to as Phase V, Phase VI, and Phase VII has been prepared and meets the applicable requirements of 40 CFR §257.94(e)(2).



Daniel Sullivan
Indiana Professional Engineer
License # 19600309

3-31-2021
Date

TECHNICAL MEMORANDUM

DATE March 31, 2021 **Project No.** 19121567

TO Dan Sullivan, Jeff Loewe NIPSCO LLC

CC Maggie Rice, Maureen Turman, Craig Myers, Joe Kutch, Mark Haney, Jim Peace, Danielle Sylvia Cofelice

FROM Krysta Cione **EMAIL kcione@golder.com**

RE: R.M. SCHAHFER LANDFILL PHASES V, VI, AND VII ALTERNATIVE SOURCE DEMONSTRATION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO LLC), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the seventh (September 2020) groundwater Detection Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS) Landfill Phase V, Phase VI, and Phase VII (CCR Unit) in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule" (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

Statistical analyses of Appendix III groundwater Detection Monitoring results indicated statistically significant increases (SSIs) for seven analytes detected in groundwater samples collected from downgradient wells compared to background levels. Although determination of an SSI generally indicates that the groundwater monitoring program should transition from Detection Monitoring to Assessment Monitoring, 40 CFR §257.94(e)(2) allows the owner or operator (i.e., NIPSCO LLC) to demonstrate that a source other than the CCR unit or another condition caused the apparent SSI(s). Golder identified similar SSIs after the first (October 2017) Detection Monitoring event at the RMSGS Landfill Phase V and Phase VI and submitted an Alternative Source Demonstration (ASD) on April 13, 2018. As described in that ASD, the conceptual site model, historical groundwater data, and Phase V and Phase VI landfill design indicate the source of the identified SSIs is the unlined portion of the landfill, Phases I and II, which is not regulated by the CCR Rule. Golder recertified the ASD based on the second (February/March 2018) Detection Monitoring Event, on August 28, 2018; the third (September 2018) Detection Monitoring Event, on March 21, 2019; the fourth (March 2019) Detection Monitoring Event, on September 6, 2019; the fifth (October 2019) Detection Monitoring Event, on May 7, 2020; and the sixth (March 2020) Detection Monitoring Event, on September 29, 2020.

NIPSCO constructed a new landfill cell (Phase VII) immediately north of Phase VI in 2018. Due to the proximity of Phase VII to Phase VI and landfill construction activities, Golder decommissioned monitoring wells GAMW-21/21B, GAMW-22/22B, GAMW-23/23B, and GAMW-28/28B, which were part of the original CCR Rule-required landfill monitoring network. Golder collected groundwater samples from these original four well pairs from July 2016 to March 2018. To replace the decommissioned wells, Golder installed monitoring wells GAMW-38/38B, GAMW-39/39B, GAMW-40/40B, and GAMW-41/41B downgradient and along the waste boundary of Phase VII in April and May 2018.

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Golder collected groundwater samples from existing and replacement monitoring wells during the September 2020 semi-annual monitoring event. Groundwater analytical data obtained from groundwater samples collected from the downgradient wells in these subsequent events were consistent with historical analytical results. As discussed in the ASD recertification dated September 6, 2019, Golder calculated new prediction limits in June 2019 using all background data collected through March 2019. The table below provides the original prediction limits calculated in January 2018 and the revised prediction limits calculated in June 2019. Golder will re-evaluate the background dataset following collection of an additional four rounds of groundwater data from the background wells.

1.0 SUMMARY OF RESULTS

The results of the seventh Detection Monitoring event are included in the 2020 Annual Report and the results of the statistical analysis are summarized below. SSIs were detected in groundwater samples collected from monitoring wells downgradient of the RMSGS Landfill Phase V, Phase VI, and Phase VI, for all Appendix III parameters. Overall, results are consistent with those collected previously and indicate few differences from the SSIs detected during the previous Detection Monitoring events. The differences are likely due to normal or temporal fluctuations in groundwater quality. The SSI results are summarized in the table below by well location and timeframe of the SSI exceedance.

Monitoring Well ID	Boron	Calcium	Chloride	Fluoride	Sulfate	pH	TDS
Prediction Level (2018)	**1.7**	**116.1**	**34.91**	**2.3**	**300**	**6.465-7.739**	**653.4**
Prediction Level (2019)	**3.2**	**130.9**	**39.93**	**2.3**	**470**	**6.353-7.82**	**1100**
GAMW21*							
GAMW21B*	1,2	1,2	1		1,2		1,2
GAMW22*		2					
GAMW22B*	1,2	1,2	1,2		1,2		1,2
GAMW23*	1,2	1,2			1,2	1,2	1,2
GAMW23B*	1,2	1,2	1,2		1,2	1,2	1,2
GAMW26				1,3,5,6,7			2
GAMW26B		1,3,7	3,7		1,3,7	3	1,3,7
GAMW27	1,2,3,4,5,6,7	1,2,3,4,5,6,7			1,2,3,4,6,7		1,2,3,4,6,7
GAMW27B	1,2,3,4,5,6,7	1,2,3,5,6,7	1,2,3,4,5,6,7		1,2,3,4,5,6,7	3	1,2,3,4,5,6,7
GAMW28*	1,2	1,2	1		1,2		1,2

Monitoring Well ID	Boron	Calcium	Chloride	Fluoride	Sulfate	pH	TDS
Prediction Level (2018)	**1.7**	**116.1**	**34.91**	**2.3**	**300**	**6.465-7.739**	**653.4**
Prediction Level (2019)	**3.2**	**130.9**	**39.93**	**2.3**	**470**	**6.353-7.82**	**1100**
GAMW28B*	1,2	1,2	1,2		1,2		1,2
GAMW38							
GAMW38B	3,4,5,6,7	3,4,5,6,7	3,4		3,4,5,6,7		3,4,5,6,7
GAMW39	3	3,4,5,6,7			3	5	3
GAMW39B	3,4,5,6,7	3,4,5,6,7	3,4,5,6,7		3,4,5,6,7	5	3,4,5,6,7
GAMW40	3,4,6	3,4,5,6,7			3		3,4,5,6,7
GAMW40B	3,4,5,6,7	3,4,5,6,7	3,4,5,6,7		3,4,5,6,7	3,4,6	3,4,5,6,7
GAMW41	4,5,6,7	4,5,6,7	4,5,6,7		4,5,6,7		4,5,6,7
GAMW41B	4,5,6,7	4,6,7	4,5,6,7		4,5,6,7	6,7	4,5,6,7

“1” Indicates a statistically significant increase detected in the first Detection Monitoring event
“2” Indicates a statistically significant increase detected in the second Detection Monitoring event
“3” Indicates a statistically significant increase detected in the third Detection Monitoring event
“4” Indicates a statistically significant increase detected in the fourth Detection Monitoring event
“5” Indicates a statistically significant increase detected in the fifth Detection Monitoring event
“6” Indicates a statistically significant increase detected in the sixth Detection Monitoring event
“7” Indicates a statistically significant increase detected in the seventh Detection Monitoring event
“*” Indicates monitoring well was decommissioned prior to the third Detection Monitoring event

2.0 ALTERNATIVE SOURCE DEMONSTRATION CONCLUSION

The preceding information indicates the results of the seventh Detection Monitoring event are consistent with the previous Detection Monitoring events, and the rationale behind the ASD dated April 13, 2018 is still applicable. Golder prepared the ASD in accordance with 40 CFR 257.94(e)(2) and it supports the finding that the SSIs determined on December 18, 2020 are not due to a release from the CCR Unit. As described in that 2018 ASD, the conceptual site model, historical groundwater data, and the Phase V, Phase VI, and Phase VII landfill design indicate that a release from the unlined portion of the landfill not subject to the CCR Rule, Phases I and II, is the source of the identified SSIs. Therefore, no further action (i.e., Assessment Monitoring) is warranted, and the Schahfer Landfill Phases V, VI, and VII will remain in Detection Monitoring.

3.0 REFERENCES

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, April 13, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, August 28, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, March 31, 2019.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 6, 2019.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, May 7, 2020.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 29, 2020.

APPENDIX L

R. M. Schahfer Landfill Phase V and Phase VI Alternative Source Demonstration- October 2021

Northern Indiana Public Service Company LLC
(NIPSCO LLC)

R. M. Schahfer Generating Station

Wheatfield, Indiana

Schahfer Landfill Phase V, Phase VI, and Phase VII

Certification of Alternative Source Demonstration

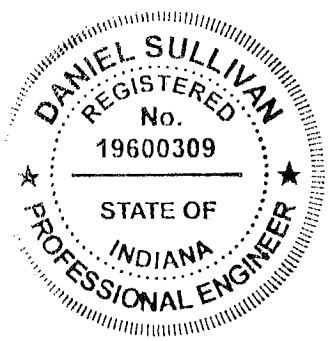
I, Daniel Sullivan, being a Professional Engineer in accordance with the laws of the State of Indiana, and having experience in the design, construction, and operation of restricted waste landfills and groundwater monitoring systems for them, do hereby state that I am qualified in the subject matter of CCR management, groundwater monitoring, data interpretation, and groundwater impacts. I have personally examined and am familiar with this alternative source demonstration (ASD) for the NIPSCO LLC R. M. Schahfer Generating Station, prepared by Golder, and dated October 2021. Based on an inquiry of those individuals immediately responsible, and on supporting data which I understand to be true, accurate and complete, I verify the information in this ASD is accurate and meets the applicable requirements of the CCR Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the ASD for the regulated CCR management unit referred to as Phase V, Phase VI, and Phase VII has been prepared and meets the applicable requirements of 40 CFR §257.94(e)(2).

Daniel Sullivan

Daniel Sullivan
Indiana Professional Engineer
License # 19600309

10.26.2021

Date



TECHNICAL MEMORANDUM

DATE October 26, 2021 **Project No.** 19121567

TO Dan Sullivan, Jeff Loewe NIPSCO LLC

CC Maggie Rice, Maureen Turman, Joe Kutch, Mark Haney, Jim Peace

FROM Danielle Sylvia Cofelice **EMAIL dsylvia@golder.com**

RE: R.M. SCHAHFER LANDFILL PHASES V, VI, AND VII ALTERNATIVE SOURCE DEMONSTRATION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the eighth (April 2021) groundwater Detection Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS) Landfill Phase V, Phase VI, and Phase VII (CCR Unit) in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule" (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

Statistical analyses of Appendix III groundwater Detection Monitoring results indicated statistically significant increases (SSIs) for seven analytes detected in groundwater samples collected from downgradient wells compared to background levels. Although determination of an SSI generally indicates that the groundwater monitoring program should transition from Detection Monitoring to Assessment Monitoring, 40 CFR §257.94(e)(2) allows the owner or operator (i.e., NIPSCO LLC) to demonstrate that a source other than the CCR unit or another condition caused the apparent SSI(s). Golder identified similar SSIs after the first (October 2017) Detection Monitoring event at the RMSGS Landfill Phase V and Phase VI and submitted an Alternative Source Demonstration (ASD) on April 13, 2018. As described in that ASD, the conceptual site model, historical groundwater data, and Phase V and Phase VI landfill design indicate the source of the identified SSIs is the unlined portion of the landfill, Phases I and II, which is not regulated by the CCR Rule. Golder recertified the ASD based on the second (February/March 2018) Detection Monitoring Event, on August 28, 2018; the third (September 2018) Detection Monitoring Event, on March 21, 2019; the fourth (March 2019) Detection Monitoring Event, on September 6, 2019; the fifth (October 2019) Detection Monitoring Event, on May 7, 2020; the sixth (March 2020) Detection Monitoring Event, on September 29, 2020, and the seventh (October 2020) Detection Monitoring Event, on March 31, 2021.

NIPSCO constructed a new landfill cell (Phase VII) immediately north of Phase VI in 2018. Phase VII is constructed in a similar manner to Phase V and Phase VI. Due to the proximity of Phase VII to Phase VI and landfill construction activities, Golder decommissioned monitoring wells GAMW-21/21B, GAMW-22/22B, GAMW-23/23B, and GAMW-28/28B, which were part of the original CCR Rule-required landfill monitoring network. Golder collected groundwater samples from these original four well pairs from July 2016 to March 2018. To replace the decommissioned wells, Golder installed monitoring wells GAMW-38/38B, GAMW-39/39B, GAMW-40/40B, and GAMW-41/41B downgradient and along the waste boundary of Phase VII in April and May 2018.

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Golder collected groundwater samples from existing and replacement monitoring wells during the September 2020 semi-annual monitoring event. Groundwater analytical data obtained from groundwater samples collected from the downgradient wells in these subsequent events were consistent with historical analytical results.

As discussed in the ASD recertification dated September 6, 2019, Golder calculated new prediction limits in June 2019 using all background data collected through March 2019. Again, in July 2021, Golder reviewed the analytical data collected to date and considered the option to update the prediction limits. The Groundwater Monitoring Program Implementation Manual (GMPIM, 2017) and the Unified Guidance allow for updating the statistical limits after a minimum of four "new measurements" are available. The periodic update of background datasets improves statistical power and accuracy by providing a more complete approximation of the true background population. The analytical data collected, and groundwater flow directions observed to date, indicate the chosen background wells are still representative of background conditions. The table below provides the original prediction limits calculated in January 2018, the revised prediction limits calculated in June 2019, and the revised prediction limits calculated in July 2021. Golder will re-evaluate the background dataset following collection of an additional four rounds of groundwater data from the background wells.

1.0 SUMMARY OF RESULTS

The results of the eighth Detection Monitoring event will be included in the 2021 Annual Report and the results of the statistical analysis are summarized below. SSIs were detected in groundwater samples collected from monitoring wells downgradient of the RMSGS Landfill Phase V, Phase VI, and Phase VI, for all Appendix III parameters. Overall, results are consistent with those collected previously and indicate few differences from the SSIs detected during the previous Detection Monitoring events. The differences are likely due to normal or temporal fluctuations in groundwater quality. The SSI results are summarized in the table below by well location and timeframe of the SSI exceedance.

Monitoring Well ID	Boron	Calcium	Chloride	Fluoride	Sulfate	pH	TDS
Prediction Level (2018)	**1.7**	**116.1**	**34.91**	**2.3**	**300**	**6.465-7.739**	**653.4**
Prediction Level (2019)	**3.2**	**130.9**	**39.93**	**2.3**	**470**	**6.353-7.82**	**1100**
Prediction Level (2021)	**3.8**	**230**	**50.21**	**2.3**	**670**	**6.184-8.163**	**1210**
GAMW21*							
GAMW21B*	1,2	1,2	1		1,2		1,2
GAMW22*		2					
GAMW22B*	1,2	1,2	1,2		1,2		1,2
GAMW23*	1,2	1,2			1,2	1,2	1,2
GAMW23B*	1,2	1,2	1,2		1,2	1,2	1,2
GAMW26				1,3,5,6,7, 8			2

Monitoring Well ID	Boron	Calcium	Chloride	Fluoride	Sulfate	pH	TDS
Prediction Level (2018)	**1.7**	**116.1**	**34.91**	**2.3**	**300**	**6.465-7.739**	**653.4**
Prediction Level (2019)	**3.2**	**130.9**	**39.93**	**2.3**	**470**	**6.353-7.82**	**1100**
Prediction Level (2021)	**3.8**	**230**	**50.21**	**2.3**	**670**	**6.184-8.163**	**1210**
GAMW26B		1,3,7	3,7		1,3,7	3	1,3,7
GAMW27	1,2,3,4,5,6,7,8	1,2,3,4,5,6,7,8			1,2,3,4,6,7,8		1,2,3,4,6,7,8
GAMW27B	1,2,3,4,5,6,7,8	1,2,3,5,6,7,8	1,2,3,4,5,6,7,8		1,2,3,4,5,6,7,8	3	1,2,3,4,5,6,7,8
GAMW28*	1,2	1,2	1		1,2		1,2
GAMW28B*	1,2	1,2	1,2		1,2		1,2
GAMW38							
GAMW38B	3,4,5,6,7,8	3,4,5,6,7,8	3,4		3,4,5,6,7,8		3,4,5,6,7,8
GAMW39	3	3,4,5,6,7			3	5	3
GAMW39B	3,4,5,6,7,8	3,4,5,6,7,8	3,4,5,6,7,8		3,4,5,6,7,8	5	3,4,5,6,7,8
GAMW40	3,4,6	3,4,5,6,7,8			3		3,4,5,6,7,8
GAMW40B	3,4,5,6,7,8	3,4,5,6,7	3,4,5,6,7,8		3,4,5,6,7,8	3,4,6,8	3,4,5,6,7,8
GAMW41	4,5,6,7,8	4,5,6,7	4,5,6,7,8		4,5,6,7,8		4,5,6,7,8
GAMW41B	4,5,6,7,8	4,6,7	4,5,6,7,8		4,5,6,7,8	6,7	4,5,6,7,8

“1” Indicates a statistically significant increase detected in the first Detection Monitoring event
“2” Indicates a statistically significant increase detected in the second Detection Monitoring event
“3” Indicates a statistically significant increase detected in the third Detection Monitoring event
“4” Indicates a statistically significant increase detected in the fourth Detection Monitoring event
“5” Indicates a statistically significant increase detected in the fifth Detection Monitoring event
“6” Indicates a statistically significant increase detected in the sixth Detection Monitoring event
“7” Indicates a statistically significant increase detected in the seventh Detection Monitoring event
“8” Indicates a statistically significant increase detected in the eighth Detection Monitoring event
“*” Indicates monitoring well was decommissioned prior to the third Detection Monitoring event

2.0 ALTERNATIVE SOURCE DEMONSTRATION CONCLUSION

The preceding information indicates the results of the eighth Detection Monitoring event are consistent with the previous Detection Monitoring events, and the rationale behind the ASD dated April 13, 2018 is still applicable. Golder prepared the ASD in accordance with 40 CFR 257.94(e)(2) and it supports the finding that the SSIs determined on July 28, 2021 are not due to a release from the CCR Unit. As described in that 2018 ASD, the conceptual site model, historical groundwater data, and the Phase V, Phase VI, and Phase VII landfill design indicate that a release from the unlined portion of the landfill not subject to the CCR Rule, Phases I and II, is the source of the identified SSIs. Therefore, no further action (i.e., Assessment Monitoring) is warranted, and the Schahfer Landfill Phases V, VI, and VII will remain in Detection Monitoring.

3.0 REFERENCES

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, April 13, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, August 28, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, March 31, 2019.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 6, 2019.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, May 7, 2020.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 29, 2020.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, March 31, 2021.

APPENDIX M

R. M. Schahfer Landfill Phase V and Phase VI Alternative Source Demonstration- March 2022

Northern Indiana Public Service Company LLC
(NIPSCO LLC)

R. M. Schahfer Generating Station

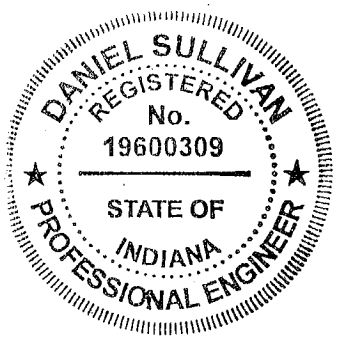
Wheatfield, Indiana

Schahfer Landfill Phase V, Phase VI, and Phase VII

Certification of Alternative Source Demonstration

I, Daniel Sullivan, being a Professional Engineer in accordance with the laws of the State of Indiana, and having experience in the design, construction, and operation of restricted waste landfills and groundwater monitoring systems for them, do hereby state that I am qualified in the subject matter of CCR management, groundwater monitoring, data interpretation, and groundwater impacts. I have personally examined and am familiar with this alternative source demonstration (ASD) for the NIPSCO LLC R. M. Schahfer Generating Station, prepared by Golder, and dated March 2022. Based on an inquiry of those individuals immediately responsible, and on supporting data which I understand to be true, accurate and complete, I verify the information in this ASD is accurate and meets the applicable requirements of the CCR Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the ASD for the regulated CCR management unit referred to as Phase V, Phase VI, and Phase VII has been prepared and meets the applicable requirements of 40 CFR §257.94(e)(2).

Daniel Sullivan
Indiana Professional Engineer
License # 19600309



3. 25. 2022
Date

TECHNICAL MEMORANDUM

DATE March 25, 2022 **Project No.** 19121567

TO Dan Sullivan, Jeff Loewe NIPSCO LLC

CC Maggie Rice, Maureen Turman, Joe Kutch, Mark Haney, Jim Peace, Thomas Haskins

FROM Danielle Sylvia Cofelice **EMAIL dsylvia@golder.com**

RE: R.M. SCHAHFER LANDFILL PHASES V, VI, AND VII ALTERNATIVE SOURCE DEMONSTRATION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the ninth (September 2021) groundwater Detection Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS) Landfill Phase V, Phase VI, and Phase VII (CCR Unit) in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule" (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

Statistical analyses of Appendix III groundwater Detection Monitoring results indicated statistically significant increases (SSIs) for five analytes detected in groundwater samples collected from downgradient wells compared to background levels. Although determination of an SSI generally indicates that the groundwater monitoring program should transition from Detection Monitoring to Assessment Monitoring, 40 CFR §257.94(e)(2) allows the owner or operator (i.e., NIPSCO) to demonstrate that a source other than the CCR unit or another condition caused the apparent SSI(s). Golder identified similar SSIs after the first (October 2017) Detection Monitoring event at the RMSGS Landfill Phase V and Phase VI and submitted an Alternative Source Demonstration (ASD) on April 13, 2018. As described in that ASD, the conceptual site model, historical groundwater data, and Phase V and Phase VI landfill design indicate the source of the identified SSIs is the unlined portion of the landfill, Phases I and II, which is not regulated by the CCR Rule. Golder recertified the ASD based on the second (February/March 2018) Detection Monitoring Event, on August 28, 2018; the third (September 2018) Detection Monitoring Event, on March 21, 2019; the fourth (March 2019) Detection Monitoring Event, on September 6, 2019; the fifth (October 2019) Detection Monitoring Event, on May 7, 2020; the sixth (March 2020) Detection Monitoring Event, on September 29, 2020, the seventh (October 2020) Detection Monitoring Event, on March 31, 2021; and the eighth (April 2021) Detection Monitoring Event, on October 26, 2021.

NIPSCO constructed a new landfill cell (Phase VII) immediately north of Phase VI in 2018. Phase VII is constructed in a similar manner to Phase V and Phase VI. Due to the proximity of Phase VII to Phase VI and landfill construction activities, Golder decommissioned monitoring wells GAMW-21/21B, GAMW-22/22B, GAMW-23/23B, and GAMW-28/28B, which were part of the original CCR Rule-required landfill monitoring network. Golder collected groundwater samples from these original four well pairs from July 2016 to March 2018. To replace the decommissioned wells, Golder installed monitoring wells GAMW-38/38B, GAMW-39/39B, GAMW-40/40B, and GAMW-41/41B downgradient and along the waste boundary of Phase VII in April and May 2018.

Golder first collected groundwater samples from existing and replacement monitoring wells during the September 2020 semi-annual monitoring event. Groundwater analytical data obtained from groundwater samples collected from the downgradient wells in the subsequent events were consistent with historical analytical results.

As discussed in the ASD recertification dated September 6, 2019, Golder calculated new prediction limits in June 2019 using all background data collected through March 2019. Again, in July 2021, Golder reviewed the analytical data collected to date and chose the option to update the prediction limits. The Groundwater Monitoring Program Implementation Manual (GMPIM, 2017) and the Unified Guidance allow for updating the statistical limits after a minimum of four “new measurements” are available. The periodic update of background datasets improves statistical power and accuracy by providing a more complete approximation of the true background population. The analytical data collected, and groundwater flow directions observed to date, indicate the chosen background wells are still representative of background conditions. The table below provides the original prediction limits calculated in January 2018, the revised prediction limits calculated in June 2019, and the revised prediction limits calculated in July 2021. Golder will re-evaluate the background dataset following collection of an additional four rounds of groundwater data from the background wells.

1.0 SUMMARY OF RESULTS

The results of the ninth Detection Monitoring event were included in the 2021 Annual Groundwater Monitoring and Corrective Action Report and the results of the statistical analysis are summarized below. SSIs were detected in groundwater samples collected from monitoring wells downgradient of the RMSGS Landfill Phase V, Phase VI, and Phase VI, for all Appendix III parameters. Overall, results are consistent with those collected previously and indicate few differences from the SSIs detected during the previous Detection Monitoring events. The differences are likely due to normal or temporal fluctuations in groundwater quality. The SSI results are summarized in the table below by well location and timeframe of the SSI exceedance.

Monitoring Well ID	Boron	Calcium	Chloride	Fluoride	Sulfate	pH	TDS
Prediction Level (2018)	**1.7**	**116.1**	**34.91**	**2.3**	**300**	**6.465-7.739**	**653.4**
Prediction Level (2019)	**3.2**	**130.9**	**39.93**	**2.3**	**470**	**6.353-7.82**	**1100**
Prediction Level (2021)	**3.8**	**230**	**50.21**	**2.3**	**670**	**6.184-8.163**	**1210**
GAMW21*							
GAMW21B*	1,2	1,2	1		1,2		1,2
GAMW22*		2					
GAMW22B*	1,2	1,2	1,2		1,2		1,2
GAMW23*	1,2	1,2			1,2	1,2	1,2
GAMW23B*	1,2	1,2	1,2		1,2	1,2	1,2
GAMW26				1,3,5,6,7, 8			2

Monitoring Well ID	Boron	Calcium	Chloride	Fluoride	Sulfate	pH	TDS
Prediction Level (2018)	**1.7**	**116.1**	**34.91**	**2.3**	**300**	**6.465-7.739**	**653.4**
Prediction Level (2019)	**3.2**	**130.9**	**39.93**	**2.3**	**470**	**6.353-7.82**	**1100**
Prediction Level (2021)	**3.8**	**230**	**50.21**	**2.3**	**670**	**6.184-8.163**	**1210**
GAMW26B		1,3,7	3,7		1,3,7	3	1,3,7
GAMW27	1,2,3,4,5,6,7,8,9	1,2,3,4,5,6,7,8,9			1,2,3,4,6,7,8,9		1,2,3,4,6,7,8,9
GAMW27B	1,2,3,4,5,6,7,8,9	1,2,3,5,6,7,8,9	1,2,3,4,5,6,7,8,9		1,2,3,4,5,6,7,8,9	3	1,2,3,4,5,6,7,8,9
GAMW28*	1,2	1,2	1		1,2		1,2
GAMW28B*	1,2	1,2	1,2		1,2		1,2
GAMW38							
GAMW38B	3,4,5,6,7,8,9	3,4,5,6,7,8,9	3,4		3,4,5,6,7,8,9		3,4,5,6,7,8,9
GAMW39	3	3,4,5,6,7			3	5	3
GAMW39B	3,4,5,6,7,8,9	3,4,5,6,7,8,9	3,4,5,6,7,8,9		3,4,5,6,7,8,9	5	3,4,5,6,7,8,9
GAMW40	3,4,6,9	3,4,5,6,7,8,9			3		3,4,5,6,7,8,9
GAMW40B	3,4,5,6,7,8,9	3,4,5,6,7	3,4,5,6,7,8,9		3,4,5,6,7,8,9	3,4,6,8	3,4,5,6,7,8,9
GAMW41	4,5,6,7,8,9	4,5,6,7	4,5,6,7,8		4,5,6,7,8,9		4,5,6,7,8,9
GAMW41B	4,5,6,7,8,9	4,6,7,9	4,5,6,7,8,9		4,5,6,7,8,9	6,7	4,5,6,7,8,9

"1" Indicates a statistically significant increase detected in the first Detection Monitoring event
"2" Indicates a statistically significant increase detected in the second Detection Monitoring event
"3" Indicates a statistically significant increase detected in the third Detection Monitoring event
"4" Indicates a statistically significant increase detected in the fourth Detection Monitoring event
"5" Indicates a statistically significant increase detected in the fifth Detection Monitoring event
"6" Indicates a statistically significant increase detected in the sixth Detection Monitoring event
"7" Indicates a statistically significant increase detected in the seventh Detection Monitoring event
"8" Indicates a statistically significant increase detected in the eighth Detection Monitoring event
"9" Indicates a statistically significant increase detected in the ninth Detection Monitoring event
"*" Indicates monitoring well was decommissioned prior to the third Detection Monitoring event

2.0 ALTERNATIVE SOURCE DEMONSTRATION CONCLUSION

The preceding information indicates the results of the ninth Detection Monitoring event are consistent with the previous Detection Monitoring events, and the rationale behind the ASD dated April 13, 2018 is still applicable. Golder prepared the ASD in accordance with 40 CFR 257.94(e)(2) and it supports the finding that the SSIs determined on December 27, 2021 are not due to a release from the CCR Unit. As described in that 2018 ASD, the conceptual site model, historical groundwater data, and the Phase V, Phase VI, and Phase VII landfill design indicate that a release from the unlined portion of the landfill not subject to the CCR Rule, Phases I and II, is the source of the identified SSIs. Therefore, no further action (i.e., Assessment Monitoring) is warranted, and the Schahfer Landfill Phases V, VI, and VII will remain in Detection Monitoring.

3.0 REFERENCES

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Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 6, 2019.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, May 7, 2020.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 29, 2020.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, March 31, 2021.

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APPENDIX N

CCR Assessment of Corrective Measures Addendum 2 – July 2021

REPORT

MCU Assessment of Corrective Measures - Addendum #2

Northern Indiana Public Service Company LLC

Rollin M. Schahfer Generating Station

Wheatfield, Indiana

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July 2021

Northern Indiana Public Service Company LLC (NIPSCO)
R. M. Schahfer Generating Station – MSRB, MCWB and DA (collectively the Multi-Cell Unit [MCU] or CCR Unit)
Wheatfield, Indiana

Certification of Addendum #2 to the Assessment of Corrective Measures Report 40 CFR §257.96 & Corresponding Regulations under Indiana Administrative Code

I have personally reviewed Addendum #2 to the assessment of corrective measures (ACM) report that was prepared by Golder Associates Inc. (Golder) and dated July 2021. The subject of Addendum #2 to the ACM Report is three impoundments, the Material Storage Runoff Basin (MSRB), Metal Cleaning Waste Basin (MCWB), and Drying Area (DA), which are collectively referred to as the Multi-Cell Unit (MCU) or simply the CCR Unit, at the NIPSCO R. M. Schahfer Generating Station. Based on an inquiry of those individuals immediately responsible and on supporting data that I understand to be true, accurate, and complete, I verify the information in this Addendum #2 to the ACM Report is accurate and meets the applicable requirements of the CCR Rule and Indiana Administrative Code. In consideration of the above, I certify to the best of my knowledge, information, and belief, that Addendum #2 to the ACM Report for the regulated CCR management unit referred to as the MCU has been prepared and meets the applicable requirements of 40 CFR §257.96 and corresponding State of Indiana requirements.



Joseph Bernard Gormley, Jr.
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7/29/2021
Date

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Acronyms

ACM	Assessment of Corrective Measures
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
cm/sec	Centimeter per second
COC	Constituents of Concern
CSM	Conceptual Site Model
DA	Drying Area
FGD	flue gas desulphurization
ft amsl	feet above mean sea level
ft bgs	feet below ground surface
GMPIM	Groundwater Monitoring Program Implementation Manual
gpm	gallons per minute
GWPS	Groundwater Protection Standards
IAC	Indiana Administrative Code
IDEM	Indiana Department of Environmental Management
IDNR	Indiana Department of Natural Resources
ISS	In situ Stabilization/Solidification
IRWDA	Inactive Retired Waste Disposal Area
MCL	Maximum Contaminant Level
MCWB	Metal Cleaning Waste Basin
mg/L	milligram per liter
MCU	Multi-Cell Unit
MNA	Monitored Natural Attenuation
MSRB	Material Storage Runoff Basin
MW	megawatt
NIPSCO	Northern Indiana Public Service Company
NPDES	National Pollutant Discharge Elimination System
O&M	Operations & Maintenance
POC	Point of Compliance
POTW	Publicly Owned Treatment Works
PRB	Permeable Reactive Barrier
RCG	Remediation Closure Guide
RMSGS	Rollin. M. Schahfer Generating Station
SSL	Statistically Significant Level
ug/L	microgram per liter
USEPA	United States Environmental Protection Agency
WDA	Waste Disposal Area

1.0 INTRODUCTION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), Golder has prepared this Addendum #2 to supplement the findings of the April 2019 CCR Assessment of Corrective Measures (ACM) Report and replace the November 2020 ACM Addendum for three impoundments, the Material Storage Runoff Basin (MSRB), Metal Cleaning Waste Basin (MCWB), and Drying Area (DA), collectively the Multi-Cell Unit (MCU) or simply the CCR Unit at the NIPSCO Rollin M. Schahfer Generating Station (RMSGS, Site) (ACM Report, Golder 2019 and ACM Addendum #1, Golder 2020).

ACM Addendum #1 was prepared to provide further details of Golder's evaluation of the potential corrective measures for the MCU and specifically focuses on addressing the following requirements under 40 Code of Federal Regulations (CFR) §257.96(c)

> *"The assessment under paragraph (a) of this section must include an analysis of the effectiveness of potential corrective measures in meeting all of the requirements and objectives of the remedy as described under §257.97 addressing at least the following:*
>
> *1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies including safety impacts, cross-media impacts, and control of exposure to any residual contamination;*
>
> *2) The time required to begin and complete the remedy;*
>
> *3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s)."*

ACM Addendum #2, which supersedes and fully replaces ACM Addendum #1, revises and updates information provided in the predecessor document and incorporates an enhanced final cap design in all corrective measures alternatives. Inclusion of the revised cap design affects the implementability of certain alternatives originally identified in the ACM and Addendum #1, effectively eliminating these alternatives from further consideration in ACM Addendum #2.

Key technical aspects of the cap design revision and update have been proposed to and discussed with the approving state regulatory agency for closure of the CCR Unit, Indiana Department of Environmental Management (IDEM), and the complete Closure Application is currently under IDEM review. Finalization of the ACM as envisioned in Addendum #2 and completion of the Selection of Remedy (SOR) processes is predicated upon IDEM's approval, in particular the source removal and final cap design aspects.

This Addendum #2 and remaining applicable sections of the ACM Report (Golder 2019) should be consulted in combination with one another.

2.0 BACKGROUND

NIPSCO owns and operates the RMSGS at 2723 E 1500 N Road, in Wheatfield, Jasper County, Indiana (see Figure 1). RMSGS manages coal combustion residuals (CCR) in surface impoundments subject to applicable requirements of 40 CFR Part 257 as amended (CCR Rule). Pursuant to 40 CFR §257.96(a), the MCU was subject to an ACM, the results of which were presented in the ACM Report (Golder 2019). Figures 2 through 7 show the monitoring well network, geologic cross sections, groundwater elevation contours and shallow/deep boron isoconcentration contour maps for the Site. Regional and Site Hydrogeology are summarized in the ACM

and supported by volume calculations, slug test data and calculations, and vertical gradient calculation included in Appendices A, B, and C, respectively.

NIPSCO plans to close the MCU by removal in accordance with 40 CFR §257.102(c) and an approved IDEM Closure Application. To meet the requirements of 40 CFR §257.97-98, NIPSCO's approach combines CCR source removal/capping followed by groundwater corrective measures and monitoring to demonstrate achievement of applicable groundwater protection standards (GWPS) shown in Table 1.

In the ACM Report (Golder 2019), Golder presented the analytical data for the MCU monitoring wells (see Table 2), identified general groundwater response actions (see Table 3), and presented an initial screening of corrective measure alternatives/process options for groundwater (see Table 4). In addition, Golder identified eight potential groundwater corrective measures for further consideration following the excavation of source material, verification of adequate removal, backfilling, and closure of the MCU. The potential corrective measures and their key components were summarized in Table 5 of the ACM Report (Golder 2019).

After preparation of the ACM Report and ACM Addendum #1, NIPSCO performed additional work with respect to future performance of the initially proposed closure approach and its possible impact on groundwater conditions. Based upon this assessment, NIPSCO determined that an enhanced combination soil/geomembrane cap along with a minor modification of the existing slurry wall, designed to alleviate potential groundwater level build up under the cap, would provide better long-term performance post-closure than either no cap or a soil-only cap. Consequently, NIPSCO proposed this alternative design to IDEM. As referenced above, as of this writing, consideration of the alternative design remains under IDEM review.

Because of NIPSCO's decision and subsequent proposal to IDEM to construct a low permeability cap in conjunction with source removal, it effectively removed groundwater corrective measure Alternative 2 – Capping with Monitored Natural Attenuation (MNA) from future consideration. Furthermore, other alternatives that did not previously include or consider the implications of constructing a low permeability cap immediately following source removal including Alternative 4 – In situ Stabilization/Solidification (ISS) and MNA, Alternative 6 – Capping, Pump-and-Treat and MNA, and Alternative 8 – ISS, Pump-and-Treat, and MNA were likewise removed from future consideration. Also, Alternative 1 – MNA, Alternative 3 – Vertical Barrier/Hydraulic Controls and MNA, Alternative 5 - Pump-and-Treat and MNA, and Alternative 7 – Vertical Barrier/Hydraulic Controls, Pump-and-Treat, and MNA were modified to reflect the inclusion of a low permeability cap. In summary and as identified in the embedded table below, Alternatives 2, 4, 6, and 8 have been removed from future consideration in ACM Addendum #2, leaving four remaining alternatives in original or modified form under consideration.

Alternative	**Status**	**Comments**
Alternative 1 - Monitored Natural Attenuation (MNA)	Retained	MNA requires no modifications to the current closure strategy.
Alternative 2 - Capping and MNA	Removed	Capping is already included in the current closure strategy but remains under review by IDEM.
Alternative 3 - Vertical Barrier/Hydraulic Controls and MNA	Retained/Modified	Hydraulic controls can be integrated into the current closure strategy with limited modifications to the cap.

Alternative	Status	Comments
Alternative 4 - In situ Stabilization/Solidification (ISS) and MNA	Removed	ISS cannot be integrated into the current closure strategy without significant modifications and potentially severe damage to the cap.
Alternative 5 - Pump-and-Treat and MNA	Retained/Modified	Pump and treat can be integrated into the current closure strategy with no impact to the cap.
Alternative 6 - Capping, Pump-and-Treat, and MNA	Removed	Capping is already included in the current closure strategy.
Alternative 7 - Vertical Barrier/Hydraulic Control, Pump-and-Treat, and MNA	Retained/Modified	See comments for Alternatives 3 and 5.
Alternative 8 - ISS, Pump-and-Treat, and MNA	Removed	See comments for Alternative 4.

3.0 IDENTIFICATION OF POTENTIAL CORRECTIVE MEASURES

3.1 Source Material

As discussed in the ACM Report (Golder 2019) and referenced above, NIPSCO plans to close the MCU in accordance with 40 CFR §257.102(c) and an approved IDEM Closure Application. NIPSCO's approach combines CCR source removal/capping and groundwater remediation and monitoring to demonstrate achievement of the IDEM-approved Closure Application requirements and applicable GWPS. The multi-part corrective action approach will be integrated, but will be sequenced, to allow for monitoring of early-stage post-closure results and plume stability. This approach will facilitate optimization of subsequent steps following completion of the initial source removal and capping stages.

The first phase of the integrated corrective action approach is closure by removal/capping of the MCU. Following dewatering activities, the three impoundments will be excavated. In accordance with the Closure Application, excavations are being planned to remove CCR and non-CCR materials to the original design limits (sides and bottom) of the impoundments. Satisfactory excavation will be confirmed by a visual determination that the CCR materials have been removed (Wood 2021).

Following completion of CCR excavation and visual verification of the source removal activities, a final low permeability cap will be installed. As proposed to IDEM, the final cap will consist of the following components presented in descending order from top to bottom (Wood 2021):

- Topsoil (6-inch);
- Cover soil (18-inch);
- Geocomposite drainage layer (GDL);
- 40-mil linear low-density polyethylene (LLDPE) geomembrane; and
- Subgrade fill.

The low permeability cap (e.g., permeability less than or equal to 1 x 10-7 cm/sec) will reduce infiltration of rainwater into the closed CCR unit. In doing so it may further reduce the total volume of impacted groundwater requiring remediation.

During cap construction a hydraulically downgradient section of the slurry wall will be permanently removed down to the average elevation of the groundwater table to address the water buildup/overtopping possibility within the former impoundment. This action should reduce concerns regarding long-term cap performance and maintenance; however, it may result in periodic discharges from within the former impoundment of diluted groundwater that has previously been in contact with CCR.

Closure-by-removal construction activities including, but not limited to, dewatering and excavation of the CCR source material, removal of a portion of the existing slurry wall to the average elevation of the groundwater table, backfill of the closed impoundment, and placement of a low permeability cap are expected to affect the current groundwater flow regime within and in areas proximate to the MCU. Accordingly, NIPSCO will evaluate these impacts on groundwater remedy alternatives as a critical foundational component of the ongoing SOR process. IDEM requires NIPSCO to obtain their approval before closing the MCU; therefore, this stage of additional data collection will begin following IDEM's approval and during NIPSCO's implementation of the Closure Application. In addition to traditional long-term post-closure monitoring during closure implementation and in the early stages of post-closure, NIPSCO will perform remedy-focused groundwater monitoring activities. Beyond the Part 257 Appendix III and IV constituents, monitoring will include parameters specific to the applicability, appropriateness, and performance of MNA, continuing to build upon the results of the MNA Tier I-III evaluation previously completed. In short, NIPSCO will use the monitoring results to evaluate the impacts of source removal and associated closure construction activities and help inform and refine the groundwater remedy selection process as needed.

3.2 Groundwater Impacts

Following closure of the MCU by removal/capping, NIPSCO will address impacted groundwater below and downgradient of the MCU.

Because the existing slurry wall surrounding the MCU was installed to contact the underlying bedrock, installation of the low permeability cap will increase the possibility of creating a cell of isolated impacted groundwater beneath the MCU that will not be recharged through migration of un-impacted groundwater or infiltrating rainwater. Due to the history of CCR loading in the MCU, the capacity of the saturated zone within the slurry wall to naturally attenuate these isolated CCR impacts has likely been depleted relative to the aquifer outside the slurry wall. Therefore, there is also a potential for the isolated impacted groundwater within the MCU to be released downgradient if the slurry wall exceeds its operational lifetime or the water level inside the MCU rises and overtops the slurry wall. NIPSCO will also address these potential impacts if monitoring results do not indicate progress towards achievement of GWPS.

In the ACM Report (Golder 2019), Golder identified and preliminarily evaluated the following eight groundwater corrective measure alternatives for further consideration in accordance with the provisions of §257.96(c).

- Alternative 1 - Monitored Natural Attenuation (MNA)
- Alternative 2 - Capping and MNA
- Alternative 3 - Vertical Barrier and MNA

- Alternative 4 - In situ Stabilization/Solidification (ISS) and MNA
- Alternative 5 - Pump-and-Treat and MNA
- Alternative 6 - Capping, Pump-and-Treat, and MNA
- Alternative 7 - Vertical Barrier, Pump-and-Treat, and MNA
- Alternative 8 - ISS, Pump-and-Treat, and MNA

Golder's evaluation of the potential corrective measures and their key components were summarized in Table 5 of the ACM Report (Golder 2019). As noted above, previous Alternatives 2, 4, 6, and 8 have since been removed from future consideration due to a change in closure approach and previous Alternatives 1, 3, 5, and 7 have been modified for the same reason. For this Addendum #2, Golder is providing further supporting evaluation details with respect to each of the four remaining potential groundwater corrective measure alternatives. For clarification and to differentiate the ACM Addendum #2 alternatives from those presented and discussed in predecessor documents, the remaining alternatives are renumbered as follow:

- Alternative A – MNA
- Alternative B – Vertical Barrier/Hydraulic Controls and MNA
- Alternative C – Pump-and-Treat and MNA
- Alternative D –Vertical Barrier/Hydraulic Controls, Pump-and-Treat, and MNA

A summary of the retained groundwater corrective measure alternatives is shown in Table 5. The remedial components of the groundwater corrective measure alternatives following source removal and capping are described further in Section 4.

4.0 EVALUATION OF POTENTIAL GROUNDWATER CORRECTIVE MEASURES

4.1 Evaluation Criteria

In conformance with the applicable requirements of 40 CFR §257.96 and 40 CFR §257.97, Golder evaluated the effectiveness of each of the four remaining potential groundwater corrective measures originally identified in the ACM Report (Golder 2019) using the following criteria:

- **Performance** - Potential corrective measures were evaluated for their relative performance based on the magnitude of reduction of existing risks, ability to obtain the groundwater protection standard (GWPS) at the point of compliance (POC), the magnitude of residual risks in terms of likelihood of future releases due to remaining CCR following implementation of remedy, and the required type and degree of long-term management including monitoring, operation, and maintenance associated with the corrective measure.
- **Reliability** - Potential corrective measures were evaluated for their relative reliability based on the long-term reliability of engineering and institutional controls, potential need for the replacement of the remedy, extent to which containment practices will reduce further releases, and extent to which the treatment technologies may be used.

- **Ease of Implementation** - Potential corrective measures were evaluated based on their relative ease of implementation based on difficulty associated with construction of the technology, operational reliability of the technology(ies), coordination of regulatory approvals and permits from pertinent agencies, availability of necessary equipment and specialists, and availability capacity and location of needed treatment, storage, and disposal services.
- **Potential Impacts** - Potential corrective measures were evaluated based on their relative potential impacts based on safety impacts, cross-media impacts, and control of exposure. Exposure controls include short-term risks during implementation of a remedy and potential exposure to remaining wastes to the community or environment including potential threats associated with excavation, transportation, re-disposal of CCR, or contaminant.
- **Time Requirements** - Potential corrective measures were evaluated based on the time required to initiate, construct, and complete the remedy.
- **Institutional Requirements** - Potential corrective measures were evaluated based on their institutional requirements including local, state, and federal permit needs.

4.2 Evaluation Summaries

Relative to the above evaluation criteria, the following sections present brief summaries of the proposed groundwater corrective measure alternatives following source removal and capping. In addition, the summaries highlight areas where a particular remedy may perform well or poorly relative to other alternatives. A summary of Golder's evaluation of the four retained groundwater corrective measure alternatives is provided in Table 6.

4.2.1 Alternative A: Monitored Natural Attenuation

Golder evaluated MNA as a potential groundwater corrective measure for the Site COCs. The MNA Evaluation (Golder 2020) is presented in Appendix D. The results of the evaluation indicate that MNA is a technically feasible and appropriate corrective measure for groundwater at the Site based on the following factors:

- Attenuation is already occurring at the Site at a reasonable rate
- The dissolved plume is stable
- The aquifer has the long-term capacity to attenuate COCs

Based on the results of the Tier I, II, and III MNA evaluations for the Site, Golder concluded that MNA is expected to provide good long-term performance. MNA alone will not substantially affect groundwater concentrations in the short-term, however, it may show some progress within a few months of source material removal during closure of the MCU.

For the MNA evaluation, Golder conducted a point decay evaluation at monitoring wells downgradient of the MCU. Based on the results of the evaluation, maximum concentrations of boron and cobalt observed in downgradient wells over the period of monitoring would take approximately 41 and 39 years, respectively, to attenuate to concentrations below the GWPS (or health-based standard for boron) (Golder 2020).

For the evaluation, Golder also considered the following factors:

- The low groundwater flow velocities observed at the Site

- The distance from the MCU to the property boundary and lack of off-Site migration of groundwater impacts
- The lack of potable water supply wells at the Site in the vicinity of the MCU and the downgradient plume
- Planned institutional controls prohibiting use of groundwater from any impacted area at the Site for drinking water
- Lower observed boron concentrations at monitoring wells further downgradient from the MCU

Based on these other factors, MNA is expected to be protective of human health and reduce environmental degradation until the wells near the MCU achieve the cleanup criteria.

Because there is an existing monitoring well network downgradient of the MCU, implementation of an MNA program is unlikely to require any component construction/installation. In addition, it does not require disturbance of the complex subsurface utility network located hydraulically downgradient of the MCU. Therefore, MNA will be relatively easy to implement following regulatory approval and poses no short-term safety risks. Long-term operation and maintenance (O&M) will include routine groundwater sampling and potentially periodic well redevelopment.

4.2.2 Alternative B: Vertical Barrier/Hydraulic Controls and MNA

For the Vertical Barrier/Hydraulic Control and MNA Alternative, hydraulic controls within the existing slurry wall would be added to the MNA alternative. The Vertical Barrier/Hydraulic Control and MNA alternative would be implemented to reduce or eliminate downgradient migration of impacted groundwater. This alternative assumes that the existing slurry wall is intact, albeit slightly modified from the original design to address potential water buildup with the former impoundment cell, and that implementation of this alternative involves installation and operation of a pump-and-treat system within the former impoundment areas to prevent over-topping of the modified slurry wall due to groundwater recharge.

The Vertical Barrier/Hydraulic Control and MNA Alternative would have a similar effect as the MNA Alternative on groundwater downgradient of the closed MCU. It would reduce or eliminate the volume of impacted groundwater potentially overtopping the existing or modified slurry wall(s), thus removing a source of contamination, and allowing for more efficient natural attenuation. This remedy would also result in removal of contaminant mass through groundwater extraction and treatment with boron-specific ion exchange resin, which would reduce the potential for future releases of impacted groundwater if the slurry wall fails.

Because there is an existing and functional slurry wall around the MCU, corrective measure implementation would include design, well installation, enclosure construction, and treatment system assembly/construction. Some treatment system components may require lead times prior to delivery; however, most components should be readily available. An amendment to the Site's National Pollutant Discharge Elimination System (NPDES) permit would likely be required to discharge treated water to an on-site stormwater pond, which could delay implementation while awaiting regulatory review.

Resin regeneration requires concentrated sodium hydroxide and hydrochloric acid, which could be released and cause damage to the environment in the event of a containment breach. Likewise, in the event of unidentified contaminant breakthrough, there is the potential for treated water containing unacceptable contaminant levels to be discharged in the treatment system effluent. However, both of these events are unlikely to occur as the reagents will be stored in secondary containment and resin regeneration will be completed automatically on a regular basis to maintain the resin at a high level of removal efficiency.

The hydraulic control system will require a higher level of periodic O&M compared to the MNA Alternative as influent and effluent samples will likely need to be collected monthly and there is significant potential for shut-downs due to the number of different components (filter vessels, ion-exchange columns, slurry dryer, pH adjustment system, etc.) that are needed to keep the system operational. Most or all of these components will also need replacement over the 30-year design lifetime of the system.

4.2.3 Alternative C: Pump-and-Treat and MNA

For the Pump-and-Treat and MNA Alternative, a groundwater pump-and-treat system would be designed and installed to capture contaminated groundwater present in the downgradient vicinity of the MCU and/or potentially leaking through/under the CCR slurry wall, to prevent downgradient off-Site migration. The captured groundwater would then be treated to reduce concentrations to an acceptable concentration and discharged to surface water or groundwater.

The Pump-and-Treat and MNA Alternative offers a higher level of short- and long-term protection than capping and ISS as it removes contaminant mass through treatment of extracted water using ion-exchange resin. This will help reduce contaminant concentrations and thereby enhance natural attenuation downgradient of the capture zone. The capture zone is extensive enough that continued operation of the pump-and-treat system will also contain any future groundwater releases if the slurry wall fails.

Some treatment system components may require lead times prior to delivery, but most components should be readily available. An amendment to the Site's NPDES permit would likely be required to discharge treated water to an on-site stormwater pond, which could delay implementation while awaiting regulatory review. Resin regeneration requires concentrated sodium hydroxide and hydrochloric acid, which could be released and cause damage to the environment in the event of a containment breach. Likewise, in the event of unidentified contaminant breakthrough, there is the potential for treated water containing unacceptable contaminant levels to be discharged. However, both of these events are unlikely to occur as the any reagents will be stored in secondary containment and resin regeneration will be completed automatically on a regular basis to maintain the resin at a high level of removal efficiency. The system will require a higher level of periodic O&M compared to capping and ISS as effluent samples will likely need to be collected monthly and there is significant potential for shut-downs due to the number of different components (filter vessels, ion-exchange columns, slurry dryer, pH adjustment system, etc.) that are needed to keep the system operational. Most or all of these components will also need replacement over the 30-year design lifetime of the system.

4.2.4 Alternative D: Vertical Barrier/Hydraulic Control, Pump-and-Treat, and MNA

The Vertical Barrier/Hydraulic Control, Pump-and-Treat, and MNA Alternative, which includes a pump-and-treat system pumping from wells both inside and downgradient of the slurry wall, would offer a high level of short- and long-term protection. The downgradient well field would remove impacted groundwater allowing for higher-efficiency natural attenuation downgradient of the capture zone while the well field inside the slurry wall would remove more highly-impacted material and reduce the potential for future releases if the slurry wall fails. This alternative would also result in the highest level of contaminant mass removal.

Construction/implementation of this corrective measure alternative would face similar construction/permitting hurdles as the Vertical Barrier/Hydraulic Control and Pump-and-Treat Alternatives in Sections 4.2.2 and 4.2.3, most significantly lead times on components and discharge permitting. Operation and maintenance for this remedy would also be similar to these alternatives with frequent influent/effluent sampling and component monitoring and maintenance, however, the treatment system could be contained in a single enclosure and have a

single set of components for treating extracted water from both capture areas. Because of the shared treatment system, the O&M level of effort would likely not be significantly higher than that presented in Section 4.2.3 for the Pump-and-Treat Alternative (as opposed to an additive level of effort for the combined remedial alternatives).

5.0 SUMMARY AND NEXT STEPS

This Addendum #2 supplements the ACM Report (Golder 2019) and replaces in full ACM Addendum #1 (Golder 2020). It reflects NIPSCO's enhanced closure strategy and ongoing discussions with IDEM in response to comments on the latest Closure Application, providing additional details regarding the remaining four potential groundwater corrective measures originally identified in those reports, and evaluating those corrective measures in accordance with the performance requirements identified in 40 CFR §257.96(c). As noted above, a summary of Golder's evaluation of the four retained groundwater corrective measure alternatives is provided in Table 6.

In addition to updating the ACM to reflect the most recent discussions with IDEM and the revision/submission of the Closure Application for IDEM for review and approval, NIPSCO continues to conduct activities in accordance with the expectations of the ACM and Selection of Remedy (SOR) processes, including the following:

- Preparation of bid documents (specifications and drawings) for closure of the MCU, which provide SOR-related information relative to cost and schedule for alternatives.
- Contractor procurement (including contractor pre-qualification, scheduling of site walks, scope of work question-and-answer, request for alternative approach(es), and establishment of a bid due date) to perform the source removal/capping phase of the corrective measures. This activity informs and refines cost and schedule aspects of the SOR alternatives evaluation process.
- Communications with vendors regarding water treatment technologies, equipment availability, and media costs/handling. This activity also informs and helps refine cost and schedule aspects of the SOR evaluation.

6.0 REFERENCES

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Tables

Table 1: Applicable Groundwater Cleanup Standards
CCR Unit Schahfer MSRB, MCWB, and DA
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL (mg/L)	GWPS (mg/L)	IDEM RCG (mg/L)
Appendix III Constituents			
Boron	-	NA	4
Calcium	-	NA	-
Chloride	-	NA	-
Fluoride	4	4	0.8
pH	-	NA	-
Sulfate	-	NA	-
Total Dissolved Solids	-	NA	-
Appendix IV Constituents			
Antimony	0.006	0.006	0.006
Arsenic	0.01	0.078	0.01
Barium	2	2	2
Beryllium	0.004	0.004	0.004
Cadmium	0.005	0.005	0.005
Chromium	0.1	0.1	0.1
Cobalt(1)	0.006(2)	0.01	0.006
Fluoride	4	4	0.8
Lead(1)	0.015(2)	0.0007	0.015
Lithium(1)	0.04(2)	0.0082	0.04
Mercury	0.002	0.002	0.002
Molybdenum(1)	0.1(2)	0.036	0.1
Radium 226+228	5	5	-
Selenium	0.05	0.05	0.05
Thallium	0.002	0.002	0.002

Prepared by: DFS
Checked by: KMC
Reviewed by: MAH

Notes:
MCL= Environmental Protection Agency Maximum Contaminant Level
GWPS= Groundwater Protection Standard calculated August 23, 2018.
Revision
mg/L= milligrams per liter
NA= not applicable; GWPS are calculated for Appendix IV constituents only
1) These four constituents do not have an established MCL. Prior to the Phase 1 Part 1 amendment, effective August 29, 2018, the GWPS was calculated based on background concentrations according to the CCR Final Rule.
2) The Phase 1 Part 1 amended health-based standard, effective August 29, 2018 pursuant to 40 CFR §257.95(h)(2)

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW04																		
				2016-07-12	2016-09-08	2016-11-09	2017-01-10		2017-03-01	2017-04-26	2017-06-28	2017-08-22	2017-10-04	2018-03-13	2018-03-14	2018-04-20		2018-10-25	2019-04-23	2019-11-07	2020-05-13	
				N	N	N	FD	N	N	N	N	N	N	FD	N	FD	N	N	N	N	FD	N
Appendix III Parameters																						
Boron		4	mg/L	0.48	1.4	2.4 O	1.1	1	1.2	0.74	0.92	1.2	0.54			0.74	0.72	0.78	0.74	1.3	0.66	0.64
Calcium			mg/L	110	230	300 O	270	240	230	220	200	200	140			140	140	210	130	190	115	112
Chloride			mg/L	2.2	27	69 O	13	14	13	5.4	12	13	4.5			3.7 J	4.4	10	3.7	9.5	2	2
Fluoride	4	4	mg/L	0.92 J+	0.2 J	10 UO	0.19 J	0.17 J	5 U	5 U	0.19 J	0.21 J	0.24 J	0.15 J	5 U	5 U	0.17 J-	0.26	0.16 J+	0.23	0.15	0.15
pH			SU	7.22	6.83	6.75		6.93	7.01	6.76	6.88	7.21	7.28		6.95		7.2	6.39	7	7.14		7.42
Sulfate			mg/L	140 J-	460	480 O	460	470	390	470	370	440	250			220	210	530	260	490	136	139
Total Dissolved Solids			mg/L	420	990	1400 O	1000	1000	890	870	880	920	610			580 J	580	980	600	900	411	419
Appendix IV Parameters																						
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.00027 JO	0.002 U	0.00057 J	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U	0.002 U			0.002 U	0.00065 J	0.00092 J	0.001 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0059	0.013	0.0052 O	0.0058	0.0072	0.005 U	0.0099	0.012	0.012		0.004 J	0.0054			0.014	0.0023 J	0.0018 J	0.002	0.002
Barium	2	2	mg/L	0.041	0.077	0.11 O	0.095	0.079	0.089	0.069	0.084	0.09		0.11	0.077			0.074	0.068	0.066	0.076	0.077
Beryllium	0.004	0.004	mg/L	0.00027 J	0.001 U	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.00048 J	0.00053 J	0.001 U	0.0002 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.00036 JO	0.00036 J	0.0052 JO	0.002 U	0.002 U	0.002 U	0.002 U		0.0011 J	0.0012 J			0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.001 U	0.00031 J	0.00064 JO	0.0061	0.0058	0.0038	0.0049	0.003	0.0023		0.0028	0.0031			0.0026	0.0011	0.00043 J	0.001 U	0.001 U
Fluoride	4	4	mg/L	0.92 J+	0.2 J	10 UO	0.19 J	0.17 J	5 U	5 U	0.19 J	0.21 J	0.24 J	0.15 J	5 U	5 U	0.17 J-	0.26	0.16 J+	0.23	0.15	0.15
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0018 J	0.008 U	0.008 UO	0.0021 J	0.0023 J	0.0033 J	0.0033 J	0.0062 J	0.0062 J		0.008 U	0.008 U			0.0023 J	0.0045 J	0.0028 J	0.008 U	0.008 U
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 UO	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U	0.0002 U			0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.0075 J	0.023	0.073 O	0.037	0.038	0.034	0.016	0.02	0.034		0.0048 J	0.024			0.039	0.024	0.055	0.022	0.022
Radium 226 + 228	5		pCi/L	5 U	0.583	0.697 O	0.804	0.515 U	0.362 U	0.379 U	0.364 U	0.352 U		1.35 J+	0.778 J+			0.473	0.591		1.7 U	1.62 U
Radium-226			pCi/L	1 U	0.138 U	0.346 UO	0.301 U	0.242 U	0.121 U	0.117 U	0.119 J+	0.118		0.177	0.0881			0.306	0.311 U		0.78 U	0.613 U
Radium-228			pCi/L	1 U	0.498 U	0.495 UO	0.677 J+	0.515 U	0.362 U	0.379 U	0.364 U	0.352 U		1.17 J+	0.69 J+			0.462 U	0.405		0.924 U	1.01 U
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.00064 JO	0.0017 J	0.0021 J	0.005 U	0.005 U	0.005 U	0.005 U		0.001 J	0.001 J			0.005 U	0.0013 J	0.0052	0.001 U	0.001 U
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																						
Dissolved Oxygen			mg/L	0.09	0.58	0.37		1.82	1.47	0.12	0.3	0.52	0.09		0.66		2.3	0.15	7.08	2.55		1.32
Oxidation Reduction Potential			millivolts	59.6	-24	-6.9		-31.7	14	-57.8	-45	-27	-105.8		-181.8		-81.2	-58.1	19	-60.7		-28.6
pH			SU	7.22	6.83	6.75		6.93	7.01	6.76	6.88	7.21	7.28		6.95		7.2	6.39	7	7.14		7.42
Specific Conductivity			uS/cm	595	1345	1681		1109	910	1137	911	1153	813		562		770	1311	549	866		681
Temperature			deg C	13	17.3	16.3		10.5	8.05	10.2	13.1	15.9	16.1		7.55		3.5	15.5	4.2	13.2		9.8
Turbidity			NTU	4.04	1.48	2.21		2.28	4.26	4.04	4.88	1.65	0.51		4.92		3.12	1.92	4.48	1.38		3.51

Notes:
IDEM RCG= Indiana Department of Environmental Management
Remediation Closure Guidance Table A-6 Screening Levels - 2021
Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW07																
				2016-07-12	2016-09-08	2016-11-09	2017-01-10	2017-03-01	2017-04-26	2017-06-29	2017-08-23	2017-10-03		2018-03-15	2018-04-23	2018-10-26	2019-05-02	2019-11-08	2020-04-28	
				N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	FD	N
Appendix III Parameters																				
Boron		4	mg/L	1.2	1	0.91	0.91	1	0.68	0.67	0.68	0.71	0.72		1.2	1.3	0.85	0.85	0.87	0.87
Calcium			mg/L	170	190	200	170	170	190	220	190	220	220		210	230	220	180	209	211
Chloride			mg/L	7.8	6.6	5.3	6	7.6	2.8	3 J	3.2 J	3 J	3.6 J		4.7 J	6.3	6.5	4.8	6.5	6.3
Fluoride	4	4	mg/L	0.72 J+	0.91 J	0.8 J	0.85 J	0.66 J	0.76 J	0.79 J	0.66 J	1.1 J	0.93 J	0.58 J	0.57 J	0.73	0.97	0.88	0.64	0.64
pH			SU	7.03	7.27	7.04	7.15	7.2	7.17	6.57	7.2		7.1	7.28	7.35	5.71	7.2	7.44		7.3
Sulfate			mg/L	310 J-	330	320	320	290	310	360	380	460	450		450	530	500	480	403	399
Total Dissolved Solids			mg/L	770	830	840	750	710	810	970	910	970	1000		900	970	1100	940	840	846
Appendix IV Parameters																				
Antimony	0.006	0.006	mg/L	0.00035 J	0.00039 J	0.00035 J	0.00028 J	0.002 U	0.002 U	0.002 U	0.002 U			0.002 U		0.002 U	0.002 U	0.002 U	0.001 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0013 J	0.0016 J	0.0018 J	0.0028 J	0.005 U	0.0028 J	0.0025 J	0.0016 J			0.005 U		0.0012 J	0.0019 J	0.0011 J	0.001 U	0.001 U
Barium	2	2	mg/L	0.052	0.055	0.056	0.042	0.05	0.05	0.059	0.059			0.056		0.064	0.053	0.043	0.041	0.04
Beryllium	0.004	0.004	mg/L	0.00011 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0003 J	0.00022 J			0.001 U		0.00047 J	0.001 U	0.001 U	0.0002 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.00047 J	0.00046 J	0.002 U	0.002 U	0.002 U	0.002 U			0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.0056	0.0077	0.0055	0.0038	0.0044	0.0063	0.01	0.0095			0.006		0.01	0.0074	0.0049	0.0063	0.0064
Fluoride	4	4	mg/L	0.72 J+	0.91 J	0.8 J	0.85 J	0.66 J	0.76 J	0.79 J	0.66 J	1.1 J	0.93 J	0.58 J	0.57 J	0.73	0.97	0.88	0.64	0.64
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0007 J			0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0034 J	0.008 U	0.008 U	0.0035 J	0.0031 J	0.0041 J	0.0037 J	0.0038 J			0.0024 J		0.0054 J	0.0041 J	0.0033 J	0.008 U	0.008 U
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ			0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.0084 J	0.0098 J	0.0095 J	0.01 U	0.01 U	0.0083 J	0.0081 J	0.007 J			0.0066 J		0.0087 J	0.0097 J	0.0087 J	0.0073	0.0073
Radium 226 + 228	5		pCi/L	1.59	0.696	0.548	0.412 U	0.42 U	0.371 U	0.45	0.588			0.749 J+		0.823 J+	0.37 U		1.62	2.01 U
Radium-226			pCi/L	0.667 J+	0.289	0.374	0.237 U	0.186	0.155	0.232 J+	0.3			0.163		0.483 J+	0.305 U		0.653 U	1.19 U
Radium-228			pCi/L	0.923	0.406	0.462 U	0.412 U	0.42 U	0.371 U	0.262 U	0.413 U			0.585 J+		0.365 U	0.37 U		1.07	0.864
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.003 J	0.003 J	0.005 U	0.008	0.0054	0.005			0.0028 J		0.0016 J	0.0045 J	0.0019 J	0.0017	0.0018
Thallium	0.002	0.002	mg/L	0.00011 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.00024 J	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																				
Dissolved Oxygen			mg/L	0.6	1.81	0.59	0.52	0.51	1.96	1.02	0.84		0.48	0.8	3.52	2.64	0.81	0.38		0.34
Oxidation Reduction Potential			millivolts	111.2	64.2	-6.4	71.3	65.3	76.9	291.1	8.5		95.4	-55	-98.7	-233.3	135.1	-131.8		115.2
pH			SU	7.03	7.27	7.04	7.15	7.2	7.17	6.57	7.2		7.1	7.28	7.35	5.71	7.2	7.44		7.3
Specific Conductivity			uS/cm	966	1072	1106	928	832	1121	1151	1157		1273	760	1060	1240	975	828		1223
Temperature			deg C	14.4	19.2	16.7	12.9	10.63	11.8	14.6	16.5		18	10	10	16.95	10.3	15.3		10.5
Turbidity			NTU	4.6	4.51	1.26	3.2	4.76	2.17	2.87	0.9		0.49	1.3	1.75	1.08	2.72	4.58		3.2

Notes:
IDEM RCG= Indiana Department of Environmental Management
Remediation Closure Guidance Table A-6 Screening Levels - 2021
Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW07B					GAMW08														
				2018-09-06	2018-10-26	2019-05-02	2019-11-12	2020-04-28	2016-07-13	2016-09-08	2016-11-09	2017-01-10	2017-03-02	2017-04-27	2017-06-29	2017-08-23	2017-10-04	2018-03-14	2018-04-23	2018-10-26	2019-05-08	2019-11-07	2020-04-24
				N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Appendix III Parameters																							
Boron		4	mg/L	20	23	18	15	11.1	3.5	3.9	3.2	3.4	3.3	3.2	2.9	2.2	3.7		2.4	1.8	1.4	2.5	3
Calcium			mg/L	370	430	380	400	370	310	310	300	260	270	310	340	270	290		360	230	250	280	309
Chloride			mg/L	10 UO	250	170	150	113	88	71	89	99	110	86	83	39	87		64	56	49	66	67
Fluoride	4	4	mg/L	10 UO	1.5	1.3	1.2	1.2	1 J+	1.2 J	0.73 J	0.87 J	0.94 J	0.92 J	1.3 J	2 J	0.68 J	1.2 J	1.3 J-	1.6	2.2	1.9	1.1 J-
pH			SU	8.29	6.78	7.58	7.13	7.73	6.92	7.03	6.85	7.02	7.09	6.93	7	7.27	6.89	7.41	7.41	6.99	7.37	7.5	7.35
Sulfate			mg/L	10 UO	1600	1500	1400	1260	770 J-	690	680	610	630	770	800	640	670		800	460	540	670	719
Total Dissolved Solids			mg/L	2700	2600	920	2300	2140	1600	1500	1600	1300	1400	1700	2000	1400	1500		1700	1100	1300	1300	1550
Appendix IV Parameters																							
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.00073 J	0.00069 J	0.0014 J	0.00041 J	0.00043 J	0.002 U	0.00059 J	0.00075 J		0.002 U		0.00082 J	0.00076 J	0.00077 J	0.001 U
Arsenic	0.01	0.01	mg/L	0.0028 J	0.0015 J	0.0019 J	0.0017 J	0.0023	0.0018 J	0.0019 J	0.0018 J	0.0027 J	0.0016 J	0.0031 J	0.0027 J	0.0023 J		0.005 U		0.0011 J	0.0015 J	0.0016 J	0.0012
Barium	2	2	mg/L	0.072	0.063	0.053	0.043	0.044	0.068	0.065	0.065	0.05	0.055	0.064	0.074	0.077		0.066	0.069	0.053	0.058	0.066	0.061
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.00017 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.0004 J	0.001 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	7.4E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.00037 J	0.001 U	0.001 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.00029 J	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.00074 J	0.001 U	0.001 U	0.001 U	0.001 U	0.036	0.034	0.059	0.047	0.05	0.037	0.047	0.02		0.022	0.027	0.011	0.0079	0.011	0.022
Fluoride	4	4	mg/L	10 U	1.5	1.3	1.2	1.2	1 J+	1.2 J	0.73 J	0.87 J	0.94 J	0.92 J	1.3 J	2 J	0.68 J	1.2 J	1.3 J-	1.6	2.2	1.9	1.1 J-
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0043 J	0.0045 J	0.004 J	0.0035 J	0.008 U	0.0098	0.012	0.009	0.0098	0.0093	0.012	0.011	0.012		0.0089	0.009	0.011	0.015	0.0091	0.0087
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.015	0.017	0.025	0.026	0.026	0.034	0.036	0.024	0.02	0.019	0.038	0.049	0.083		0.058	0.058	0.059	0.08	0.068	0.048
Radium 226 + 228	5		pCi/L	2.63	2.6 J+	2.31		1.92 U	1.07	1.08	1.09	0.581	0.777	0.632	1.11	0.762		1.13 J+	0.99	1 J+	0.473		1.25 U
Radium-226			pCi/L	1.16	1.56 J+	1.17		0.884 U	0.501 J+	0.469	0.557	0.375	0.368	0.383	0.613 J+	0.591		0.267	0.437	0.582 J+	0.312 U		0.563 U
Radium-228			pCi/L	1.47	1.04	1.14		1.07	1 U	0.609	0.533	0.43 U	0.423 U	0.365 U	0.499	0.341 U		0.865 J+	0.552	0.423	0.456 U		0.689 U
Selenium	0.05	0.05	mg/L	0.0012 J	0.005 U	0.005 U	0.005 U	0.001 U	0.005 U	0.0065	0.0033 J	0.0014 J	0.0032 J	0.011	0.0088	0.0081		0.024	0.022	0.0021 J	0.016	0.0036 J	0.0062
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.00045 J	0.001 U	0.001 U
Field Parameters																							
Dissolved Oxygen			mg/L	0.13	0.67	0.19	0.2	0.1	1.9	0.38	1.62	1.27	0.96	0.63	1.96	0.93	0.21	0.97	5.09	0.21	0.44	4.2	0.34
Oxidation Reduction Potential			millivolts	-197.6	-230.2	34.9	-196.7	-128.6	159.7	64.6	-8	58.4	49.9	60.4	242.5	61.9	-15.9	110.1	-106.4	27.7	62.2	44.1	52.5
pH			SU	8.29	6.78	7.58	7.13	7.73	6.92	7.03	6.85	7.02	7.09	6.93	7	7.27	6.89	7.41	7.41	6.99	7.37	7.5	7.35
Specific Conductivity			uS/cm	5178	3237	2357	1686	2722	1925	1807	1664	1517	1494	2098	1834	1713	1840	1121	1732	1440	1102	1322	2009
Temperature			deg C	15.03	13.86	12.4	12.9	12.7	15.5	18.78	17.75	12.2	10.06	11.1	15.8	18.5	18.3	9.6	10.2	17.2	11	10.84	10.5
Turbidity			NTU	4.48	3.01	2.86	1.11	3.48	2.3	3.22	0.58	1.26	1.56	1.1	2.41	0.68	4.38	1.11	1.54	1.4	1.81	0.31	2.5

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"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW08B							
				2018-09-07		2018-10-26		2019-05-03	2019-11-07	2020-04-24	
				FD	N	FD	N	N	N	FD	N
Appendix III Parameters											
Boron		4	mg/L		18		15	14	13		20.4
Calcium			mg/L		380		370	350	340		355
Chloride			mg/L		240		180	160	180		220
Fluoride	4	4	mg/L		1.6 J		1.5	1.9	1.7		1.5 J-
pH			SU		7.7		7.45	7.57	7.85		7.89
Sulfate			mg/L		1500		1500	1400	1300		1280
Total Dissolved Solids			mg/L		1900 J+		2300	2300	2200		2560
Appendix IV Parameters											
Antimony	0.006	0.006	mg/L		0.002 U		0.002 U	0.002 U	0.002 U		0.001 U
Arsenic	0.01	0.01	mg/L		0.005 U		0.005 U	0.005 U	0.005 U		0.001 U
Barium	2	2	mg/L		0.042		0.03	0.025	0.023		0.028
Beryllium	0.004	0.004	mg/L		0.001 U		0.001 U	0.001 U	0.001 U		0.0002 U
Cadmium	0.005	0.005	mg/L		0.001 U		0.001 U	0.001 U	0.001 U		0.0002 U
Chromium	0.1	0.1	mg/L		0.002 U		0.002 U	0.002 U	0.002 U		0.002 U
Cobalt		0.006	mg/L		0.00066 J		0.001 U	0.001 U	0.001 U		0.001 U
Fluoride	4	4	mg/L		1.6 J		1.5	1.9	1.7		1.5 J-
Lead	0.015	0.015	mg/L		0.001 U		0.001 U	0.001 U	0.001 U		0.001 U
Lithium		0.04	mg/L		0.0098		0.0073 J	0.0063 J	0.0058 J		0.008 U
Mercury	0.002	0.002	mg/L		0.0002 U		0.0002 U	0.0002 U	0.0002 U		0.0002 U
Molybdenum		0.1	mg/L		0.037		0.039	0.057	0.044		0.05
Radium 226 + 228	5		pCi/L		1.67 J+		1.02 J+	0.704			1.67 U
Radium-226			pCi/L		1.09 J+		0.596 J+	0.438			0.798 U
Radium-228			pCi/L		0.579		0.454 U	0.518 U			0.867 U
Selenium	0.05	0.05	mg/L		0.0014 J		0.005 U	0.005 U	0.005 U		0.001 U
Thallium	0.002	0.002	mg/L		0.001 U		0.001 U	0.001 U	0.001 U		0.001 U
Field Parameters											
Dissolved Oxygen			mg/L		0.42		0.12	0.13	2.61		0.12
Oxidation Reduction Potential			millivolts		-185.5		-67	7.9	-67		-142.2
pH			SU		7.7		7.45	7.57	7.85		7.89
Specific Conductivity			uS/cm		2538		2375	2190	1896		3391
Temperature			deg C		14.6		14.5	12.8	8.05		13
Turbidity			NTU		3.4		1.63	1.72	2.89		2.91

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Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW09																	
				2016-07-13	2016-09-08	2016-11-09	2017-01-10	2017-03-01		2017-04-26		2017-06-28	2017-08-23	2017-10-03	2018-03-14	2018-04-23	2018-10-25	2019-05-02		2019-11-07	2020-04-24
				N	N	N	N	FD	N	FD	N	N	N	N	N	N	N	FD	N	N	N
Appendix III Parameters																					
Boron		4	mg/L	5.7	4.7	7.3	5.3	7.7	7.6	5.9	6.1	4.9	7.9	7.3		4.9	6.3	3	3	2.7	3.3
Calcium			mg/L	320	240	210	210	200	200	220	240	270	280	220		220	220	200	200	150	178
Chloride			mg/L	63	55	58	58	75	73	71	67	53	39	64		58	82	46	46	39	54.4
Fluoride	4	4	mg/L	0.15 J+	10 U	10 U	0.22 J	0.13 J	0.14 J	0.16 J	0.13 J	0.18 J	2 JO	0.21 J	5 U	0.26 J-	0.28	0.27	0.27	0.33	0.3 J-
pH			SU	7.27	7.25	7.12	6.68		7.44		7.15	7.25	7.31	7.3	7.28	6.87	6.88		7.1	7.06	7.15
Sulfate			mg/L	910 J-	570	360	500	440	420	460	460	600	740	540		510	510 J-	530	530	380	390
Total Dissolved Solids			mg/L	1500	1100	880	980	1000	990	1000	960	1300	1400	1100		930	1100	970	980	770	772
Appendix IV Parameters																					
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0015 J	0.0013 J	0.00076 J	0.0031 J	0.005 U	0.005 U	0.0028 J	0.0029 J	0.002 J	0.0027 J		0.005 U		0.005 U	0.005 U	0.005 U	0.005 U	0.001 U
Barium	2	2	mg/L	0.059	0.043	0.036	0.039	0.035	0.037	0.039	0.042	0.047	0.054		0.041	0.039	0.039	0.041	0.041	0.036	0.032
Beryllium	0.004	0.004	mg/L	0.00012 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00036 J	0.001 U	0.001 U	0.001 U		0.001 UO		0.00092 J	0.00058 J	0.00052 J	0.00049 J	0.00039
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.00033 J	0.001 U	0.001 U	0.001 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.0036	0.002 U	0.00062 J	0.0013 J	0.002 U	0.002 U	0.002 U	0.002 U	0.0011 J	0.0015 J		0.0016 J		0.002 U	0.0012 J	0.0012 J	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.001 U	0.00018 J	0.0002 J	0.0002 J	0.001 U	0.001 U	0.00029 J	0.00025 J	0.001 U	0.001 U		0.001 U		0.00038 J	0.00049 J	0.00055 J	0.00035 J	0.001 U
Fluoride	4	4	mg/L	0.15 J+	10 U	10 U	0.22 J	0.13 J	0.14 J	0.16 J	0.13 J	0.18 J	2 JO	0.21 J	5 U	0.26 J-	0.28	0.27	0.27	0.33	0.3 J-
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0019 J	0.008 U	0.008 U	0.0016 J	0.0011 J	0.0012 J	0.008 U	0.008 U	0.0017 J	0.0018 J		0.008 U		0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.02	0.017	0.029	0.023	0.027	0.027	0.021	0.021	0.028	0.032		0.025	0.035	0.04	0.043	0.043	0.035	0.052
Radium 226 + 228	5		pCi/L	1.5	0.568	0.477 U	0.467 U	0.55	0.469	0.593	0.414	0.707	0.803		1.45 J+	0.096	0.679	0.505	0.427 U		1.47 U
Radium-226			pCi/L	0.506 J+	0.231	0.397 U	0.257	0.134	0.166	0.194	0.205	0.255 J+	0.357		0.188	0.204	0.446	0.33	0.355 U		0.696 U
Radium-228			pCi/L	0.994	0.349 U	0.477 U	0.467 U	0.427 U	0.432 U	0.398	0.36 U	0.452	0.446		1.26 J+	-0.108	0.361 U	0.428 U	0.427 U		0.777 U
Selenium	0.05	0.05	mg/L	0.014	0.0091	0.0049 J	0.011	0.014	0.014	0.019	0.02	0.013	0.027		0.0082	0.011	0.0098	0.012	0.012	0.0077	0.0096
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																					
Dissolved Oxygen			mg/L	3.59	6.69	1.98	6.1		3.41		3.92	5.27	3.24	5.98	6.71	5.43	0.22		5.82	5.54	3.14
Oxidation Reduction Potential			millivolts	-1.4	75.7	27.6	236		90.5		152.6	280.8	58.9	139.5	-116.3	-90.8	-48.8		53.6	-25.7	44
pH			SU	7.27	7.25	7.12	6.68		7.44		7.15	7.25	7.31	7.3	7.28	6.87	6.88		7.1	7.06	7.15
Specific Conductivity			uS/cm	1671	736	1110	822		1041		1209	702	1542	1331	600	1156	1274		888	685	774
Temperature			deg C	14.4	18.4	16.9	11.9		10.75		11.9	14.7	17.2	18.2	10.2	10.6	17.9		11.4	15.9	10.3
Turbidity			NTU	1.59	3.92	1.15	1.34		3.12		1.88	1.91	0.91	0.39	0.82	2.44	2.41		3.41	1.55	2.37

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Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW09B																		
				2016-07-13		2016-09-08	2016-11-09	2017-01-10	2017-03-01	2017-04-26	2017-06-28	2017-08-23		2017-10-03	2018-03-14	2018-04-23	2018-09-06	2018-10-26	2019-05-08		2019-11-07	2020-04-27
				FD	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	FD	N	N	N
Appendix III Parameters																						
Boron		4	mg/L	24	25	25	16	11	11	11	12	16	16	16		14	12	12	14	14	8	6.1
Calcium			mg/L	260	280	270	190	200	170	170	180	180	180	160		160	150	180	150	150	150	148
Chloride			mg/L	210	180	190	130	110	120	130	150	170	160	140		150	180	150	140	140	110	117
Fluoride	4	4	mg/L	0.54 J+	0.55 J+	0.67 J	0.68 J	0.1 J	1.3 J	1.2 J	1.4 J	1.2 J	0.37 J	1.5 J	1.4 J	1.6 J	1.8 J	1.6	1.6	1.6	1.5	1.3
pH			SU		7.08	7.15	6.96	7.36	7.44	7.29	7.36		7.46	7.36	7.56	7.43	7.32	7.46		7.49	7.56	7.65
Sulfate			mg/L	970 J-	1000 J-	960	740	670 J+	550	570	640	630	650	550		430	570	580	510	520	440	387
Total Dissolved Solids			mg/L	2100	2000	2100	1700	1300	1200	1200	1500	1500	1500	1300		990	1300	1200	1200	1200	990	906
Appendix IV Parameters																						
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0024 J	0.0026 J	0.002 J	0.0014 J	0.0027 J	0.005 U	0.004 J	0.004 J	0.0031 J	0.0031 J		0.0054	0.0064	0.0044 J	0.004 J	0.0052	0.0057	0.0042 J	0.0049
Barium	2	2	mg/L	0.069	0.071	0.076	0.062	0.048	0.04	0.046	0.055	0.062	0.058		0.045	0.04	0.049	0.047	0.042	0.041	0.029	0.034
Beryllium	0.004	0.004	mg/L	0.00012 J	9.1E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.00027 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.001 U	0.001 U	0.00069 J	0.00028 J	0.00045 J	0.001 U	0.00028 J	0.00045 J	0.00041 J	0.00041 J		0.001 U		0.00058 J	0.00028 J	0.00022 J	0.00025 J	0.001 U	0.001 U
Fluoride	4	4	mg/L	0.54 J+	0.55 J+	0.67 J	0.68 J	0.1 J	1.3 J	1.2 J	1.4 J	1.2 J	0.37 J	1.5 J	1.4 J	1.6 J	1.8 J	1.6	1.6	1.6	1.5	1.3
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.00017 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0055 J	0.0065 J	0.008 U	0.008 U	0.0049 J	0.0045 J	0.0056 J	0.0054 J	0.0047 J	0.0042 J		0.0031 J		0.0037 J	0.0052 J	0.0053 J	0.0055 J	0.0033 J	0.008 U
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.01 U	0.0079 J	0.0075 J	0.0097 J	0.013	0.015	0.015	0.013	0.0094 J	0.01		0.014	0.012	0.01	0.011	0.012	0.012	0.0096 J	0.013
Radium 226 + 228	5		pCi/L	1.12	1.86	1.65	1.14	0.453	1.09	0.774	1.85	1.01	1.27		1.18 J+	0.868	1.04	1.24 J+	1.03	1.01		1.28 U
Radium-226			pCi/L	0.809 J+	0.947 J+	0.907	0.579	0.476	0.585	0.316	0.781 J+	0.585	0.709		0.482	0.301	0.653	0.69 J+	0.586	0.449		0.596 U
Radium-228			pCi/L	1 U	0.913	0.743	0.559	0.41 U	0.508	0.458	1.07	0.422	0.563		0.699 J+	0.567	0.386	0.546	0.491 U	0.564		0.838
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.002 J	0.005 U	0.0014 J	0.001 J	0.0015 J	0.0016 J		0.005 U		0.002 J	0.0019 J	0.005 U	0.005 U	0.0011 J	0.001 U
Thallium	0.002	0.002	mg/L	0.0003 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.0002 J	0.001 U	0.001 U
Field Parameters																						
Dissolved Oxygen			mg/L		0.44	1.06	0.43	0.38	0.44	0.61	0.71		0.57	0.45	0.1	0.04	0.61	0.28		0.04	0.35	0.17
Oxidation Reduction Potential			millivolts		-57.7	67.3	-76.4	-100.1	-80.6	-102.6	68.2		19.7	-46.8	-121.6	-130.5	-100.5	-101.1		-16.8	-131.8	-106
pH			SU		7.08	7.15	6.96	7.36	7.44	7.29	7.36		7.46	7.36	7.56	7.43	7.32	7.46		7.49	7.56	7.65
Specific Conductivity			uS/cm		2356	2435	2088	1559	1352	1592	1561		1922	1722	1053	1301	1556	1693		1165	9.24	1419
Temperature			deg C		14.1	14.7	15.1	13.6	13.45	14.5	14.8		15.5	16	14	14.4	16.1	16		14.2	14.4	13.3
Turbidity			NTU		3.48	4.29	2.17	0.99	2.58	1.88	1.69		2.54	1.96	4.18	4.11	2.96	1.39		4.7	3.36	4.8

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mg/L = milligrams per liter
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"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW15															
				2016-07-13	2016-09-08		2016-11-09	2017-01-11	2017-03-02	2017-04-27	2017-06-29	2017-08-23	2017-10-03	2018-03-15	2018-04-24	2018-10-26	2019-05-06	2019-11-08	2020-04-27
				N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Appendix III Parameters																			
Boron		4	mg/L	0.75	0.45 J	1 J	1.1	0.6	0.44	0.45	0.87	0.91	0.66		0.72	0.76	0.71	0.73	0.68
Calcium			mg/L	100	130	120	100	82	81	95	160	150	77		170	120	140	100	128
Chloride			mg/L	28	31	31	27	28	27	27	27	25	19		24	21	22	28	25.2
Fluoride	4	4	mg/L	1.2 J+	0.85 J	0.85 J	0.74 J	0.8 J	0.77 J	0.74 J	0.82 J	0.82 J	0.93 J	0.67 J	0.76 J	0.69	0.52	0.73	0.6
pH			SU	6.88		6.98	6.83	6.96	6.99	6.76	6.61	6.96	6.88	6.95	6.89	5.2	7.1	7.34	7.34
Sulfate			mg/L	160 J-	260	260	150	140	140	160	300	330	260		410	240	380	260	227
Total Dissolved Solids			mg/L	570	660	630	520	400	400	420	780	750	660		790	5900 O	740	640	572
Appendix IV Parameters																			
Antimony	0.006	0.006	mg/L	0.002 U	0.00041 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.056	0.072	0.069	0.078	0.076	0.054	0.062	0.059	0.066		0.058		0.091	0.081	0.075	0.061
Barium	2	2	mg/L	0.044	0.053	0.053	0.039	0.032	0.031	0.034	0.054	0.058		0.047		0.046	0.047	0.037	0.039
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.002 U	0.00027 J	0.00028 J	0.00029 J	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.0019	0.0022	0.0022	0.0021	0.0019	0.0018	0.0022	0.0029	0.0027		0.0025		0.0023	0.0035	0.0017	0.0018
Fluoride	4	4	mg/L	1.2 J+	0.85 J	0.85 J	0.74 J	0.8 J	0.77 J	0.74 J	0.82 J	0.82 J	0.93 J	0.67 J	0.76 J	0.69	0.52	0.73	0.6
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0053 J	0.008 U	0.008 U	0.008 U	0.004 J	0.0024 J	0.0041 J	0.0058 J	0.005 J		0.0023 J		0.0054 J	0.0053 J	0.0027 J	0.008 U
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.02	0.027	0.026	0.023	0.022	0.022	0.026	0.017	0.019		0.029		0.016	0.017	0.029	0.031
Radium 226 + 228	5		pCi/L	5 U	0.479	0.513	0.646 U	0.555 J+	0.339 U	0.463 U	0.335	0.342 U		0.657 J+		0.858 J+	0.476 U		1.72 U
Radium-226			pCi/L	1 U	0.202	0.145	0.337 U	0.38	0.127 U	0.1	0.0965 J+	0.104		0.0817		0.527 J+	0.28 U		1.02 U
Radium-228			pCi/L	1 U	0.397 U	0.382 U	0.646 U	0.401 U	0.339 U	0.463 U	0.278 U	0.342 U		0.576 J+		0.407 U	0.476 U		0.695 U
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U		0.005 U		0.005 U	0.005 U	0.005 U	0.001 U
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																			
Dissolved Oxygen			mg/L	0.48		0.48	0.14	0.25	0.16	0.19	1	0.32	0.29	0.06	0.02	1.97	0.15	0.12	0.09
Oxidation Reduction Potential			millivolts	-79.2		-60.1	-111	-114.3	-104.1	-104.4	-46.9	-43.7	-13.8	-56.8	-99.1	-254.7	-27.5	-100	-103.9
pH			SU	6.88		6.98	6.83	6.96	6.99	6.76	6.61	6.96	6.88	6.95	6.89	5.2	7.1	7.34	7.34
Specific Conductivity			uS/cm	779		909	733	594	584	674	9.32	1004	901	581	933	855	730	598	950
Temperature			deg C	15.3		20.3	19.9	14.6	12.1	11.6	14.6	16.6	18.1	10.8	10.6	17.1	8.3	15.8	11.5
Turbidity			NTU	4.48		2.96	3.41	3.98	4.4	4.92	4.2	3.1	4.11	3.98	4.29	3.1	4.9	6.9	4.51

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"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW15B																	
				2016-07-13	2016-09-08	2016-11-09	2017-01-11	2017-03-02	2017-04-27	2017-06-29	2017-08-24	2017-10-03	2018-03-15	2018-04-24	2018-09-06		2018-10-26	2019-05-08	2019-11-08		2020-04-27
				N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	FD	N	N
Appendix III Parameters																					
Boron		4	mg/L	1.1	1.7	2	3.7	3.3	3.6	3.1	2.1	2.1		4.4		4.1	4.9	10		6.2	7.9
Calcium			mg/L	160	160	160	180	160	170	190	170	73		230		200	210	280		280	273
Chloride			mg/L	52	58	62	81	64	65	71	64	64		87		89	93	110		80	104
Fluoride	4	4	mg/L	0.65 J+	0.62 J	0.46 J	0.74 J	0.77 J	0.75 J	0.72 J	0.61 J	0.5 J	0.69 J	0.79 J		0.6 J	0.6	0.84 J+		0.89	0.84
pH			SU	7.81	7.49	7.04	7.52	7.48	7.11	7.26	7.37	7.42	7.45	7.36		7.8	6.74	7.43		7.57	7.56
Sulfate			mg/L	380 J-	390	340	500	390	460	530	540	500		790		720	770	1300		940	912
Total Dissolved Solids			mg/L	830	800	840	1000	890	980	1200	1100	1100		1400		1400	1400	2100		1600	1720
Appendix IV Parameters																					
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U			0.002 U	0.002 U	0.002 U		0.002 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.003 J	0.0011 J	0.0014 J	0.0022 J	0.0011 J	0.00098 J	0.00084 J	0.00081 J		0.005 U			0.005 U	0.005 U	0.00088 J		0.005 U	0.001 U
Barium	2	2	mg/L	0.054	0.053	0.056	0.056	0.051	0.052	0.064	0.069		0.068			0.07	0.064	0.081		0.054	0.054
Beryllium	0.004	0.004	mg/L	7.8E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U			0.001 U	0.001 U	0.001 U		0.001 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U			0.001 U	0.001 U	0.001 U		0.001 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.00062 J	0.002 U	0.002 U	0.00033 J	0.00034 J	0.002 U	0.002 U	0.002 U		0.002 U			0.002 U	0.002 U	0.002 U		0.002 U	0.002 U
Cobalt		0.006	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.00016 J	0.001 U	0.001 U	0.001 U		0.00029 J			0.00037 J	0.001 U	0.001 U		0.001 U	0.001 U
Fluoride	4	4	mg/L	0.65 J+	0.62 J	0.46 J	0.74 J	0.77 J	0.75 J	0.72 J	0.61 J	0.5 J	0.69 J	0.79 J		0.6 J	0.6	0.84 J+		0.89	0.84
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.00023 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U			0.001 U	0.001 U	0.001 U		0.001 U	0.001 U
Lithium		0.04	mg/L	0.0069 J	0.008 U	0.008 U	0.0077 J	0.0053 J	0.0082	0.0082	0.0077 J		0.007 J			0.008	0.0096	0.012		0.0085	0.0086
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U			0.0002 U	0.0002 U	0.0002 U		0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.011	0.013	0.01	0.012	0.015	0.014	0.014	0.012		0.011			0.01	0.011	0.012		0.01	0.012
Radium 226 + 228	5		pCi/L	1.26	0.594	0.61	1.14 J+	0.876	0.687	0.789	0.872		1.69 J+			1.31	1.51 J+	1.61			1.63 U
Radium-226			pCi/L	0.607 J+	0.442	0.361 U	0.785	0.441	0.442	0.537 J+	0.547		0.752			0.711	0.837 J+	1.07			0.656 U
Radium-228			pCi/L	1 U	0.389 U	0.498 U	0.502 U	0.435	0.378 U	0.329 U	0.363 U		0.94 J+			0.603	0.676	0.544			0.975 U
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U		0.005 U			0.0017 J	0.005 U	0.005 U		0.005 U	0.001 U
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U			0.001 U	0.001 U	0.0003 J		0.001 U	0.001 U
Field Parameters																					
Dissolved Oxygen			mg/L	0.22	0.91	0.56	0.22	0.46	0.3	0.43	0.64	0.23	0.08	0.04		0.29	2.06	0.23		0.16	0.16
Oxidation Reduction Potential			millivolts	-129.7	-21.6	-94.6	-132.6	-81.7	-79.6	-21.3	-36.5	-42.6	-64	-102.4		-91.2	-256.1	46.3		-189.2	-98.1
pH			SU	7.81	7.49	7.04	7.52	7.48	7.11	7.26	7.37	7.42	7.45	7.36		7.8	6.74	7.43		7.57	7.56
Specific Conductivity			uS/cm	834	1049	1060	1237	940	1096	1099	1110	1294	1255	1612		2757	1889	1798		1384	2359
Temperature			deg C	12.71	15.9	16.1	13.9	13.6	13	13.8	14.2	14.5	13.3	13		14.13	13.6	8.1		13.8	13.9
Turbidity			NTU	4.72	1.56	1.48	3.8	2.23	3.65	3.16	1.78	0.4	4.59	4.88		3.59	1.35	3.56		1.49	4.3

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"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW16																
				2016-07-13	2016-09-08	2016-11-09	2017-01-11	2017-03-02	2017-04-27	2017-06-29	2017-08-24	2017-10-04	2018-03-15	2018-04-24	2018-10-29		2019-05-03	2019-11-08		2020-04-23
				N	N	N	N	N	N	N	N	N	N	N	FD	N	N	FD	N	N
Appendix III Parameters																				
Boron		4	mg/L	1.1	1.8	1.6	1.2	0.89	1.3	1	1.4	1.1		1.4	1.4	1.4	1.6		1.9	1.1
Calcium			mg/L	230	180	170	120	160	210	220	240	57		220	160	160	210		210	302
Chloride			mg/L	53	37	30	28	24	25	28	31	42		58	36	36	28		59	21.9
Fluoride	4	4	mg/L	1.4 J+	1.6 J	1.3 J	1.5	1.3 J	1.3 J	1.2 J	1.3 J	1.5 J	1 J	1.2 J	1.1	1.1	0.99		1.1	0.88
pH			SU	7.92	7.18	7.48	7.5	7.58	7.17	7.36	7.06	7.62	7.41	7.67		7.28	7.46		7.8	7.79
Sulfate			mg/L	530 J-	400	320	47 O	300	500	480	630	520		530	340	350	570		530	757
Total Dissolved Solids			mg/L	1100	810	790	570	670	930	1000	1100	980		1100	740	730	1100		1100	1290
Appendix IV Parameters																				
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.00028 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U		0.002 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.011	0.0077	0.012	0.0084	0.0079	0.006	0.008	0.0096		0.002 J	0.0065	0.01	0.0098	0.005		0.0082	0.009
Barium	2	2	mg/L	0.049	0.042	0.035	0.024	0.029	0.043	0.044	0.054		0.057	0.045	0.035	0.035	0.034		0.034	0.046
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U		0.001 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U		0.001 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.00062 J	0.002 U	0.002 U	0.0031	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U		0.002 U	0.002 U
Cobalt		0.006	mg/L	0.001 U	0.00068 J	0.00051 J	0.00046 J	0.00055 J	0.00092 J	0.00094 J	0.0011		0.0013		0.00059 J	0.00061 J	0.00066 J		0.00061 J	0.0012
Fluoride	4	4	mg/L	1.4 J+	1.6 J	1.3 J	1.5	1.3 J	1.3 J	1.2 J	1.3 J	1.5 J	1 J	1.2 J	1.1	1.1	0.99		1.1	0.88
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U		0.001 U	0.001 U
Lithium		0.04	mg/L	0.00043 J	0.008 U	0.008 U	0.00023 J	0.008 U	0.008 U	0.008 U	0.008 U		0.008 U		0.008 U	0.008 U	0.008 U		0.008 U	0.008 U
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U		0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.024	0.036	0.045	0.044	0.03	0.027	0.023	0.024		0.027	0.031	0.033	0.033	0.027		0.028	0.022
Radium 226 + 228	5		pCi/L	1.68	0.543	0.527 U	0.629 U	0.648	0.392 U	0.339 U	0.429		0.862 J+	0.29	0.862 J+	1.32 J+	0.685 U			1.69 U
Radium-226			pCi/L	0.537 J+	0.249	0.363 U	0.256 U	0.129 U	0.094	0.106 J+	0.246		0.1	0.0822	0.214 J+	0.278 J+	0.277 U			0.644 U
Radium-228			pCi/L	1.14	0.395 U	0.527 U	0.629 U	0.528	0.392 U	0.339 U	0.322 U		0.762 J+	0.208	0.648 J+	1.04 J+	0.685 U			1.05 U
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.0005 J	0.0005 J	0.005 U	0.0012 J	0.005 U	0.005 U		0.0015 J		0.005 U	0.005 U	0.005 U		0.0015 J	0.001 U
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U		0.001 U	0.001 U
Field Parameters																				
Dissolved Oxygen			mg/L	0.16	0.27	0.48	0.31	0.36	0.14	0.5	0.14	0.06	0.22	0.22		1.27	0.29		4.02	0.19
Oxidation Reduction Potential			millivolts	-18.06	711.6	-124.8	-78.8	-136.9	-73.6	-114.2	9.6	-158.4	-55.9	-106.5		-216.8	8		-2	-124.3
pH			SU	7.92	7.18	7.48	7.5	7.58	7.17	7.36	7.06	7.62	7.41	7.67		7.28	7.46		7.8	7.79
Specific Conductivity			uS/cm	1331	1112	927	751	821	1257	1123	1406	1254	1029	1239		1046	1001		1014	1680
Temperature			deg C	15.02	18.8	18.15	12.1	9.72	10.6	15.41	18	17.8	8.71	9.2		17.81	10.5		17.52	10.3
Turbidity			NTU	3.89	2.16	1.93	3.16	4.14	3.25	4.33	2.45	4.95	4.62	12.81		3.64	4.65		3.98	8.11

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"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW16B																	
				2016-07-13	2016-09-08	2016-11-09		2017-01-11	2017-03-02	2017-04-27	2017-06-29	2017-08-24	2017-10-04	2018-03-15	2018-04-24	2018-09-07	2018-10-29	2019-05-06	2019-11-08		2020-04-24
				N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N
Appendix III Parameters																					
Boron		4	mg/L	1.8	1.6	1.4	1.4	1.4	1.4	1.1	3.4	6.5	2.9		4.1	7.6	9.7	12	11	10	8.2
Calcium			mg/L	230	190	180	180	210	210	270	220	260	100		250	310	350	350	300	280	230
Chloride			mg/L	63	56	57	55	57	47	71	71	120	78		140	160	150	190	220	210	122
Fluoride	4	4	mg/L	1.1 J+	1.1 J	0.84 J	0.73 J	0.99 J	0.87 J	0.83 J	0.76 J	0.78 J	1 J	0.8 J	0.76 J	0.73 J	0.64	0.76	1	1	0.78 J-
pH			SU	7.76	7.47		7.41	7.57	7.55	7.3	7.51	7.28	7.54	7.6	7.65	7.97	7.02	7.49		7.85	7.73
Sulfate			mg/L	580 J-	480	500	440	50 O	470	730	720	640	580		690	760	890	940	1500	1500	884
Total Dissolved Solids			mg/L	1100	1000	1000	1000	1000	1000	1300	1200	1400	1200		1400	20 UO	1600	1800	2400	2400	1860
Appendix IV Parameters																					
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.00057 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.00095 J		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0068	0.0064	0.011	0.011	0.012	0.0095	0.012	0.0096	0.0081		0.0099	0.0097	0.011	0.0088	0.0071	0.0079	0.0076	0.008
Barium	2	2	mg/L	0.072	0.04	0.036	0.035	0.038	0.039	0.055	0.043	0.046		0.053	0.058	0.068	0.071	0.079	0.055	0.054	0.043
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.00022 J		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.00029 J	0.002 U	0.00026 J	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.001 U	0.00016 J	0.00019 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.0003 J		0.00054 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	4	4	mg/L	1.1 J+	1.1 J	0.84 J	0.73 J	0.99 J	0.87 J	0.83 J	0.76 J	0.78 J	1 J	0.8 J	0.76 J	0.73 J	0.64	0.76	1	1	0.78 J-
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0055 J	0.008 U	0.0032 J	0.0022 J	0.0058 J	0.0035 J	0.0072 J	0.006 J	0.0061 J		0.007 J		0.0059 J	0.0059 J	0.007 J	0.0054 J	0.0055 J	0.008 U
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.013	0.012	0.012	0.012	0.012	0.013	0.023	0.016	0.013		0.016	0.015	0.012	0.011	0.014	0.02	0.019	0.017
Radium 226 + 228	5		pCi/L	1.31	1.05	0.866	0.794	0.998 J+	0.577	1.23	0.795	1.21		1.11 J+	0.99	1.17 J+	1.64 J+	0.984			1.5 U
Radium-226			pCi/L	0.651 J+	0.458	0.427	0.412 U	0.507	0.348	0.635	0.54 J+	0.559		0.443	0.535	0.724 J+	0.719 J+	0.753			0.673 U
Radium-228			pCi/L	0.66	0.59	0.467 U	0.435 U	0.491 J+	0.399 U	0.597	0.287 U	0.647		0.671 J+	0.455	0.522 U	0.919 J+	0.459 U			0.855
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.00061 J	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U		0.005 U		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.001 U
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																					
Dissolved Oxygen			mg/L	1.23	1.63		0.39	0.3	0.21	0.12	0.32	0.16	0.15	0.28	0.25	1.02	4.23	0.33		3.41	0.14
Oxidation Reduction Potential			millivolts	-122.6	-89		-126.3	-148.5	-132.2	-130.2	-123.1	-32.7	-135.8	-75.5	-117.8	-101.5	-166.8	21.2		-99.5	-129.6
pH			SU	7.76	7.47		7.41	7.57	7.55	7.3	7.51	7.28	7.54	7.6	7.65	7.97	7.02	7.49		7.85	7.73
Specific Conductivity			uS/cm	1147	1297		1158	1230	1192	1645	1333	1665	1461	1142	1653	3104	2098	1692		2340	2595
Temperature			deg C	13.04	14.44		15.27	14.3	13.37	12.3	13.48	14.3	15	12.6	12.3	15	17.7	11.2		14.65	13
Turbidity			NTU	4.1	3.99		1.8	2.76	4.21	4.58	3.27	2.48	3.9	4.08	4.2	4.99	3.49	3.72		2.81	6.61

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"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW17																	
				2016-07-14	2016-09-08	2016-11-09	2017-01-10	2017-03-02	2017-04-27	2017-06-29	2017-08-24	2017-10-04	2018-03-14		2018-04-23		2018-10-29	2019-05-09	2019-11-08	2020-04-24
				N	N	N	N	N	N	N	N	N	FD	N	FD	N	N	N	N	N	N
Appendix III Parameters																					
Boron		4	mg/L	12	12	11	11	11	8.9	7.6	12	12			5.8	5.8	16	7.7	4.9	7.6	
Calcium			mg/L	150	160	170	180	200	180	120	150	64			110	110	200	130	120	198	
Chloride			mg/L	110	100	130	150	140	81	170	130	160			40	38	150	90	92	106	
Fluoride	4	4	mg/L	1.8 J+	2.2 J	2 J	1.9 J	1.6 J	1.6 J	0.79 J	1.9 J	2.4 J	5 U	1.7 J	1.9 J	1.9 J-	1.7	1.6	1.7	1.2 J-	
pH			SU	7.56	7.27	7.21	7.33	7.54	7.23	7.4	7.16	7.22		7.62		7.82	6.85	7.53	7.75	7.34	
Sulfate			mg/L	330 J-	330	360	390	390	390	520	250	350			240	220	430	300	290	459	
Total Dissolved Solids			mg/L	940	920	940	1000	1100	950	1400	890	1000			630	620	1100	800	860	1120	
Appendix IV Parameters																					
Antimony	0.006	0.006	mg/L	0.00034 J	0.00032 J	0.00032 J	0.002 U	0.00028 J	0.002 U	0.002 U	0.002 U		0.002 U	0.002 U			0.002 U	0.002 U	0.002 U	0.001 U	
Arsenic	0.01	0.01	mg/L	0.0054	0.0056	0.0042 J	0.0069	0.0055	0.0054	0.0035 J	0.0028 J		0.005 U	0.0027 J			0.004 J	0.0021 J	0.0028 J	0.0023	
Barium	2	2	mg/L	0.047	0.056	0.054	0.05	0.054	0.048	0.044	0.06		0.041	0.058		0.029	0.073	0.041	0.052	0.067	
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.00076 J	0.001 U	0.0002 U	
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U	0.0002 U	
Chromium	0.1	0.1	mg/L	0.0015 J	0.002 U	0.0011 J	0.0011 J	0.0012 J	0.0012 J	0.002 U	0.002 U		0.0017 J	0.0014 J			0.002 U	0.002 U	0.002 U	0.002 U	
Cobalt		0.006	mg/L	6.3E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U	0.001 U	
Fluoride	4	4	mg/L	1.8 J+	2.2 J	2 J	1.9 J	1.6 J	1.6 J	0.79 J	1.9 J	2.4 J	5 U	1.7 J	1.9 J	1.9 J-	1.7	1.6	1.7	1.2 J-	
Lead	0.015	0.015	mg/L	0.00018 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U	0.001 U	
Lithium		0.04	mg/L	0.0047 J	0.008 U	0.0036 J	0.0047 J	0.0024 J	0.0045 J	0.0058 J	0.0076 J		0.008 U	0.0035 J			0.0066 J	0.0035 J	0.0052 J	0.008 U	
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U	0.0002 U			0.0002 U	0.0002 U	0.0002 U	0.0002 U	
Molybdenum		0.1	mg/L	0.015	0.012	0.011	0.01 U	0.01	0.011	0.018	0.024		0.024	0.024		0.02	0.017	0.017	0.012	0.03	
Radium 226 + 228	5		pCi/L	0.569	0.451 U	0.447 U	0.553 U	0.428	0.477	0.403 U	0.71		0.816 J+	0.384 U		0.205	1.1 J+	0.518 U		1.58 U	
Radium-226			pCi/L	1 U	0.331	0.415 U	0.246 U	0.222	0.23	0.191 J+	0.215		0.202	0.112		0.0399	0.315 J+	0.26 U		0.783 U	
Radium-228			pCi/L	1 U	0.451 U	0.447 U	0.553 U	0.402 U	0.406 U	0.403 U	0.495		0.614 J+	0.384 U		0.166	0.783 J+	0.518 U		0.797 U	
Selenium	0.05	0.05	mg/L	0.019	0.03	0.018	0.023	0.028	0.026	0.0081	0.0032 J		0.0074	0.021		0.015	0.022	0.004 J	0.011	0.0011	
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.00063 J	0.001 U	0.001 U	
Field Parameters																					
Dissolved Oxygen			mg/L	5.78	1.7	1.8	1.01	2.35	7.33	3.18	4.33	3.3		4.99		9	1.78	5.75	6.47	3.15	
Oxidation Reduction Potential			millivolts	45.8	825.9	6.1	82.3	6.6	67.9	23.3	8	57.9		-90.2		-90.2	-237	53.1	35	25.2	
pH			SU	7.56	7.27	7.21	7.33	7.54	7.23	7.4	7.16	7.22		7.62		7.82	6.85	7.53	7.75	7.34	
Specific Conductivity			uS/cm	1059	1287	1141	1272	1541	1290	902	1151	1357		832		675	1513	894	798	1017	
Temperature			deg C	17.23	20.6	18.63	13.6	10.95	11.8	17.71	24.4	22.3		10.9		11.4	20	12.1	17.23	9.31	
Turbidity			NTU	1.56	1.09	0.58	2.58	0.44	2.21	1.02	1.5	2.51		0.54		1.19	0.45	0.44	0.86	0.73	

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"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW17B																
				2016-07-13	2016-09-08	2016-11-09	2017-01-10	2017-03-02	2017-04-27	2017-06-29	2017-08-23	2017-10-04	2018-03-14	2018-04-23	2018-09-06	2018-10-29	2019-05-09	2019-11-08	2020-04-24
				N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Appendix III Parameters																				
Boron		4	mg/L	18	19	19	21	22	20	16	13	11		13	10	12	12	9.4	8.7	
Calcium			mg/L	230	250	240	250	270	250	240	160	57		180	150	150	180	150	141	
Chloride			mg/L	180	170	180	190	200	200	71	99	130		140	120	110	130	110	111	
Fluoride	4	4	mg/L	0.9 J+	0.98 J	0.68 J	0.58 J	0.6 J	0.6 J	2.1 J	1.3 J	1.1 J	0.55 J	0.58 J	0.84 J	0.71	0.62	0.67	0.68 J-	
pH			SU	7.43	7.37	7.1	7.24	7.44	7.02	7.25	7.19	7.38	7.48	7.39	7.63	7.4	7.15	7.66	7.22	
Sulfate			mg/L	710 J-	680	710	740	710	680	300	380	420		520	350	350	270	350	314	
Total Dissolved Solids			mg/L	1500	1400	1400	1500	1700	1500	660	1000	960		1100	940	950	980	990	835	
Appendix IV Parameters																				
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	
Arsenic	0.01	0.01	mg/L	0.0024 J	0.0021 J	0.0024 J	0.0035 J	0.0023 J	0.0022 J	0.0023 J	0.0026 J		0.0011 J		0.0017 J	0.0023 J	0.0022 J	0.0019 J	0.0015	
Barium	2	2	mg/L	0.078	0.079	0.086	0.092	0.1	0.089	0.065	0.06		0.085	0.069	0.066	0.073	0.11	0.074	0.065	
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.00033 J	0.001 U	0.0002 U	
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	
Cobalt		0.006	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.0003 J	0.001 U	0.001 U	0.001 U	0.001 U	
Fluoride	4	4	mg/L	0.9 J+	0.98 J	0.68 J	0.58 J	0.6 J	0.6 J	2.1 J	1.3 J	1.1 J	0.55 J	0.58 J	0.84 J	0.71	0.62	0.67	0.68 J-	
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	
Lithium		0.04	mg/L	0.0017 J	0.008 U	0.008 U	0.0019 J	0.00046 J	0.0021 J	0.0019 J	0.008 U		0.008 U		0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	
Molybdenum		0.1	mg/L	0.024	0.021	0.013	0.011	0.012	0.011	0.017	0.021		0.017	0.016	0.01	0.011	0.0073 J	0.01	0.014	
Radium 226 + 228	5		pCi/L	1.79	1.84	2.53	2.58	1.25	1.94	1.03	2.4		1.64 J+	1.21	1.47	2.48 J+	1.71		1.74	
Radium-226			pCi/L	0.882 J+	0.864	1.28	1.4	1.01	1.09	0.639 J+	0.867		0.799	0.518	0.945	1.15 J+	0.964		0.671 U	
Radium-228			pCi/L	0.913	0.98	1.25	1.17	0.423 U	0.846	0.395	1.53		0.845 J+	0.696	0.524	1.33 J+	0.748		1.12	
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.005 U	0.00053 J	0.00051 J	0.005 U	0.005 U	0.005 U		0.005 U		0.0011 J	0.005 U	0.005 U	0.005 U	0.001 U	
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.00022 J	0.001 U	0.001 U	
Field Parameters																				
Dissolved Oxygen			mg/L	0.33	0.24	0.67	0.36	0.13	0.13	0.18	0.14	0.09	0.16	0.11	0.2	0.88	0.23	4.2	0.2	
Oxidation Reduction Potential			millivolts	-115	654	-100.8	-119.6	-91.8	102.3	-98.6	-51.1	-129.4	-95.2	-131.9	-91.9	-244.5	11.8	-3.6	-94.1	
pH			SU	7.43	7.37	7.1	7.24	7.44	7.02	7.25	7.19	7.38	7.48	7.39	7.63	7.4	7.15	7.66	7.22	
Specific Conductivity			uS/cm	1525	1734	1568	171.9	2251	1950	1488	1244	1337	1235	1463	2077	1380	1060	890	920	
Temperature			deg C	15.29	16.16	15.77	15	14.8	14.4	15.62	16.5	16.6	15.2	15.2	16.55	16.1	13.6	15.05	13.12	
Turbidity			NTU	4.09	2.48	0.62	0.92	0.58	2.11	2.35	1.86	3.45	3.76	3.88	3.55	4.86	3.61	2.68	4.58	

Notes:
IDEM RCG= Indiana Department of Environmental Management
Remediation Closure Guidance Table A-6 Screening Levels - 2021
Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW18																	
				2016-07-13	2016-09-08	2016-11-09		2017-01-10	2017-03-01	2017-04-26	2017-07-12		2017-08-23	2017-10-03		2018-03-14	2018-04-23	2018-10-25	2019-04-29	2019-11-07	2020-04-23
				N	N	FD	N	N	N	N	FD	N	N	FD	N	N	N	N	N	N	N
Appendix III Parameters																					
Boron		4	mg/L	1.8	3.5	1.9	1.8	1.3	1	0.77	1.2	1.2	1.5	1.9	1.9		1.2	1.7	0.95	1.7	1.2
Calcium			mg/L	320	610 O	370	360	330	280	210	280	290	300	380 J	64 J		320	230	320	360	294
Chloride			mg/L	17	39	17	17	9.3	5	4.3	10	10	11	23	23		7.3	22	12	27	16.7
Fluoride	4	4	mg/L	0.047 J+	0.036 J	10 U	10 U	5 U	5 U	2 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	0.057	0.074	0.15	0.17
pH			SU	6.95	6.83		6.7	6.88	7.11	6.6		6.96	7.02		6.91	7.2	7.21	6.54	6.71	7.18	6.96
Sulfate			mg/L	760 J-	1400	850	830	640	540	370	600	610	690	960	950		670	550	780	920	679
Total Dissolved Solids			mg/L	1300	2200	1500	1500	1200	1000	730	1100	1100	1300	1600	1500		2400	1100	1400	1500	1130
Appendix IV Parameters																					
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.00096 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U			0.002 U		0.002 U	0.002 U	0.002 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0014 J	0.0023 J	0.0014 J	0.00091 J	0.0014 J	0.005 U	0.0015 J	0.0021 J	0.0021 J	0.0011 J			0.005 U		0.005 U	0.00079 J	0.005 U	0.001 U
Barium	2	2	mg/L	0.038	0.047	0.041	0.039	0.037	0.024	0.021	0.051	0.052	0.055			0.048	0.035	0.037	0.039	0.05	0.033
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.001 U	0.001 U	0.0002 U
Cadmium	0.005	0.005	mg/L	8.1E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.001 U	0.001 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.00067 J	0.00046 J	0.0005 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U			0.002 U		0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.001 U	0.00023 J	0.00047 J	0.0002 J	0.00024 J	0.001 U	0.00023 J	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.00028 J	0.001 U	0.001 U
Fluoride	4	4	mg/L	0.047 J+	0.036 J	10 U	10 U	5 U	5 U	2 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	0.057	0.074	0.15	0.17
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.00051 J	0.00025 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.00067 J		0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.00096 J	0.008 U	0.008 U	0.008 U	0.00042 J	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U			0.008 U		0.008 U	0.008 U	0.008 U	0.008 U
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ			0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.11	0.18 O	0.14 O	0.13 O	0.094	0.1	0.1	0.1	0.11	0.1			0.097	0.085	0.057	0.062	0.076	0.071
Radium 226 + 228	5		pCi/L	5 U	0.803	0.474	0.449	0.581 U	0.398 U	0.384 U	0.493	0.337 U	0.629			0.373 U	0.259	0.477	0.365 U		1.74 U
Radium-226			pCi/L	1 U	0.348	0.334 U	0.33 U	0.325	0.13	0.131 U	0.166 J+	0.179 J+	0.332			0.111	0.0715	0.291	0.325 U		0.789 U
Radium-228			pCi/L	1 U	0.49 U	0.455 U	0.413 U	0.581 U	0.398 U	0.384 U	0.381 U	0.337 U	0.369 U			0.373 U	0.187	0.357 U	0.365 U		0.947 U
Selenium	0.05	0.05	mg/L	0.01	0.018	0.0065	0.0052	0.0099	0.011	0.0053	0.012	0.012	0.006			0.009	0.0084	0.015	0.015	0.012	0.018
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																					
Dissolved Oxygen			mg/L	4.83	4.77		5.93	7.52	8.86	7.79		6.04	4.52		5.32	6.5	8.49	3.78	7.01	2.95	5.6
Oxidation Reduction Potential			millivolts	98.9	76.8		28.7	106.8	97.9	209.2		203.2	24.7		121.9	-129.6	-51.6	-36.6	129.2	-41.1	241.3
pH			SU	6.95	6.83		6.7	6.88	7.11	6.6		6.96	7.02		6.91	7.2	7.21	6.54	6.71	7.18	6.96
Specific Conductivity			uS/cm	1474	2362		1740	1255	986	970		1299	1414		1760	905	1170	1230	1060	1338	995
Temperature			deg C	16.3	20.1		16.6	9.65	8.47	11.2		17.9	19.8		19.3	8.1	8.9	17.4	8.8	14.2	9.18
Turbidity			NTU	3.32	1.63		2.38	3.05	4.44	2.48		1.71	1.03		4.16	4.59	0.71	1.29	4.55	2.04	1.33

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Remediation Closure Guidance Table A-6 Screening Levels - 2021
Revision

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NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW18B						GAMW46								
				2018-09-10	2018-10-25		2019-04-29	2019-11-07	2020-04-23	2018-06-13	2019-03-01	2019-04-17	2019-06-06	2019-07-18	2019-08-26	2019-10-04	2019-11-19	2020-04-21
				N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N
Appendix III Parameters																		
Boron		4	mg/L	13	12	13	14	11	10.9	0.055 JO	0.1 U	0.033 J	0.1 U	0.032 J	0.053 J	0.043 J	0.049 J	0.1 U
Calcium			mg/L	260	200	220	240	180	299	56 O	14	28	25 J-	25	25	23	27	24.5
Chloride			mg/L	150	140	140	170	140	117	8.4 O	2.4	1.9		1.8	1.6	1.6	1.6	1.6
Fluoride	4	4	mg/L	0.77 J	0.74	0.73	0.88	0.99	0.91	0.052 JO	0.068	0.063		0.065	0.06	0.079 J+	0.062	0.062
pH			SU	7.73		6.86	7.15	7.68	7.21	7.93	8.17	8.23	7.52	8.15	7.9	7.81	7.77	8.64
Sulfate			mg/L	1100	1000	1100	1100	840	1220	55 O	34	30		28	29	30	27	24.7
Total Dissolved Solids			mg/L	2100	2000	2000	2100	1500	2060	260 O	160	150		130	150	140 J+	140	101
Appendix IV Parameters																		
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.002 UO	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0018 J	0.0026 J	0.0028 J	0.0037 J	0.0041 J	0.0029	0.0014 JO	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.00086 J	0.005 U	0.001 U
Barium	2	2	mg/L	0.048	0.035	0.039	0.039	0.024	0.041	0.027 O	0.0028 J	0.0059	0.0065	0.0054	0.0054	0.0049 J	0.0059	0.0053
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.001 UO	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00054 J	0.001 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 UO	0.002 U	0.002 U	0.002 U	0.002 U	0.0014 J	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.00027 J	0.00026 J	0.00028 J	0.00024 J	0.00024 J	0.001 U	0.0002 JO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	4	4	mg/L	0.77 J	0.74	0.73	0.88	0.99	0.91	0.052 JO	0.068	0.063		0.065	0.06	0.079 J+	0.062	0.062
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.025	0.015	0.016	0.023	0.015	0.026	0.008 UO	0.04 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UO	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.024	0.014	0.015	0.026	0.011	0.039	0.0031 JO	0.01	0.01 U	0.01 U	0.01 U	0.01 U	0.0015 J	0.01 U	0.001 U
Radium 226 + 228	5		pCi/L	1.7	1.28	1.46			1.7 U	0.384 UO	0.486 U	0.33 U		0.427 U	0.505 U	0.566		1.7 U
Radium-226			pCi/L	0.773 J+	0.717	0.748	0.41		0.882 U	0.244 UO	0.103 U	0.0708 U		0.214 U	0.0925 UJ	0.179 J+		0.745 U
Radium-228			pCi/L	0.928	0.562	0.708	0.941		0.821 U	0.384 UO	0.486 U	0.33 U		0.427 U	0.505 UJ	0.481 U		0.95 U
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.001 U	0.001 JO	0.025 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.001 U
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00059 J	0.001 U	0.001 U
Field Parameters																		
Dissolved Oxygen			mg/L	0.24		0.29	0.92	0.36	0.18	0.12	1.85	4.18	6.44	6.58	4.03	2.44	3.36	3.42
Oxidation Reduction Potential			millivolts	-140.7		-103.4	109.2	-144.8	-77.7	-171.4	1.9	7.7	157.6	25.5	40.6	9.16	-141.1	125.6
pH			SU	7.73		6.86	7.15	7.68	7.21	7.93	8.17	8.23	7.52	8.15	7.9	7.81	7.77	8.64
Specific Conductivity			uS/cm	3311		2147	1902	1475	1897	367	155	161	179	153	153	152	132	208
Temperature			deg C	15.39		14.9	11.8	13.7	12.1	11.4	8	9.1	11.1	13.2	14.2	14.8	11.7	8.3
Turbidity			NTU	2.78		3.58	3.21	3.14	2.35	3.96	1.91	1.33	0.51	0.82	0.69	0.89	0.66	2.18

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mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW46B									GAMW52						
				2018-06-13	2019-03-04	2019-04-17	2019-06-07	2019-07-18	2019-08-26	2019-10-04	2019-11-19	2020-04-21	2018-09-10	2018-10-31		2019-05-09	2019-11-14		2020-04-30
				N	N	N	N	N	N	N	N	N	N	FD	N	N	FD	N	N
Appendix III Parameters																			
Boron		4	mg/L	0.05 JO	0.05 J	0.037 J	0.047 J	0.03 J	0.05 J	0.047 J	0.046 J	0.1 U	0.34		0.17	0.077 J		0.13	0.1 U
Calcium			mg/L	25 O	58	58	56	52	58	49	56	53.8	75		59	52		72	48.3
Chloride			mg/L	3 O	7.9	7.9		7.2	8	7.1	6.9	5.5	34		9.1	5.5		37	8.2
Fluoride	4	4	mg/L	0.048 JO	0.066	0.076		0.072	0.069	0.073 J+	0.072	0.084	0.36 J		0.3	0.25 J+		0.3	0.29
pH			SU	8.2	7.11	7.99	7.58	8.18	7.62	7.44	7.47	8.08	7.5		7.06	7.17		7.59	7.98
Sulfate			mg/L	29 O	64	64		64	68	65	64	58.8	86		39	24		67	21.6
Total Dissolved Solids			mg/L	150 O	260	290		240	220 J	250	240	209	400		250	240		350	205
Appendix IV Parameters																			
Antimony	0.006	0.006	mg/L	0.002 UO	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.002 U		0.002 U	0.002 U		0.002 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0015 JO	0.0012 J	0.00076 J	0.005 U	0.00091 J	0.00095 J	0.0013 J	0.001 J	0.001 U	0.005 U		0.005 U	0.005 U		0.005 U	0.001 U
Barium	2	2	mg/L	0.0086 O	0.027	0.026	0.025	0.023	0.024	0.021	0.025	0.025	0.039		0.019	0.015		0.02	0.013
Beryllium	0.004	0.004	mg/L	0.001 UO	0.0011	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0011	0.0002 U	0.001 U		0.001 U	0.001 U		0.001 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.001 U		0.00024 J	0.001 U		0.001 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.0021 O	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U	0.002 U		0.002 U	0.002 U
Cobalt		0.006	mg/L	0.00034 JO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00058 J		0.00031 J	0.001 U		0.001 U	0.001 U
Fluoride	4	4	mg/L	0.048 JO	0.066	0.076		0.072	0.069	0.073 J+	0.072	0.084	0.36 J		0.3	0.25 J+		0.3	0.29
Lead	0.015	0.015	mg/L	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U		0.001 U	0.001 U
Lithium		0.04	mg/L	0.008 UO	0.0017 J	0.008 U	0.008 U	0.002 J	0.008 U	0.008 U	0.003 J	0.008 U	0.0017 J		0.008 U	0.008 U		0.0025 J	0.008 U
Mercury	0.002	0.002	mg/L	0.0002 UO	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U		0.0002 U	0.0002 U		0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.0018 JO	0.0024 J	0.0022 J	0.0025 J	0.0028 J	0.0028 J	0.0025 J	0.003 J	0.0021	0.005 J		0.0035 J	0.0016 J		0.0017 J	0.0012
Radium 226 + 228	5		pCi/L	0.392 UO	0.402 U	0.308 U		0.427 U	0.609 U	0.408 U		1.68 U	0.796		1 J+	0.53 U			1.64 U
Radium-226			pCi/L	0.223 UO	0.286	0.108		0.232 U	0.105 UJ	0.192 J+		0.881 U	0.46 J+		0.299 J+	0.436			0.738 U
Radium-228			pCi/L	0.392 UO	0.402 U	0.308 U		0.427 U	0.609 UJ	0.408 U		1.25	0.392 U		0.706 J+	0.53 U			0.904 U
Selenium	0.05	0.05	mg/L	0.0017 JO	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.001 U	0.0014 J		0.0017 J	0.0014 J		0.0011 J	0.001 U
Thallium	0.002	0.002	mg/L	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00068 J	0.001 U	0.001 U		0.001 U	0.001 U		0.001 U	0.001 U
Field Parameters																			
Dissolved Oxygen			mg/L	3.59	0.08	1.9	0.3	1.4	1.25	0.31	0.3	0.17	0.48		0.21	6.42		2.2	6.9
Oxidation Reduction Potential			millivolts	-29.4	111.9	-111.1	-133.1	-93.9	-119.9	33.7	-229.6	-137.1	-30.3		85.1	108.2		-43.2	165.6
pH			SU	8.2	7.11	7.99	7.58	8.18	7.62	7.44	7.47	8.08	7.5		7.06	7.17		7.59	7.98
Specific Conductivity			uS/cm	211	268	294	282	274	284	260	242	405	0.896		448	308		320	389
Temperature			deg C	11.3	9.6	10.8	11	11.9	12.3	12.3	11.3	10	19.97		17.6	14.2		15.3	10.9
Turbidity			NTU	3.45	3.26	4.3	3.25	3.11	1.15	4.16	2.84	4.02	0.45		0.83	0.42		0.74	1.57

Notes:
IDEM RCG= Indiana Department of Environmental Management Remediation Closure Guidance Table A-6 Screening Levels - 2021 Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW52B					GAMW53					GAMW53B					
				2018-09-11	2018-10-31	2019-05-09	2019-11-14	2020-04-30	2018-09-11	2018-10-30	2019-04-30	2019-11-14	2020-05-01	2018-09-11	2018-10-30		2019-04-30	2019-11-14	2020-05-01
				N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	N
Appendix III Parameters																			
Boron		4	mg/L	0.75	0.8	1	1.3	0.77	0.19	0.25	0.056 J	0.13	0.1 U	2.5		3.1	2.2	0.73	3.3
Calcium			mg/L	160	160	110	130	129	45	53	17	25	32	180		190	150	140	180
Chloride			mg/L	530	470	380	370	496	4.9	4.6	1.9	3.6	4.3	90		85	81	74	107
Fluoride	4	4	mg/L	10 U	0.18	0.21 J+	0.23	0.26	0.17 J	0.17	0.05 U	0.05 U	0.05 U	0.52 J		0.46	0.51	0.7	0.46
pH			SU	8.3	7.1	7.42	7.34	7.6	6	6.47	5.93	6.21	6.42	7.3		7.35	7.41	7.52	7.48
Sulfate			mg/L	210	190	220	290	216	51	56	37	36	32.6	430		510	340	320	488
Total Dissolved Solids			mg/L	1500	1300	1100	1100	1260	240	250	130	160	161	1100		1100	900	770	1060
Appendix IV Parameters																			
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.002 U	0.002 U	0.002 U	0.00061 J	0.001 U	0.002 U		0.002 U	0.002 U	0.002 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0013 J	0.0016 J	0.00083 J	0.0012 J	0.0011	0.013	0.015	0.00097 J	0.0018 J	0.0015	0.00079 J		0.00083 J	0.001 J	0.0016 J	0.0028
Barium	2	2	mg/L	0.32	0.31	0.25	0.28	0.29	0.027	0.028	0.019	0.026	0.023	0.052		0.054	0.044	0.072	0.099
Beryllium	0.004	0.004	mg/L	0.001 U	0.00042 J	0.001 U	0.001 U	0.0002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.001 U		0.001 U	0.00059 J	0.001 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.00029 J	0.001 U	0.001 U	0.0002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.001 U		0.001 U	0.001 U	0.001 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.0019 J	0.0018 J	0.0012 J	0.002 U	0.002 U	0.002 U		0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.001 U	0.00032 J	0.001 U	0.001 U	0.001 U	0.00084 J	0.00099 J	0.0005 J	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	4	4	mg/L	10 U	0.18	0.21 J+	0.23	0.26	0.17 J	0.17	0.05 U	0.05 U	0.05 U	0.52 J		0.46	0.51	0.7	0.46
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0014	0.00089 J	0.00057 J	0.00063 J	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0041 J	0.0031 J	0.0033 J	0.0071 J	0.0086	0.008 U	0.008 U	0.008 U	0.0021 J	0.008 U	0.0042 J		0.0052 J	0.005 J	0.0066 J	0.011
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.014	0.015	0.0095 J	0.0086 J	0.016	0.012	0.015	0.0051 J	0.011	0.0068	0.0083 J		0.0075 J	0.0098 J	0.02	0.016
Radium 226 + 228	5		pCi/L	3.52	5.55 J+	2.63		2.44	0.547 U	1.45 J+	0.344 U		1.9 U	1.69		0.48 J+	1.26		1.73
Radium-226			pCi/L	2.11	2.76 J+	1.2		1.76	0.257	0.795 J+	0.316 U		1.08 U	0.789		0.238 J+	0.544		0.845
Radium-228			pCi/L	1.41	2.79 J+	1.44		0.885 U	0.547 U	0.658 J+	0.344 U		0.822 U	0.897		0.347 U	0.719		0.886 J+
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.001 U	0.005 U	0.005 U	0.005 U	0.005 U	0.001 U	0.005 U		0.005 U	0.005 U	0.005 U	0.001 U
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.00049 J	0.001 U	0.001 U
Field Parameters																			
Dissolved Oxygen			mg/L	0.44	0.1	0.15	0.19	0.09	0.53	0.86	3.11	0.84	1.39	0.26		0.8	0.36	0.09	0.12
Oxidation Reduction Potential			millivolts	-214.9	-103.5	6.31	-102.9	-104.2	-24.6	-199.5	43.7	-54.8	168	-183.2		-168	27.7	-75.3	-118.9
pH			SU	8.3	7.1	7.42	7.34	7.6	6	6.47	5.93	6.21	6.42	7.3		7.35	7.41	7.52	7.48
Specific Conductivity			uS/cm	1934	2005	1652	1353	2424	307	400	125	155	260	1354		1620	1160	870	1634
Temperature			deg C	17.26	16.6	15.3	16.1	15.3	21.3	20.1	11.4	17.5	13.3	20.89		20.4	18.7	19.7	20.2
Turbidity			NTU	1.6	0.88	2.35	1.01	4.92	9.93	5.17	4.76	4.8	4.8	2.43		3	3.45	2.5	7.86

Notes:
IDEM RCG= Indiana Department of Environmental Management
Remediation Closure Guidance Table A-6 Screening Levels - 2021
Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW54					GAMW54B							GAMW55				GAMW55R	
				2018-09-10	2018-10-31	2019-04-30	2019-11-14	2020-05-04	2018-09-10	2018-10-31		2019-05-01	2019-11-15	2020-05-04		2018-09-10		2018-10-29		2019-11-15	2020-05-05
				N	N	N	N	N	N	FD	N	N	N	FD	N	FD	N	FD	N	N	N
Appendix III Parameters																					
Boron		4	mg/L	0.84	0.77	0.39	0.37	0.42	5.6		6.5	5.9	6		2.7	1.9	1.9	1.8	1.8	1.1	0.96
Calcium			mg/L	93	88	93	81	131	210		220	200	240		214	260	250	270	260	180	169
Chloride			mg/L	15	10	10	4	12.3	100		95	110	120		68.3	58	59	69	70	61	46.3
Fluoride	4	4	mg/L	0.18 J	0.17	0.14	0.28	0.18	0.41 J		0.52	0.59	0.58		0.54	0.51 J	0.52 J	0.47	0.47	0.62	0.52
pH			SU	6.24	7.92	6.82	7.08	6.74	6.95		8.71	7.27	7.2		7.43		6.77		7.04	7.31	7.51
Sulfate			mg/L	190	150	190	76	284	750		730	710	720		470	590	600	630	620	480	345
Total Dissolved Solids			mg/L	500	400	470	350	618	1600		1400	1500	1400		1000	1200	1300	1300	1300	950	846
Appendix IV Parameters																					
Antimony	0.006	0.006	mg/L	0.0011 J	0.00074 J	0.00078 J	0.001 J	0.001 U	0.002 U		0.002 U	0.002 U	0.002 U		0.001 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0024 J	0.0028 J	0.0022 J	0.0045 J	0.0045	0.0025 J		0.0032 J	0.0045 J	0.005		0.0042	0.00083 J	0.005 U	0.005 U	0.005 U	0.005 U	0.001 U
Barium	2	2	mg/L	0.043	0.039	0.031	0.031	0.052	0.098		0.093	0.08	0.084		0.06	0.099	0.097	0.068	0.069	0.035	0.046
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.001 U		0.001 U	0.001 U	0.001 U		0.0002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.001 U		0.001 U	0.001 U	0.001 U		0.0002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U	0.002 U	0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.00053 J	0.00052 J	0.00062 J	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U		0.001 U	0.0065	0.0058	0.0044	0.0044	0.001 U	0.001 U
Fluoride	4	4	mg/L	0.18 J	0.17	0.14	0.28	0.18	0.41 J		0.52	0.59	0.58		0.54	0.51 J	0.52 J	0.47	0.47	0.62	0.52
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.008 U	0.008 U	0.008 U	0.0023 J	0.008 U	0.0048 J		0.0036 J	0.0048 J	0.0074 J		0.008 U	0.0021 J	0.0017 J	0.008 U	0.008 U	0.0035 J	0.008 U
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U		0.0002 U	0.0002 U	0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.043	0.044	0.023	0.03	0.014	0.018		0.019	0.0085 J	0.012		0.018	0.03	0.028	0.026	0.026	0.024	0.02
Radium 226 + 228	5		pCi/L	0.5	1.08 J+	0.393 U		1.51 U	2.03		2.7 J+	1.82			1.41 U	1.4	0.802	0.922 J+	1.24 J+		1.58 U
Radium-226			pCi/L	0.385 J+	0.237 J+	0.337 U		0.73 U	1.18 J+		1.35 J+	0.956			0.654 U	0.574 J+	0.474 J+	0.363 J+	0.447 J+		0.387 U
Radium-228			pCi/L	0.385 U	0.843 J+	0.393 U		0.783 U	0.849		1.35 J+	0.865			0.754 U	0.824	0.403 U	0.559 J+	0.796 J+		1.34
Selenium	0.05	0.05	mg/L	0.0017 J	0.0012 J	0.0043 J	0.0035 J	0.0043	0.005 U		0.005 U	0.005 U	0.005 U		0.001 U	0.0037 J	0.0031 J	0.0027 J	0.0027 J	0.0046 J	0.0045
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U		0.001 U	0.00021 J	0.001 U	0.00023 J	0.00022 J	0.00022 J	0.001 U
Field Parameters																					
Dissolved Oxygen			mg/L	0.61	1.41	0.72	0.26	0.65	0.42		2.12	0.42	0.31		0.1		1.73		0.33	0.72	1.95
Oxidation Reduction Potential			millivolts	107.8	-294.7	48.4	-69.5	24.5	-123.4		-315.7	-23.1	-43.3		117.5		21.6		-69.4	-28.9	148.6
pH			SU	6.24	7.92	6.82	7.08	6.74	6.95		8.71	7.27	7.2		7.43		6.77		7.04	7.31	7.51
Specific Conductivity			uS/cm	675	630	493	374	960	1816		1983	1636	1310		0.63		1493		1574	1017	1270
Temperature			deg C	21.2	18.53	10.5	15.3	11.4	17.6		17.29	15.5	15.8		15.6		21.1		19.4	16.7	12.8
Turbidity			NTU	2.03	1	3.24	2.31	4.9	4.2		1.64	4.49	1.67		4.31		1.74		0.66	2.26	2.4

Notes:
IDEM RCG= Indiana Department of Environmental Management
Remediation Closure Guidance Table A-6 Screening Levels - 2021
Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW55B							GAMW56						GAMW56B				
				2018-09-11		2018-10-29	2019-05-01	2019-11-15	2020-05-05		2018-09-11	2018-10-26	2019-04-29	2019-11-15	2020-05-05		2018-09-11	2018-10-29	2019-04-29	2019-11-15	2020-05-05
				FD	N	N	N	N	FD	N	N	N	N	N	FD	N	N	N	N	N	N
Appendix III Parameters																					
Boron		4	mg/L	7.1	7.4	8.2	9.1	11	0.21 J	10.9 J	0.26	0.28	0.21	0.2		0.22	1.2	1.2	2.3	3.2	2.1
Calcium			mg/L	250	250	260	210	210	116 J	219 J	130	110	91	120		115	140	140	150	150	141
Chloride			mg/L	220	220	190	170	150	119	119	3.1	2.4	3.2	2.1		2.8	50	36	55	64	50.8
Fluoride	4	4	mg/L	0.29 J	10 U	0.25	0.31	0.31	0.33	0.32	1.2 J	0.99	0.53	0.71		0.66	0.41 J	0.33	0.4	0.44	0.55
pH			SU		7.07	7.19	7.31	7.46		7.45	6.82	7.17	6.83	7.06		7.05	6.95	6.91	7.08	7.21	7.52
Sulfate			mg/L	820	820	910	790	750	676	674	57	63	54	56		56.3	170	130	260	360	280
Total Dissolved Solids			mg/L	1800	1900	1800	1700	1400	1400	1420	470	480	420	440		456	740	690	830	860	753
Appendix IV Parameters																					
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.002 U	0.002 U	0.002 U	0.002 U		0.001 U	0.002 U	0.002 U	0.002	0.002 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0014 J	0.0011 J	0.005 U	0.005 U	0.005 U	0.0079 J	0.001 UJ	0.019	0.022	0.011	0.0097		0.0076	0.005 U	0.005 U	0.005	0.005 U	0.001 U
Barium	2	2	mg/L	0.14	0.14	0.12	0.074	0.067	0.045 J	0.067 J	0.068	0.049	0.044	0.04		0.047	0.076	0.072	0.082	0.076	0.071
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.001 U	0.001 U	0.001 U	0.001 U		0.0002 U	0.001 U	0.001 U	0.001	0.001 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.001 U	0.001 U	0.001 U	0.001 U		0.0002 U	0.001 U	0.001 U	0.001	0.001 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U	0.002 U	0.002 U	0.002	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.00034 J	0.00028 J	0.001 U	0.001 U	0.001 U	0.0087 J	0.001 UJ	0.0017	0.0053	0.0084	0.0081		0.0092	0.001 U	0.001 U	0.001	0.001 U	0.001 U
Fluoride	4	4	mg/L	0.29 J	10 U	0.25	0.31	0.31	0.33	0.32	1.2 J	0.99	0.53	0.71		0.66	0.41 J	0.33	0.4	0.44	0.55
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U	0.001	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0064 J	0.0064 J	0.0054 J	0.0055 J	0.0078 J	0.008 U	0.013	0.0034 J	0.0039 J	0.0023 J	0.0053 J		0.008 U	0.0051 J	0.0035 J	0.0044	0.0062 J	0.0082
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.0057 J	0.0055 J	0.0055 J	0.0046 J	0.005 J	0.009 J	0.0053 J	0.013	0.0094 J	0.0072 J	0.0079 J		0.0093	0.004 J	0.003 J	0.0031	0.0064 J	0.0086
Radium 226 + 228	5		pCi/L	3.35	3.18	3.66 J+	2.08		3.06	3.02	0.728	0.698 J+				1.24 U	1.26	1.28 J+			2.11
Radium-226			pCi/L	1.72	1.75	1.86 J+	1.15		1.23	1.06	0.504	0.357 J+	0.334 U			0.509 U	0.763	0.578 J+	0.506		0.966
Radium-228			pCi/L	1.63	1.43	1.79 J+	0.926		1.83	1.96	0.371 U	0.429 U	0.373 U			0.735 U	0.493	0.698 J+	0.571		1.23 U
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.002	0.001 U	0.005 U	0.005 U	0.005 U	0.005 U		0.0022	0.005 U	0.005 U	0.005	0.005 U	0.001 U
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U	0.001	0.001 U	0.001 U
Field Parameters																					
Dissolved Oxygen			mg/L		0.37	0.17	0.11	0.17		0.1	0.99	0.28	1.3	0.34		0.21	0.29	0.26	0.79	0.18	0.09
Oxidation Reduction Potential			millivolts		-129.5	-115.9	-57.5	-137.9		-101.9	-97.4	-95.4	64	-86.6		-42.1	-102.8	-44.4	31.8	-105.7	-105.5
pH			SU		7.07	7.19	7.31	7.46		7.45	6.82	7.17	6.83	7.06		7.05	6.95	6.91	7.08	7.21	7.52
Specific Conductivity			uS/cm		2109	2201	1967	1491		2018	749	835	460	466		782	928	1036	856	741	1179
Temperature			deg C		19.2	18.5	18.1	17.9		17.1	17	15.7	8.7	14		9.6	13.9	13.8	11.6	12.9	11.8
Turbidity			NTU		4.38	1.74	4.77	3.92		4.11	2.91	2.99	2.31	2.01		2.4	2.96	1.45	4.77	1.4	4.56

Notes:
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Prepared by: KMC
Checked by:
Reviewed by:

GOLDER
MEMBER OF WSP

Table 3: General Groundwater Response Actions
CCR Unit Schahfer MSRB, MCWB, and DA
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

General Response Action	Comments	Corrective Measure Area	
		Below CCR Unit	Downgradient of CCR Unit
Limited Action	Access Restrictions Institutional Controls Use Restrictions Environmental Monitoring Monitored Natural Attenuation	X	X
Containment	Physical	X	
Removal	Extraction	X	X
Treatment	In-Situ Ex-Situ	X	X
On-Site Disposal	Surface Water Discharge Groundwater Discharge POTW Discharge	X	X
Off-Site Disposal	Permitted Disposal Facility	X	X

Notes
X- General Response Action selected for further screening at the indicated Corrective Measure Area

Prepared by: DFS
Checked by: KMC
Reviewed by: MAH

Table 4: Initial Screening of Corrective Measure Alternatives / Process Options for Groundwate
CCR Unit Schahfer MSRB, MCWB, and DA
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

General Response Action	Remedial Technology	Process Option	Description	Screening Comments	Retained for Further Evaluation	
					Below CCR Unit	Downgradient of CCR Unit
Limited Action	Institutional Controls	Permitting and Notices	Administrative controls to restrict groundwater use.	Potentially implementable.	Yes	Yes
		Access Restrictions	Physical restrictions or structures that prevent access by unauthorized persons.	Potentially implementable.	Yes	Yes
	Monitoring	Groundwater Monitoring	Periodic sampling and analyses of groundwater as a means of detecting unacceptable changes in constituent concentrations.	Potentially implementable.	Yes	Yes
	Use Restriction	Deed Restrictions	Administrative controls to provide future land use restrictions.	Potentially implementable.	Yes	Yes
	Monitored Natural Attenuation	Monitored Natural Attenuation	Long-term monitoring of natural attenuation, including advection/dispersion/adsorption and biotic and abiotic degradation/transformation, of the inorganic constituents dissolved in groundwater; advection/dispersion/adsorption of inorganics.	Potentially implementable.	Yes	Yes
Containment	Physical Containment	Capping	Low-permeable cap covering the source area.	Potentially implementable, minimizes stormwater infiltration reducing the potential for plume migration.	Yes	NA
		Vertical Barriers	Vertical barriers including slurry walls and sheet piling placed around the area of contamination to contain groundwater.	Potentially implementable, reduces potential for plume migration.	Yes	NA
Removal	Extraction	Extraction Wells	Use of extraction wells to extract contaminated groundwater and control groundwater movement within capture zone.	Potentially implementable, results in physical removal of dissolved constituents of concern and reduces potential for plume migration.	Yes	Yes
		Extraction Trench	Removal of groundwater by pumping from extraction trenches.	Potentially implementable, results in physical removal of dissolved constituents of concern and reduces potential for plume migration.	Yes	Yes
In Situ Treatment	Stabilization/ Solidification	Solidification	Blending soil with grout to contain and immobilize contaminated groundwater.	Potentially implementable for the corrective measure area below the CCR Unit. Reduces potential for plume migration.	Yes	No
	Permeable Reactive Barrier	Vertical Reactive Barrier	Construction of vertical reactive barrier (e.g., carbon wall) to treat groundwater as it flows through the treatment zone.	Not effective on all Site COCs, limited effectiveness on Sites with high groundwater velocity.	No	No
In Situ Treatment	Chemical Addition/ Treatment	Chemical Precipitation	Increasing inorganic precipitation through chemical injection, either by changing site geochemical conditions (i.e., pH, Eh, or ionic strength) or the addition of a co-precipitate that reacts with or acts as an adsorbent for the COC.	Not effective on all Site COCs.	No	No
		Chemical Reduction	Injection of a reducing agent such as nanoscale or microscale zero valent iron into groundwater. Reduction reactions chemically convert constituents to non-hazardous or less toxic compounds that are more stable, less mobile, and/or inert.	Not effective on all Site COCs.	No	No
	Biological Treatment	Bioremediation	Use of microorganisms to oxidize/reduce metal contaminants directly or by the production of chemical oxidizing/reducing agents.	Not effective on all Site COCs.	No	No

Table 4: Initial Screening of Corrective Measure Alternatives / Process Options for Groundwate
CCR Unit Schahfer MSRB, MCWB, and DA
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

General Response Action	Remedial Technology	Process Option	Description	Screening Comments	Retained for Further Evaluation	
					Below CCR Unit	Downgradient of CCR Unit
Ex Situ Treatment	On-Site Treatment Facility	On-Site, Various Physical/chemical Process Options	Extracted groundwater is pumped to the on-Site treatment facility (physical/chemical treatment).	Potentially implementable to treat extracted contaminated groundwater. Treatment processes that could remediate the Site COCs include chemical/physical precipitation, activated carbon, and reverse osmosis.	Yes	Yes
Disposal	On-Site Discharge	On-Site Discharge to Surface Water	Treated groundwater discharged to local water body pursuant to updated NPDES permit.	Potentially implementable. Treated landfill leachate is currently discharged to a local water body pursuant to a NPDES permit.	Yes	Yes
		On-Site Discharge to Groundwater	Treated groundwater discharged to groundwater within the Station Area.	Potentially implementable.	Yes	Yes
		POTW Discharge	Discharge of treated groundwater to POTW under a discharge authorization.	No access to POTW.	No	No
	Off-Site Treatment	Off-Site Disposal/Treatment of Collected Groundwater	Transport and treatment of extracted groundwater at off-Site treatment facility.	Not retained due to higher safety concerns and much higher disposal costs.	No	No

Notes
COC- constituent of concern
NPDES- National Pollutant Discharge Elimination System
POTW- publicly owned treatment works
NA- not applicable

Prepared by: DFS
Checked by: KMC
Reviewed by: MAH

**Table 5: Summary of Groundwater Corrective Measure Alternatives
For Multi-Cell Unit (MSRB, MCWB, and DA)
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana**

Alternative		Key Components
A	Monitored natural attenuation	Permitting Implementation of deed restrictions Environmental monitoring
B	Vertical barrier/hydraulic controls and monitored natural attenuation	Permitting Implementation of deed restrictions Installation of hydraulic controls within existing vertical barrier wall *Ex situ* treatment of pumped groundwater by an on-Site treatment facility Disposal of treated groundwater to on-Site surface water or groundwater NPDES permit or installation of injection wells and UIC permit Long-term maintenance Environmental monitoring
C	Pump-and-treat and monitored natural attenuation	Permitting Implementation of deed restrictions Installation of monitoring wells or extraction trench immediately downgradient of the slurry wall *Ex situ* treatment of pumped groundwater by an on-Site treatment facility Disposal of treated groundwater to on-Site surface water or groundwater NPDES permit or of injection wells and UIC permit Long-term maintenance Environmental monitoring
D	Vertical barrier/hydraulic controls, pump-and-treat, and monitored natural attenuation	Permitting Implementation of deed restrictions Installation of hydraulic controls within existing vertical barrier wall Installation of monitoring wells or extraction trench outside the vertical barrier wall *Ex situ* treatment of pumped groundwater by an on-Site treatment facility Disposal of treated groundwater to on-Site surface water or groundwater NPDES permit or of injection wells and UIC permit Long-term maintenance Environmental monitoring

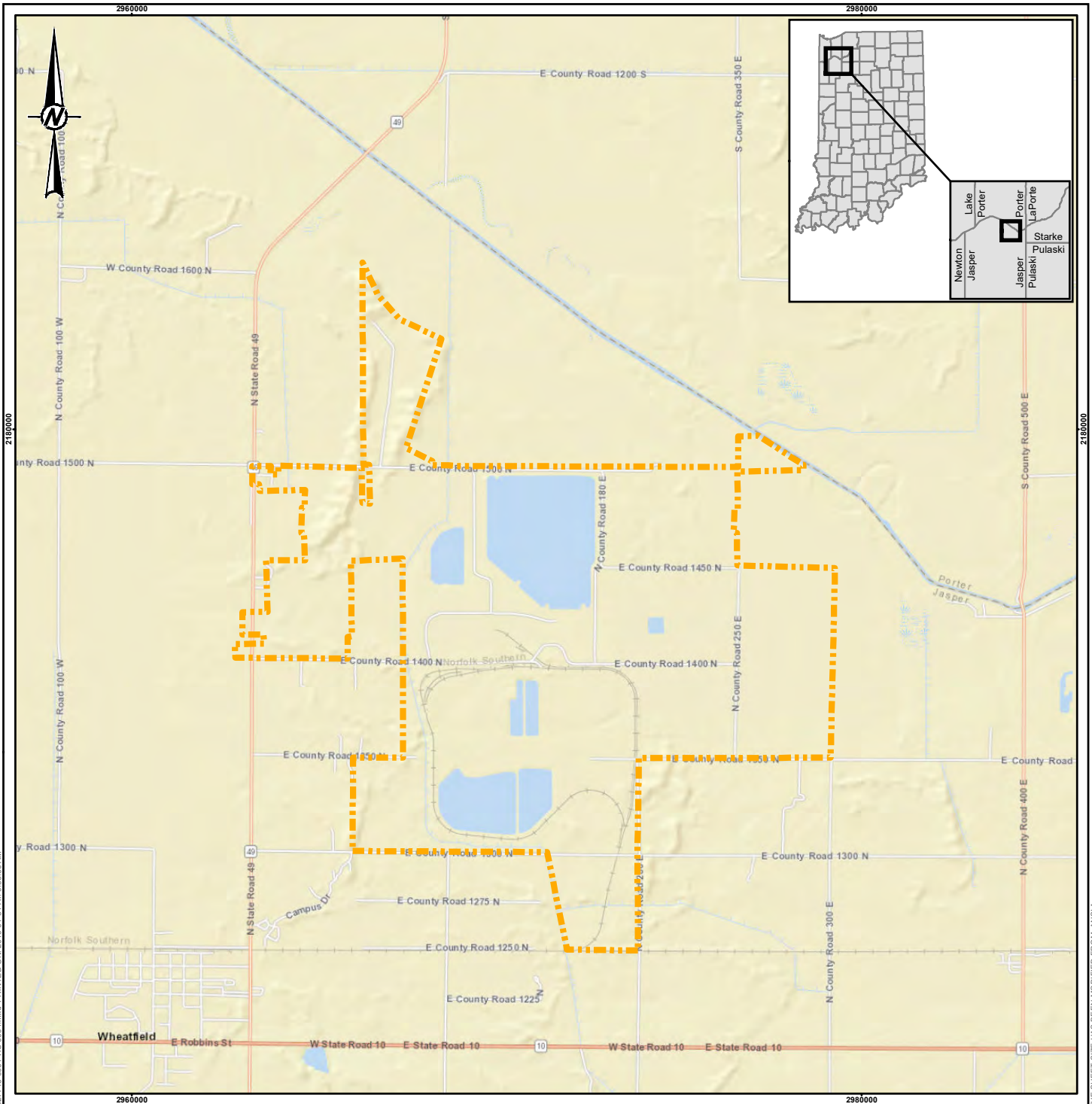
Prepared by: JBG
Checked by: CMJ
Reviewed by: JBG

Table 6: Evaluation of Groundwater Corrective Measure Alternatives
For Multi-Cell Unit (MSRB, MCWB, and DA)
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

	Corrective Measure Alternatives			
	Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
Evaluation Criteria	**Monitored natural attenuation**	**Vertical barrier/hydraulic controls and monitored natural attenuation**	**Pump-and-treat and monitored natural attenuation**	**Vertical barrier/hydraulic controls, pump-and- treat, and monitored natural attenuation**
Performance	Initial review of site conditions indicates plume stability and confirmation of attenuation and immobilization, therefore, monitored natural attenuation could be effective in reducing the COC concentrations and mobility. Relative short-term effectiveness varies depending on success of excavation to remove the source material and the low-permeability cap to reduce the mobility of residual COCs and potential for plume migration. Minimally effective short-term.	Hydraulic controls within an existing vertical barrier (slurry wall) are an effective means of containing the source area. Relatively effective both short-term and long-term.	Groundwater extraction of contaminated groundwater could be potentially effective in reducing volume and mobility of dissolved COCs in groundwater. Relatively effective both short-term and long-term.	Hydraulic controls within an existing vertical barrier (slurry wall) are an effective means of containing the source area and groundwater extraction of contaminated groundwater downgradient of the barrier could be potentially effective in reducing volume and mobility of dissolved COCs in groundwater. Relatively effective both short-term and long-term.
Reliability	Moderate to High. No O&M required, but long-term changes to geochemistry may impact attenuation.	Moderate. Some O&M required and potential treatment replacement.	Moderate, some O&M required and potential treatment replacement.	Moderate, some O&M required and potential treatment replacement.
Ease of Implementation	Already occurring.	Technology is common; some installation challenges expected based on existing slurry walls and proposed cap.	Technology is common, some installation and drilling challenges expected.	Technology is common; some installation challenges expected based on existing slurry walls and proposed cap.
Potential Impacts	Minimal potential for impacts to surface water and off-site groundwater.	Hydraulic controls within an existing vertical barrier control cross media impacts outside of the wall. Some safety concerns related to drilling wells and operating treatment plant (e.g., regenerating resin).	Groundwater collection and treatment will reduce long-term downgradient cross media impacts. Some safety concerns related to drilling wells and operating treatment plant (e.g., regenerating resin).	Hydraulic controls within an existing vertical barrier and groundwater collection and treatment have very good control of cross media impacts. Some safety concerns related to drilling wells and operating treatment plant (e.g., regenerating resin).
Time Requirements	Relatively long, no active remediation.	Moderate, should be shorter than MNA alone.	Moderate, should be shorter than MNA alone.	Moderate, should be shorter than MNA or pump-and-treat alone.
Institutional Requirements	Low permitting requirements	May require NPDES permit modifications or UIC permit, overall low permitting requirements	May require NPDES permit modifications or UIC permit, overall low permitting requirements	May require NPDES permit modifications or UIC permit, overall low permitting requirements
Relative Costs	Low Capital, Low O&M and Replacement	Moderate Capital, Moderate O&M and Replacement	Moderate Capital, Moderate O&M and Replacement	Moderate Capital, High O&M and Replacement

Prepared by: JBG
Checked by: CMJ
Reviewed by: JBG

Figures



LEGEND

Approximate Property Line

0 0.75 1.5

1 " = 0.75 miles Miles

REFERENCE(S)

SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY

PROJECT

NORTHERN INDIANA PUBLIC SERVICE COMPANY
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

SITE LOCATION MAP

CONSULTANT

GOLDER

YYYY-MM-DD	1/31/2019
DESIGNED	DFS
PREPARED	SHL
REVIEWED	JSP
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
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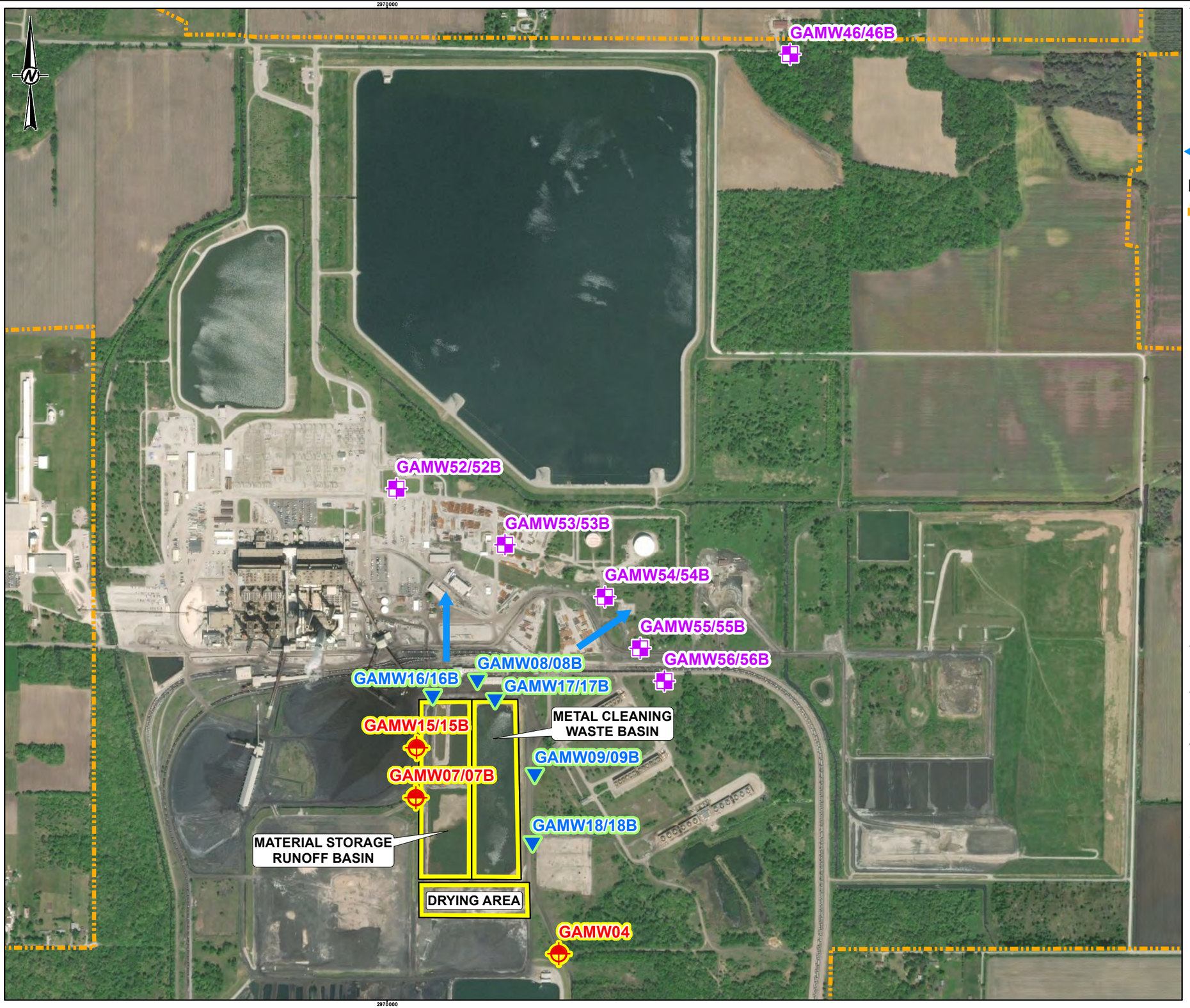
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2970000



2970000

LEGEND

- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- Generalized Groundwater Flow Direction
- CCR Units
- Approximate Property Line

0 850 1,700

1 " = 850 feet Feet

NOTE(S)

1. THIS FIGURE DEPICTS THE GENERALIZED GROUNDWATER FLOW DIRECTION WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER.

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY

PROJECT

NORTHERN INDIANA PUBLIC SERVICE COMPANY
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

MONITORING WELL LOCATIONS
DRYING AREA, MSRB, AND MCWB

CONSULTANT

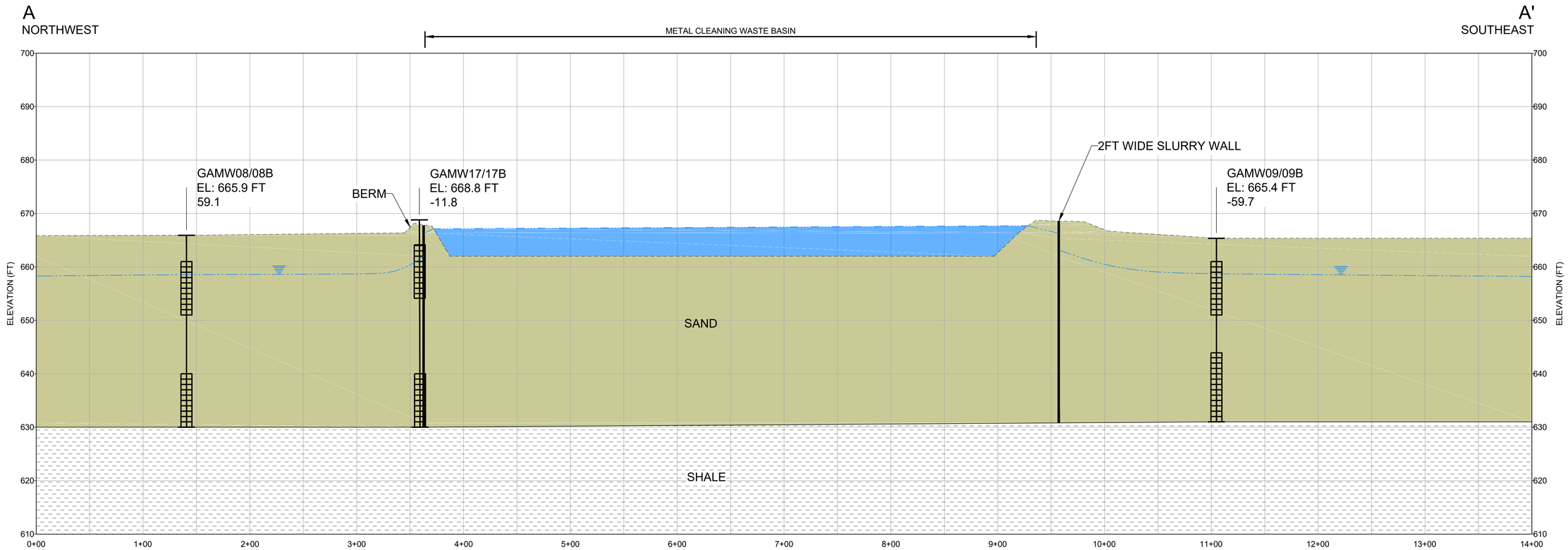
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YYYY-MM-DD	1/31/2019
DESIGNED	DFS
PREPARED	SHL
REVIEWED	MAH
APPROVED	MAH

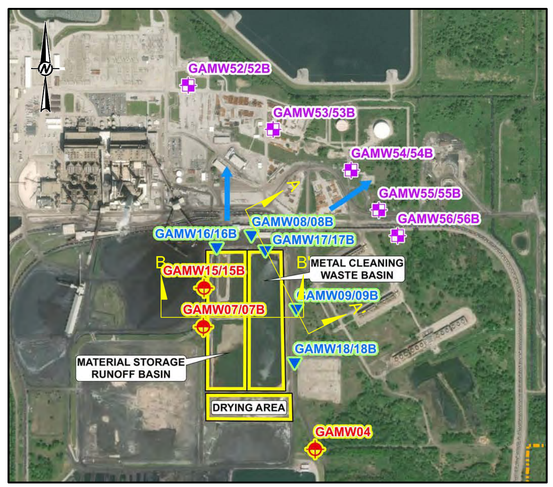
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A-A'



VERTICAL SCALE: 0 10 20 — 1" = 10' FEET

HORIZONTAL SCALE: 0 50 100 — 1" = 50' FEET

LEGEND

GAMW-08/08B	=	WELL I.D.
EL: 665.9 59.1	= =	GROUND SURFACE ELEVATION OFFSET DISTANCE C/L = CENTERLINE
	=	GROUNDWATER ELEVATION
	=	WELL SCREEN
	=	END OF BORING LOCATION
		IMPOUNDMENT WATER
		SAND
		SHALE

NOTE(S)

1. GEOLOGIC CONTACTS ILLUSTRATED BETWEEN AND BELOW BORINGS ARE INFERRED AND SHOULD NOT BE INTERPRETED AS EXACT INDICATORS OF GEOLOGIC CONDITIONS AT, BETWEEN, OR BELOW BORINGS.

CLIENT
NORTHERN INDIANA PUBLIC SERVICE COMPANY

CONSULTANT
GOLDER

YYYY-MM-DD	2019-02-28
DESIGNED	RWC
PREPARED	RWC
REVIEWED	JBG
APPROVED	MAH

PROJECT
NORTHERN INDIANA PUBLIC SERVICE COMPANY
ROLLIN M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

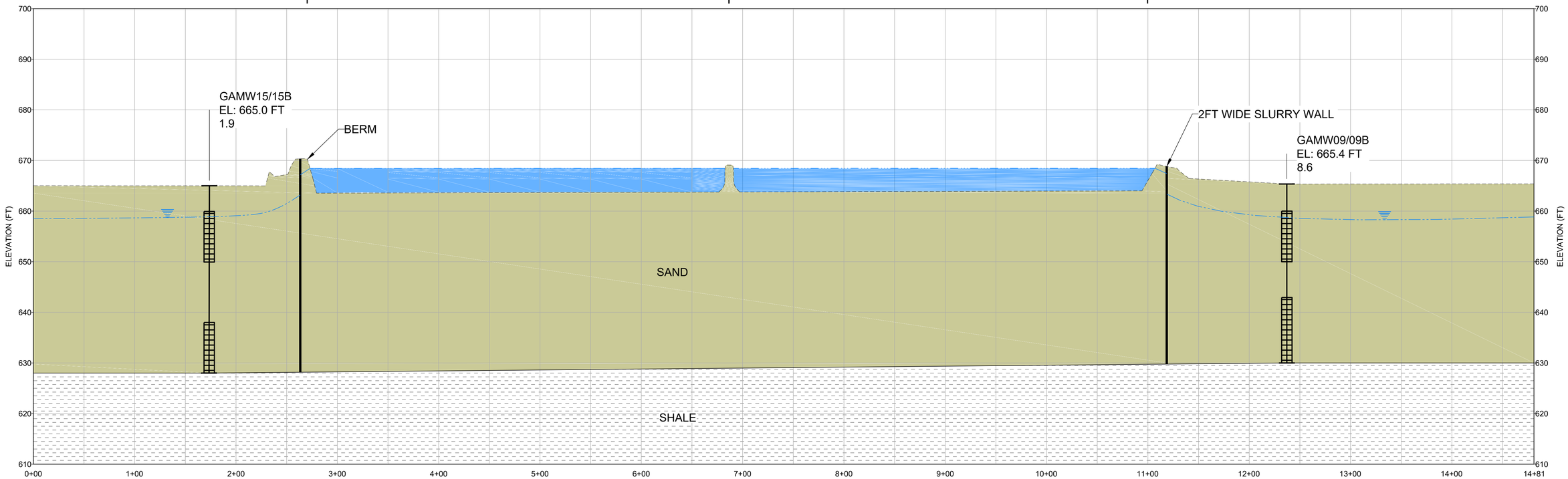
TITLE
GEOLOGIC INTERPRETATION
CROSS SECTION A-A'

PROJECT NO.	CONTROL	REV.	FIGURE
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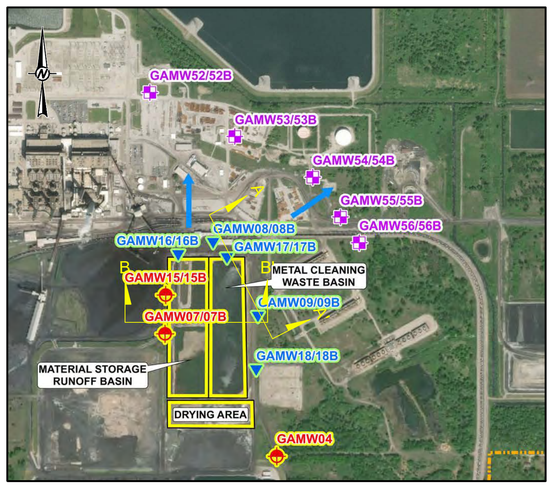
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0 1in

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B-B'



VERTICAL SCALE: 0 10 20 — 1" = 10' FEET

HORIZONTAL SCALE: 0 50 100 — 1" = 50' FEET

LEGEND

GAMW-15/15B	=	WELL I.D.
EL: 665.14	=	GROUND SURFACE ELEVATION
1.9	=	OFFSET DISTANCE C/L = CENTERLINE
	=	GROUNDWATER ELEVATION
	=	WELL SCREEN
	=	END OF BORING LOCATION
		IMPOUNDMENT WATER
		SAND
		SHALE

NOTE(S)

1. GEOLOGIC CONTACTS ILLUSTRATED BETWEEN AND BELOW BORINGS ARE INFERRED AND SHOULD NOT BE INTERPRETED AS EXACT INDICATORS OF GEOLOGIC CONDITIONS AT, BETWEEN, OR BELOW BORINGS.

CLIENT
NORTHERN INDIANA PUBLIC SERVICE COMPANY

CONSULTANT
GOLDER

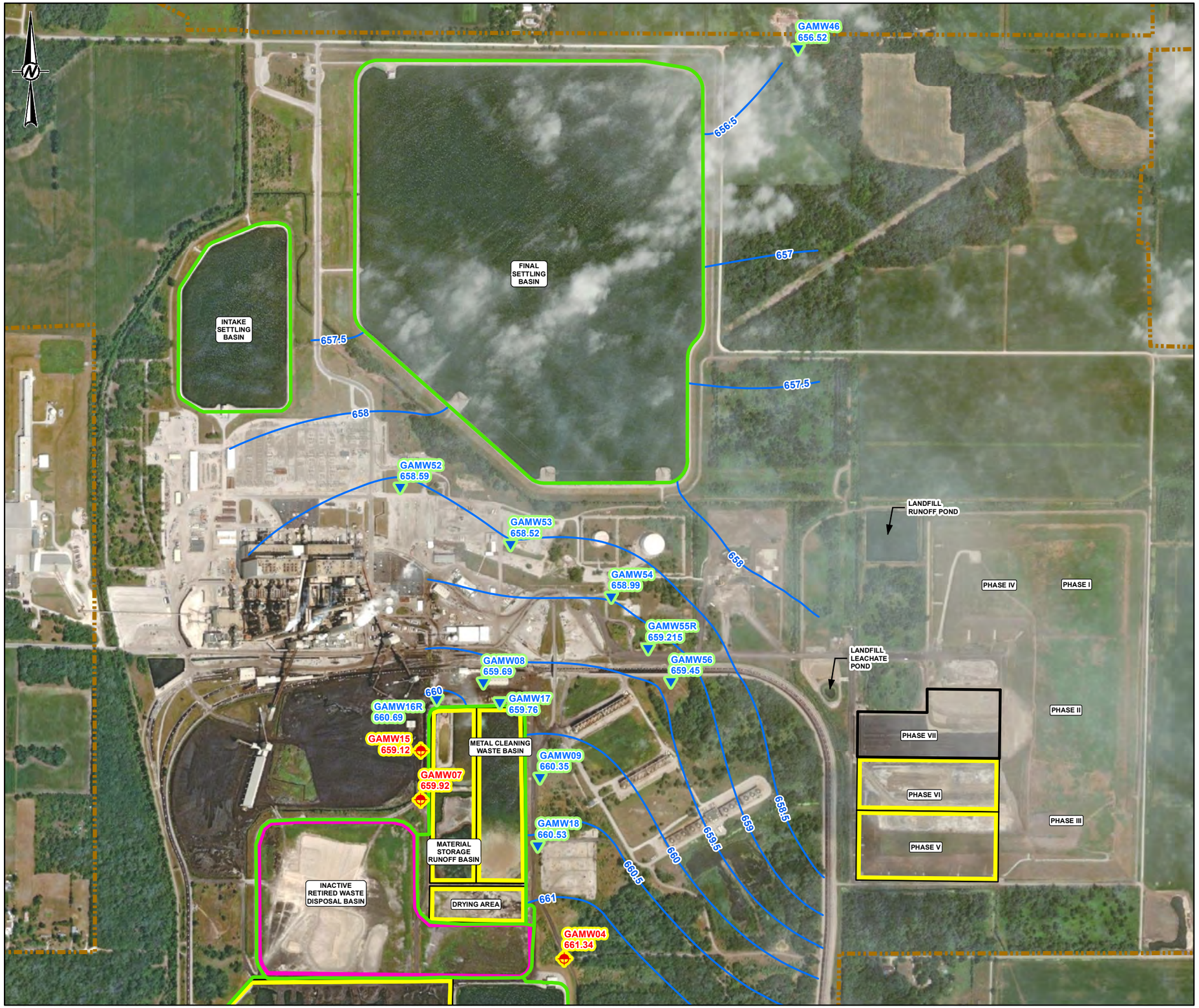
YYYY-MM-DD	2019-02-28
DESIGNED	RWC
PREPARED	RWC
REVIEWED	JBG
APPROVED	MAH

PROJECT
NORTHERN INDIANA PUBLIC SERVICE COMPANY
ROLLIN M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE
GEOLOGIC INTERPRETATION
CROSS SECTION B-B'

PROJECT NO.	CONTROL	REV.	FIGURE
1648171	03	0	4

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D
0 1 in



LEGEND

- Background Monitoring Well
- Downgradient Monitoring Well
- Non-CCR Well
- Surface Water Location
- April 2021 Groundwater Elevation Contour (0.5 ft interval)
- Slurry Wall
- Approximate Property Line
- CCR Units
- Inactive Retired Waste Disposal Basin
- Phase VII

0 850 1,700

1 " = 850 feet Feet

FIGURE NARRATIVE

THIS FIGURE DEPICTS THE GROUNDWATER ELEVATION, AS MEASURED IN 77 MONITORING WELLS SCREENED WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER, AND IS INTENDED TO REPRESENT THE APPROXIMATE ELEVATION OF THE GROUNDWATER POTENTIOMETRIC SURFACE. THE POSTED DATA WERE CALCULATED FROM DEPTH TO WATER MEASUREMENTS MADE BY GOLDER ON APRIL 8-9, 2021.

THE DIRECTION OF HORIZONTALGROUNDWATER FLOW AT AND NEAR THE POTENTIOMETRIC SURFACE CAN BE GENERALLY INTERPRETED AS BEING PERPENDICULAR TO THE GROUNDWATER ELEVATION CONTOURS. GOLDER INFERRED THE ELEVATION CONTOURS BASED ON THE DATA ILLUSTRATED.

THE ACTUAL ELEVATION OF THE POTENTIOMETRIC SURFACE IS LIKELY MORE HETEROGENEOUS THAN SHOWN AND ACTUAL CONDITIONS WILL VARY. OTHER INTERPRETATIONS ARE POSSIBLE. THE DEPTH TO GROUNDWATER IS KNOWN TO VARY WITH TIME.

NOTE(S)

1. NS INDICATES LOCATION WAS NOT SAMPLED.
2. * INDICATES NOT USED IN CONTOURING

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATION CONTOURS (APRIL 2021)

CONSULTANT

GOLDER
MEMBER OF WSP

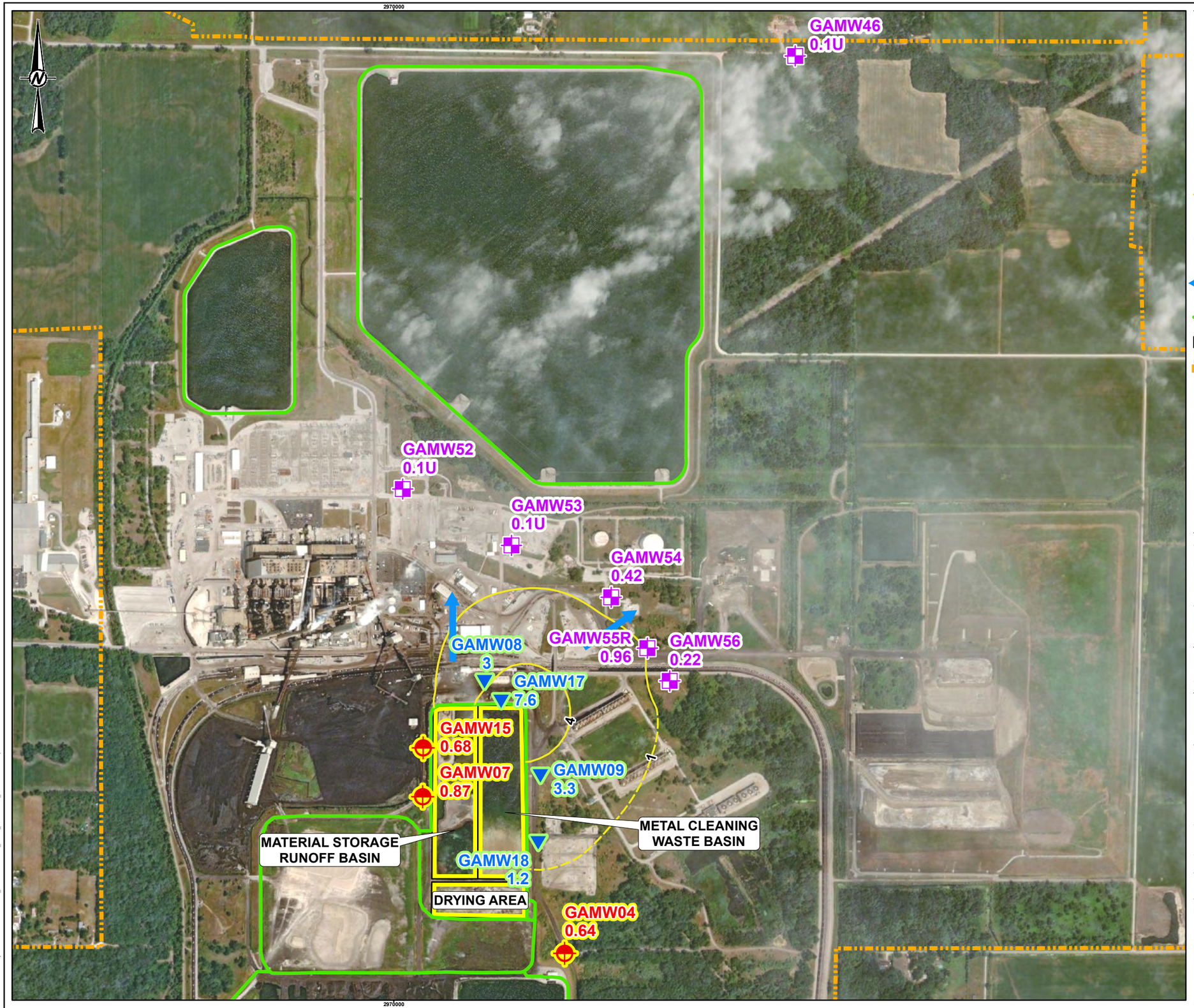
YYYY-MM-DD	2021-07-26
DESIGNED	DFS
PREPARED	TBH
REVIEWED	JBG
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
19121567	A	0	5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 1in

PATH: V:\001 GIS Projects\NIPSCO\Schahfer\99_PROJ\A164817101_EA40_PROD\0004_GWE\164817101-0004-HS-0016_Zoomed.mxd PRINTED ON: 2021-07-26 AT: 11:52:03 AM



LEGEND

- 0.17 April - May 2020 Boron Concentration (mg/L)
- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- April - May 2020 Shallow Boron Contour (mg/L)
- Inferred April - May 2020 Shallow Boron Contour (mg/L)
- Generalized Groundwater Flow Direction
- Slurry Wall
- CCR Units
- Approximate Property Line

0 850 1,700

1 " = 850 feet Feet

FIGURE NARRATIVE

THIS FIGURE SHOWS THE INTERPRETED BORON ISOCONCENTRATION CONTOURS BASED ON GROUNDWATER ANALYTICAL DATA FROM THE APRIL AND MAY 2020 SAMPLING EVENT FOR SHALLOW WELLS SCREENED IN THE SURFICIAL AQUIFER. THE ISOCONCENTRATION CONTOURS ARE INTENDED TO DEPICT THE INFERRED DISTRIBUTION OF BORON IN GROUNDWATER ON THE BASIS OF THE DATA ILLUSTRATED. THE DISTRIBUTION IS LIKELY MORE HETEROGENEOUS THAN SHOWN, AND THE ACTUAL CONDITIONS WILL VARY. OTHER INTERPRETATIONS ARE POSSIBLE. BORON DISTRIBUTION IN GROUNDWATER IS KNOWN TO VARY WITH TIME.

NOTE(S)

1. THIS FIGURE DEPICTS THE GENERALIZED GROUNDWATER FLOW DIRECTION WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER.
2. ALL VALUES SHOWN ARE IN MILLIGRAMS PER LITER (MG/L)

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

ASSESSMENT OF CORRECTIVE MEASURES
BORON ISOCONCENTRATION CONTOUR MAP
APRIL - MAY 2020 (SHALLOW)

CONSULTANT

GOLDER
MEMBER OF WSP

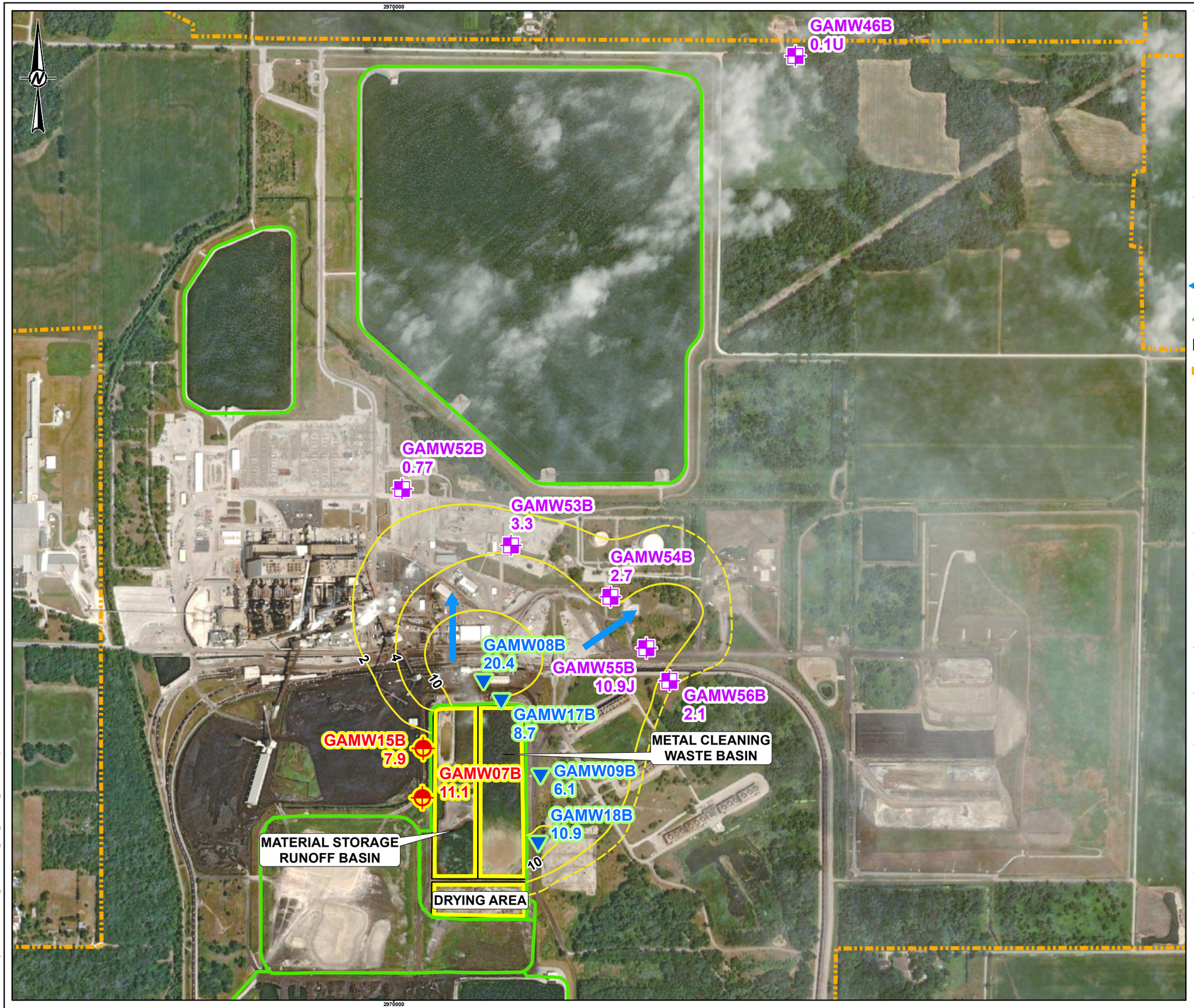
YYYY-MM-DD	7/23/2021
DESIGNED	KC
PREPARED	TBH
REVIEWED	JBG
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
20447130	A	0	6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1in 0

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LEGEND

- 3.1 April - May 2020 Boron Concentration (mg/L)
- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- April - May 2020 Deep Boron Contour (mg/L)
- Inferred April - May 2020 Deep Boron Contour (mg/L)
- Generalized Groundwater Flow Direction
- Slurry Wall
- CCR Units
- Approximate Property Line

0 850 1,700

1 " = 850 feet Feet

FIGURE NARRATIVE

THIS FIGURE SHOWS THE INTERPRETED BORON ISOCONCENTRATION CONTOURS BASED ON GROUNDWATER ANALYTICAL DATA FROM THE APRIL AND MAY 2020 SAMPLING EVENT FOR DEEP WELLS SCREENED IN THE SURFICIAL AQUIFER. THE ISOCONCENTRATION CONTOURS ARE INTENDED TO DEPICT THE INFERRED DISTRIBUTION OF BORON IN GROUNDWATER ON THE BASIS OF THE DATA ILLUSTRATED. THE DISTRIBUTION IS LIKELY MORE HETEROGENEOUS THAN SHOWN, AND THE ACTUAL CONDITIONS WILL VARY. OTHER INTERPRETATIONS ARE POSSIBLE. BORON DISTRIBUTION IN GROUNDWATER IS KNOWN TO VARY WITH TIME.

NOTE(S)

1. THIS FIGURE DEPICTS THE GENERALIZED GROUNDWATER FLOW DIRECTION WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER.
2. ALL VALUES SHOWN ARE IN MILLIGRAMS PER LITER (MG/L)

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

ASSESSMENT OF CORRECTIVE MEASURES
BORON ISOCONCENTRATION CONTOUR MAP
APRIL - MAY 2020 (DEEP)

CONSULTANT

GOLDER
MEMBER OF WSP

YYYY-MM-DD	7/23/2021
DESIGNED	KC
PREPARED	TBH
REVIEWED	JBG
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
20447130	A	0	7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1in 0

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APPENDIX A

Volume Calculations

Volume of impacted material below the CCR Unit

Assumptions:

Entire remaining volume of water within the slurry walls after excavation is impacting.
Area is estimated by the combined area of the three impoundments (Figure 6).
Depth is estimated by the approximate saturated thickness outside the slurry walls (Figure 3).

Area	36.2	acre	(A)	(Wood 2019)
Saturated depth	32	feet	(D)	(Golder 2017)

Estimated volume of impacted material was calculated using the following formula:

$Volume = A*D = V_1$ 1 acre= 43560 ft^2

V_1	1158	acre-ft
V_1	5.0E+07	ft^3

Volume of impacted material downgradient of the CCR Unit

Assumptions:

The volume is estimated by the volume with boron concentrations greater than 4 mg/L.
Plume areas are calculated based on the 4 mg/L contours displayed on Figure 6 and Figure 7.

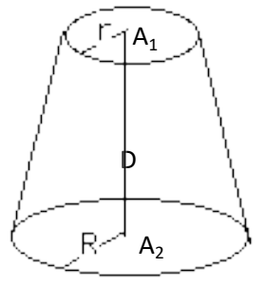
Shallow plume area	21.75	acre		
	9.474E+05	ft^2	(A1)	
Deep plume area	87.40	acre		
	3.807E+06	ft^2	(A2)	
Saturated depth	32	feet	(D)	(Golder 2017)
Assumed effective porosity	0.3		(n)	(Golder 2017)

The plume area were approximated as circles, and the volume of impacted material was estimated as a frustrum using the following formula:

$Volume = \pi*D/3*(R^2 + Rr + r^2) = V_2$

$r = (A_1/\pi)^{1/2}$, $R = (A_2/\pi)^{1/2}$

r	549.2	ft
R	1101	ft
V_2	7.10E+07	ft^3
V_2	1629	acre-ft



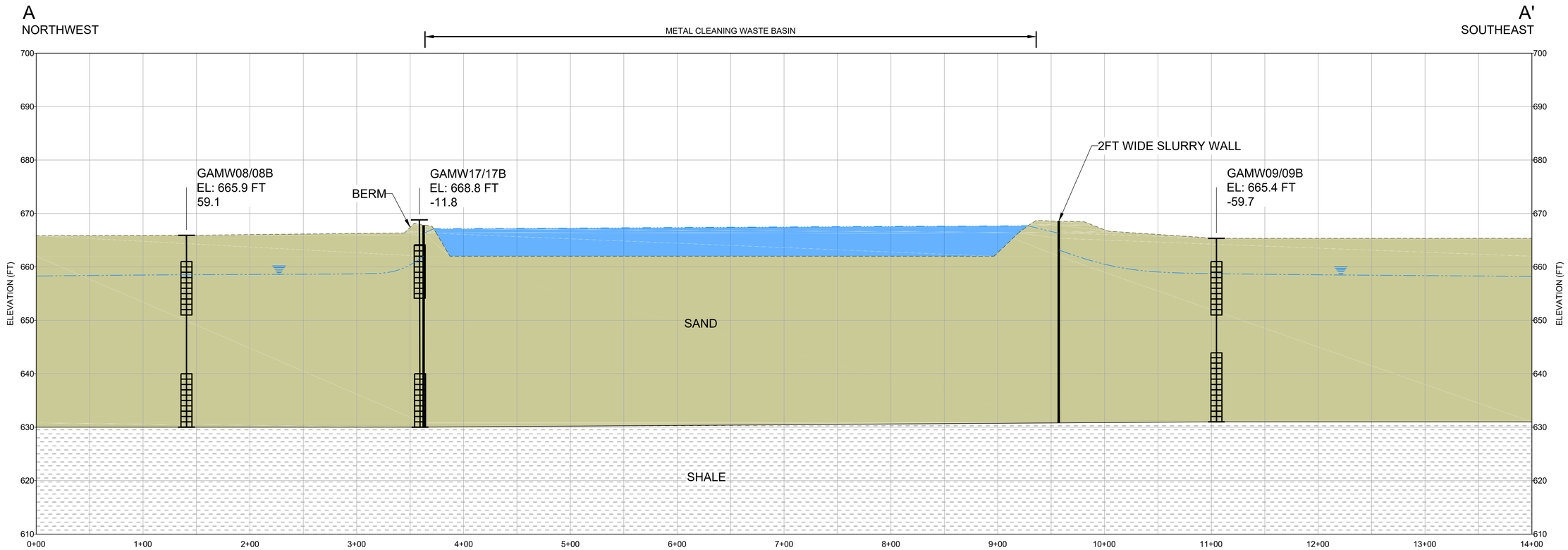
Estimated volume of impacted groundwater was calculated using the following forumula:

$Volume = V_2*n = V_{water}$

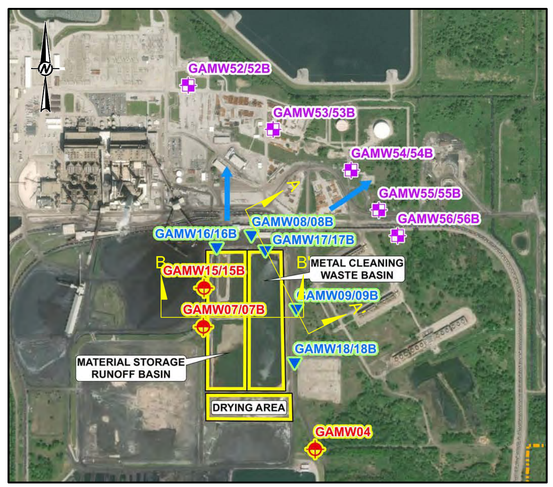
V_{water}	2.13E+07	ft^3
V_{water}	1.59E+08	gallons

Prepared by: DFS
Checked by: BPC
Reviewed by: JBG

Golder Associates, Groundwater Monitoring Program Implementation Manual, October 2017
Wood, 2019. Multi-Cell Unit Surface Impoundments (CCR Final Rule) Draft Closure Application. March 8, 2019.



A-A'



VERTICAL SCALE: 0 10 20 — 1" = 10' FEET

HORIZONTAL SCALE: 0 50 100 — 1" = 50' FEET

LEGEND

GAMW-08/08B	=	WELL I.D.
EL: 665.9 59.1	= =	GROUND SURFACE ELEVATION OFFSET DISTANCE C/L = CENTERLINE
	=	GROUNDWATER ELEVATION
	=	WELL SCREEN
	=	END OF BORING LOCATION
		IMPOUNDMENT WATER
		SAND
		SHALE

NOTE(S)

1. GEOLOGIC CONTACTS ILLUSTRATED BETWEEN AND BELOW BORINGS ARE INFERRED AND SHOULD NOT BE INTERPRETED AS EXACT INDICATORS OF GEOLOGIC CONDITIONS AT, BETWEEN, OR BELOW BORINGS.

CLIENT
NORTHERN INDIANA PUBLIC SERVICE COMPANY

CONSULTANT
GOLDER

YYYY-MM-DD	2019-02-28
DESIGNED	RWC
PREPARED	RWC
REVIEWED	
APPROVED	

PROJECT
NORTHERN INDIANA PUBLIC SERVICE COMPANY
ROLLIN M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

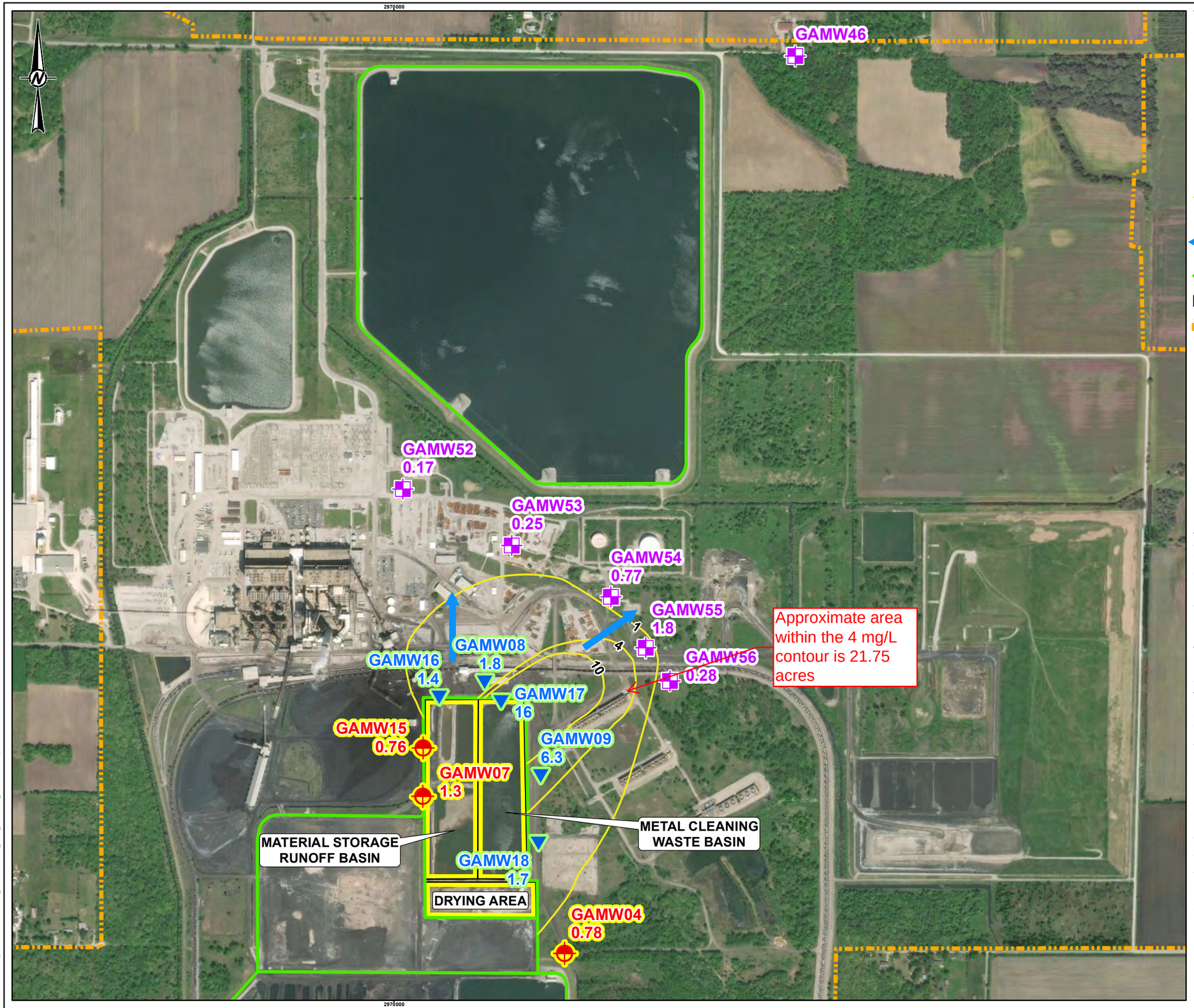
TITLE
GEOLOGIC INTERPRETATION
CROSS SECTION A-A'

PROJECT NO.	CONTROL	REV.	FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

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LEGEND

- 0.17 October 2018 Boron Concentration (mg/L)
- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- October 2018 Shallow Boron Contour (mg/L)
- Generalized Groundwater Flow Direction
- Slurry Wall
- CCR Units
- Approximate Property Line

0 850 1,700

1 " = 850 feet Feet

FIGURE NARRATIVE

THIS FIGURE SHOWS THE INTERPRETED BORON ISOCONCENTRATION CONTOURS BASED ON GROUNDWATER ANALYTICAL DATA FROM THE OCTOBER 2018 SAMPLING EVENT FOR SHALLOW WELLS SCREENED IN THE SURFICIAL AQUIFER. THE ISOCONCENTRATION CONTOURS ARE INTENDED TO DEPICT THE INFERRED DISTRIBUTION OF BORON IN GROUNDWATER ON THE BASIS OF THE DATA ILLUSTRATED. THE DISTRIBUTION IS LIKELY MORE HETEROGENEOUS THAN SHOWN, AND THE ACTUAL CONDITIONS WILL VARY. OTHER INTERPRETATIONS ARE POSSIBLE. BORON DISTRIBUTION IN GROUNDWATER IS KNOWN TO VARY WITH TIME.

NOTE(S)

1. THIS FIGURE DEPICTS THE GENERALIZED GROUNDWATER FLOW DIRECTION WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER.
2. ALL VALUES SHOWN ARE IN MILLIGRAMS PER LITER (MG/L)

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY

PROJECT

NORTHERN INDIANA PUBLIC SERVICE COMPANY
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

ASSESSMENT OF CORRECTIVE MEASURES
BORON ISOCONCENTRATION CONTOUR MAP
OCTOBER 2018 (SHALLOW)

CONSULTANT

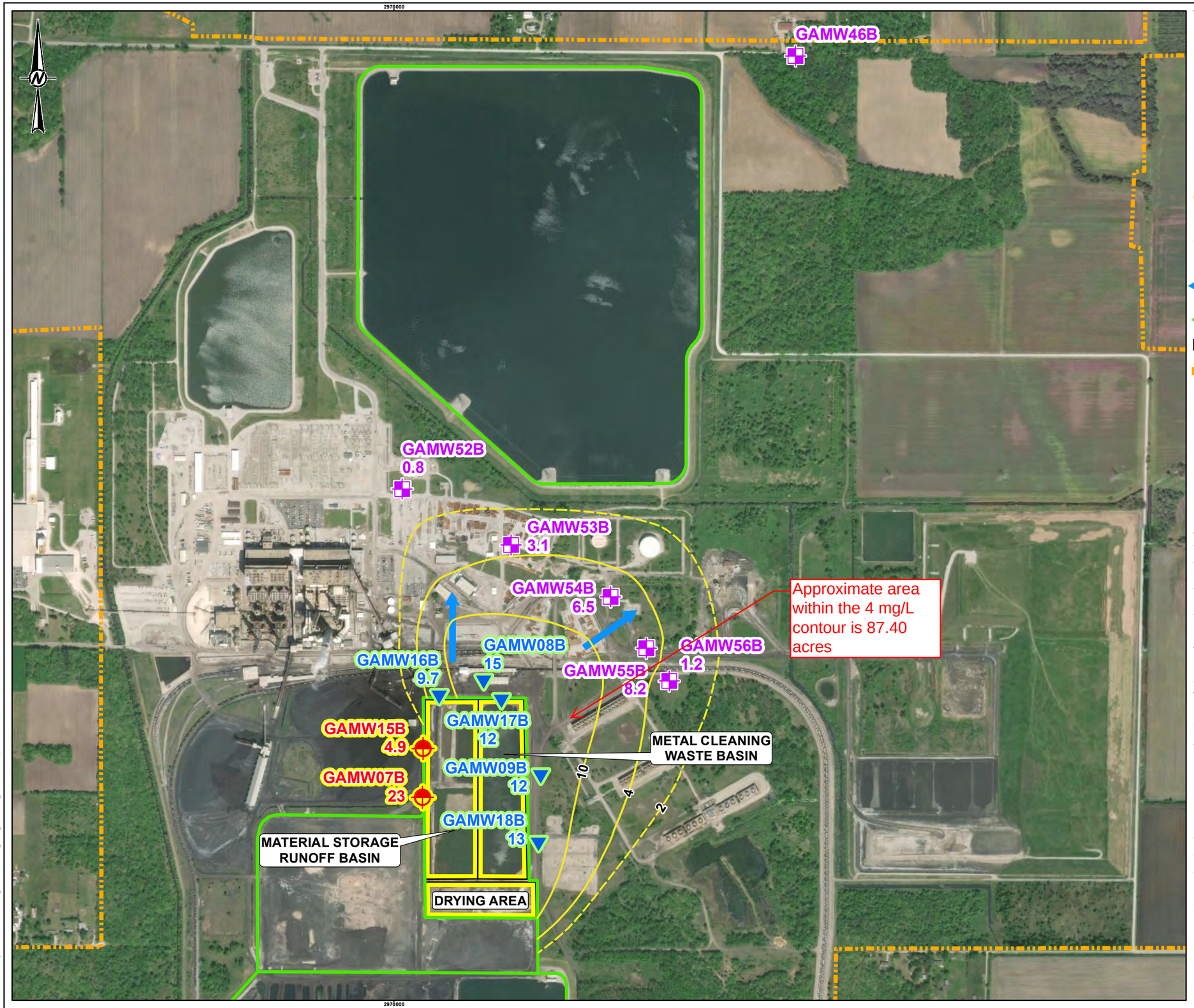
GOLDER

YYYY-MM-DD	4/18/2019
DESIGNED	DFS
PREPARED	SHL
REVIEWED	MAH
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
164817101	A	0	6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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LEGEND

- 3.1 October 2018 Boron Concentration (mg/L)
- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- October 2018 Deep Boron Contour (mg/L)
- Inferred October 2018 Deep Boron Contour (mg/L)
- Generalized Groundwater Flow Direction
- Slurry Wall
- CCR Units
- Approximate Property Line

0 850 1,700

1 " = 850 feet Feet

FIGURE NARRATIVE

THIS FIGURE SHOWS THE INTERPRETED BORON ISOCONCENTRATION CONTOURS BASED ON GROUNDWATER ANALYTICAL DATA FROM THE OCTOBER 2018 SAMPLING EVENT FOR DEEP WELLS SCREENED IN THE SURFICIAL AQUIFER. THE ISOCONCENTRATION CONTOURS ARE INTENDED TO DEPICT THE INFERRED DISTRIBUTION OF BORON IN GROUNDWATER ON THE BASIS OF THE DATA ILLUSTRATED. THE DISTRIBUTION IS LIKELY MORE HETEROGENEOUS THAN SHOWN, AND THE ACTUAL CONDITIONS WILL VARY. OTHER INTERPRETATIONS ARE POSSIBLE. BORON DISTRIBUTION IN GROUNDWATER IS KNOWN TO VARY WITH TIME.

THE IMPACTS DETECTED IN GAMW-07B AND GAMW-15B ARE NOT CONTOURED IN THIS MAP. GOLDER'S INTERPRETATION IS THAT THESE CONCENTRATIONS ARE DUE TO UPGRADIENT IMPACT.

NOTE(S)

1. THIS FIGURE DEPICTS THE GENERALIZED GROUNDWATER FLOW DIRECTION WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER.
2. ALL VALUES SHOWN ARE IN MILLIGRAMS PER LITER (MG/L)

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCES: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY

PROJECT

NORTHERN INDIANA PUBLIC SERVICE COMPANY
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

ASSESSMENT OF CORRECTIVE MEASURES
BORON ISOCONCENTRATION CONTOUR MAP
OCTOBER 2018 (DEEP)

CONSULTANT

GOLDER

YYYY-MM-DD	4/19/2019
DESIGNED	DFS
PREPARED	SHL
REVIEWED	DFS
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
164817101	A	0	7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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APPENDIX B

Slug Test Data and Calculations

Appendix B
HYDRAULIC CONDUCTIVITY TESTING RESULTS

Well	Date	Screened Interval	Type	Test Duration	Test Number	Hvorslev Method		Bouwer and Rice Method		van der Kamp Method		Hvorslev/Bouwer and Rice Arithmetic Mean	
						cm/sec	ft/day	cm/sec	ft/day	cm/sec	ft/day	cm/sec	ft/day
GAMW03	7/7/2016	5-15	Transducer (Rising)	<2 min	1	7.44E-03	2.11E+01	4.99E-03	1.42E+01	n/a	n/a	6.22E-03	1.77E+01
					2	7.45E-03	2.11E+01	5.22E-03	1.48E+01	n/a	n/a	6.34E-03	1.80E+01
GAMW13	7/7/2016	5-15	Transducer (Rising)	<2 min	1	5.75E-02	1.63E+02	3.91E-02	1.11E+02	n/a	n/a	4.83E-02	1.37E+02
					2	6.50E-02	1.84E+02	4.81E-02	1.36E+02	n/a	n/a	5.66E-02	1.60E+02
GAMW15	7/7/2016	5-15	Transducer (Rising)	<2 min	1	2.59E-02	7.34E+01	1.63E-02	4.63E+01	n/a	n/a	2.11E-02	5.99E+01
					2	1.11E-02	3.15E+01	1.08E-02	3.05E+01	n/a	n/a	1.10E-02	3.10E+01
GAMW19	7/7/2016	6-16	Transducer (Rising)	<2 min	1	3.70E-02	1.05E+02	2.25E-02	6.38E+01	n/a	n/a	2.98E-02	8.44E+01
					2	1.01E-01	2.87E+02	6.85E-02	1.94E+02	n/a	n/a	8.48E-02	2.41E+02
Average Shallow (515 ftbgs)						**3.90E-02**	**1.11E+02**	**2.69E-02**	**7.63E+01**	**n/a**	**n/a**	**3.30E-02**	**9.35E+01**
GAMW03B	7/8/2016	27-37	Transducer (Falling)	<2 min	1	6.78E-03	1.92E+01	5.81E-03	1.65E+01	n/a	n/a	6.30E-03	1.79E+01
					2	4.30E-03	1.22E+01	4.79E-03	1.36E+01	n/a	n/a	4.55E-03	1.29E+01
			Transducer (Rising)	<2 min	1	5.65E-03	1.60E+01	6.42E-03	1.82E+01	n/a	n/a	6.04E-03	1.71E+01
					2	1.47E-02	4.16E+01	1.25E-02	3.55E+01	1.49E-02	4.22E+01	1.36E-02	3.86E+01
GAMW13B	7/7/2016	25-35	Transducer (Falling)	<2 min	1	8.48E-03	2.40E+01	9.27E-03	2.63E+01	n/a	n/a	8.88E-03	2.52E+01
					2	8.09E-03	2.29E+01	9.27E-03	2.63E+01	n/a	n/a	8.68E-03	2.46E+01
			Transducer (Rising)	<2 min	1	1.11E-02	3.15E+01	1.16E-02	3.30E+01	2.73E-02	7.74E+01	1.14E-02	3.23E+01
					2	1.06E-02	3.00E+01	1.08E-02	3.06E+01	1.06E-02	3.01E+01	1.07E-02	3.03E+01
GAMW15B	7/7/2016	27.7-37.7	Transducer (Falling)	<2 min	1	4.50E-03	1.28E+01	3.45E-03	9.79E+00	n/a	n/a	3.98E-03	1.13E+01
					2	1.03E-02	2.91E+01	8.75E-03	2.48E+01	9.53E-03	2.70E+01	9.53E-03	2.70E+01
			Transducer (Rising)	<2 min	1	1.17E-02	3.32E+01	1.06E-02	3.02E+01	1.24E-02	3.50E+01	1.12E-02	3.17E+01
					2	1.06E-02	3.02E+01	9.79E-03	2.77E+01	1.69E-02	4.80E+01	1.02E-02	2.90E+01
GAMW19B	7/7/2016	23-33	Transducer (Falling)	<2 min	1	1.37E-02	3.88E+01	1.44E-02	4.09E+01	n/a	n/a	1.41E-02	3.99E+01
					2	6.82E-03	1.93E+01	6.31E-03	1.79E+01	n/a	n/a	6.57E-03	1.86E+01
			Transducer (Rising)	<2 min	1	1.84E-02	5.21E+01	1.83E-02	5.18E+01	1.29E-02	3.67E+01	1.84E-02	5.20E+01
					2	1.21E-02	3.43E+01	1.03E-02	2.91E+01	1.21E-02	3.43E+01	1.12E-02	3.17E+01
Average Deep (2535 ftbgs)						**9.86E-03**	**2.80E+01**	**9.52E-03**	**2.70E+01**	**1.46E-02**	**4.13E+01**	**9.69E-03**	**2.75E+01**

Notes:
ft/day = feet per day
cm/sec = centimeters per second
n/a = not analyzed

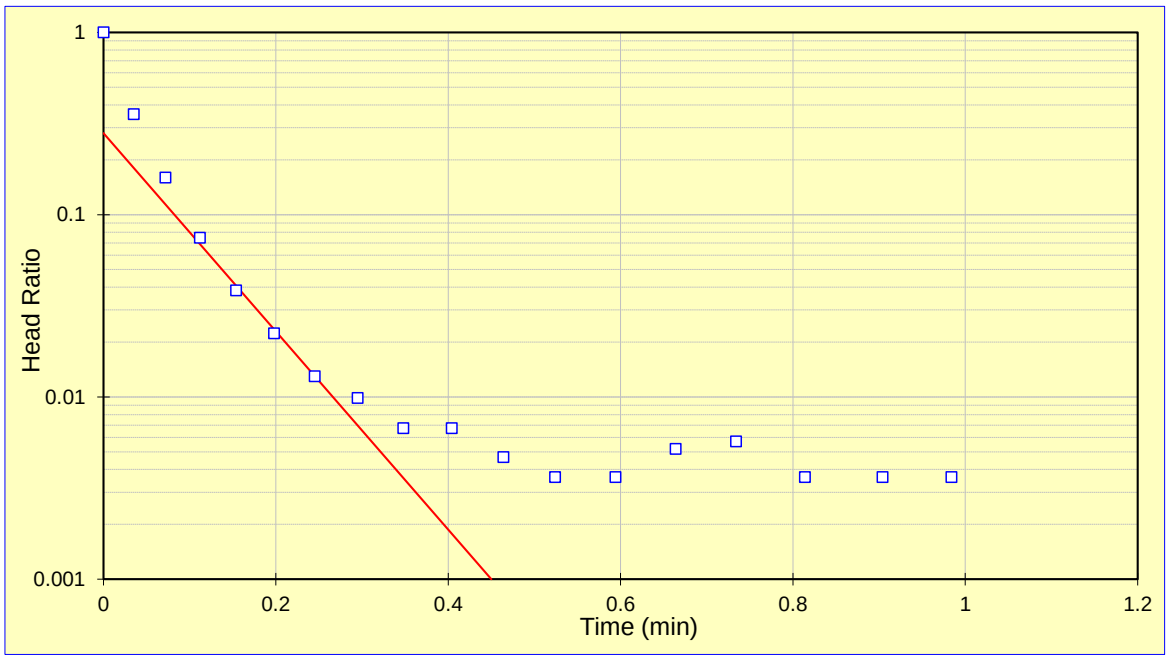
Prepared by: DFS
Checked by: KMC
Reviewed by: MAH

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left|\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right| 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	7.44E-03	cm/sec
t_1 =	0	K=	2.11E+01	ft/day
t_2 =	0.45			
h_1/h_0 =	0.28			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/25/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

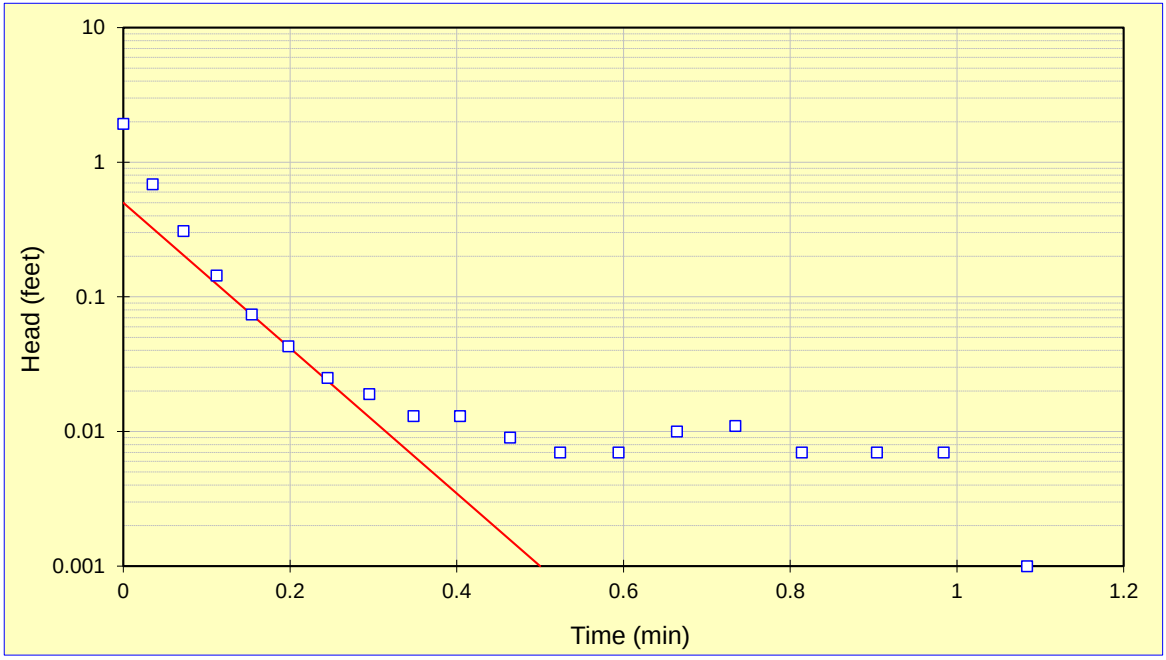
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.28
y_0 =	0.50
y_t =	0.001
t =	0.5

RESULTS

K=	4.99E-03	cm/sec
K=	1.42E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

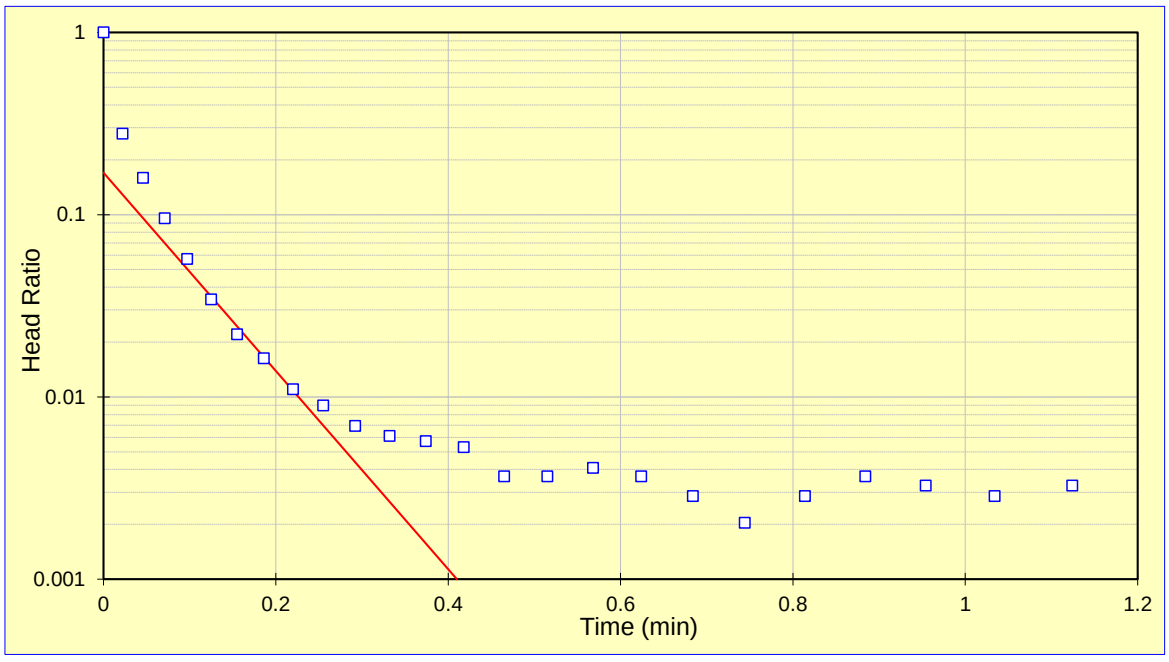
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	7.45E-03	cm/sec
t_1 =	0	K=	2.11E+01	ft/day
t_2 =	0.41			
h_1/h_0 =	0.17			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

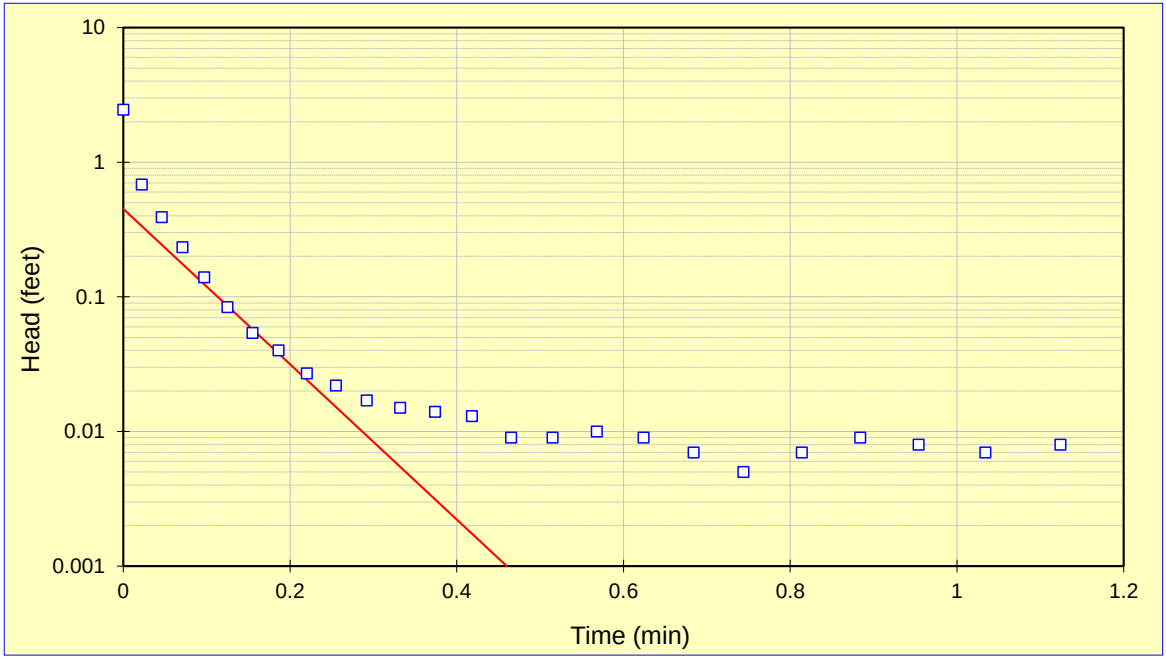
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.23
y_0 =	0.45
y_t =	0.001
t =	0.5

RESULTS

K=	5.22E-03	cm/sec
K=	1.48E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

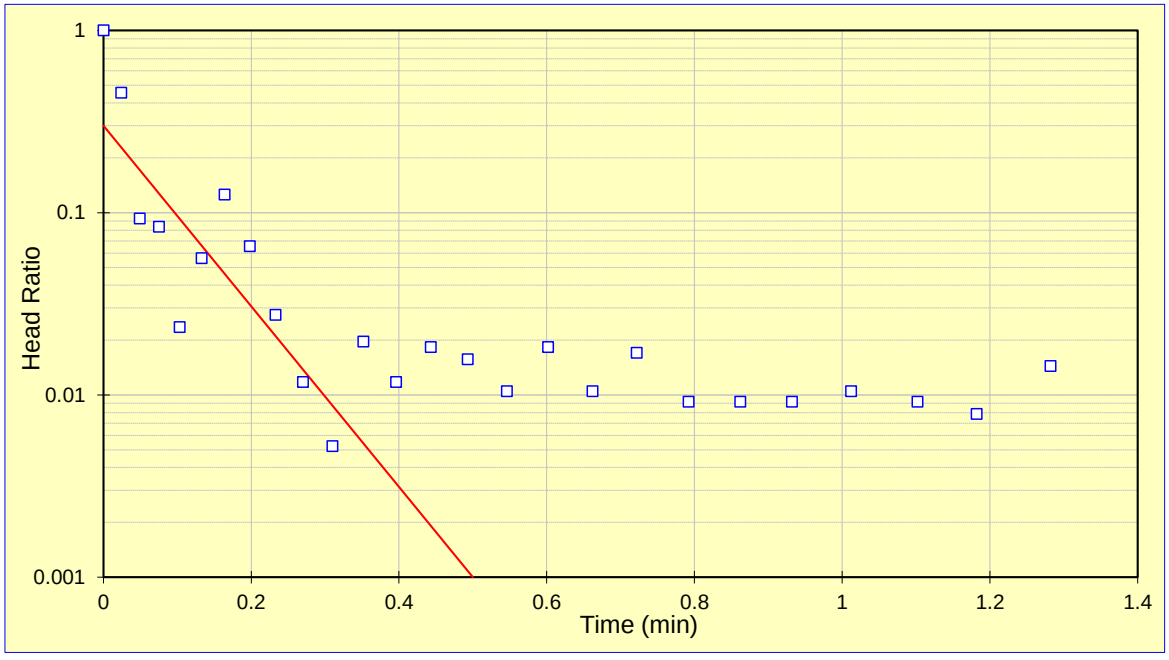
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	6.78E-03	cm/sec
t_1 =	0	K=	1.92E+01	ft/day
t_2 =	0.5			
h_1/h_0 =	0.30			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

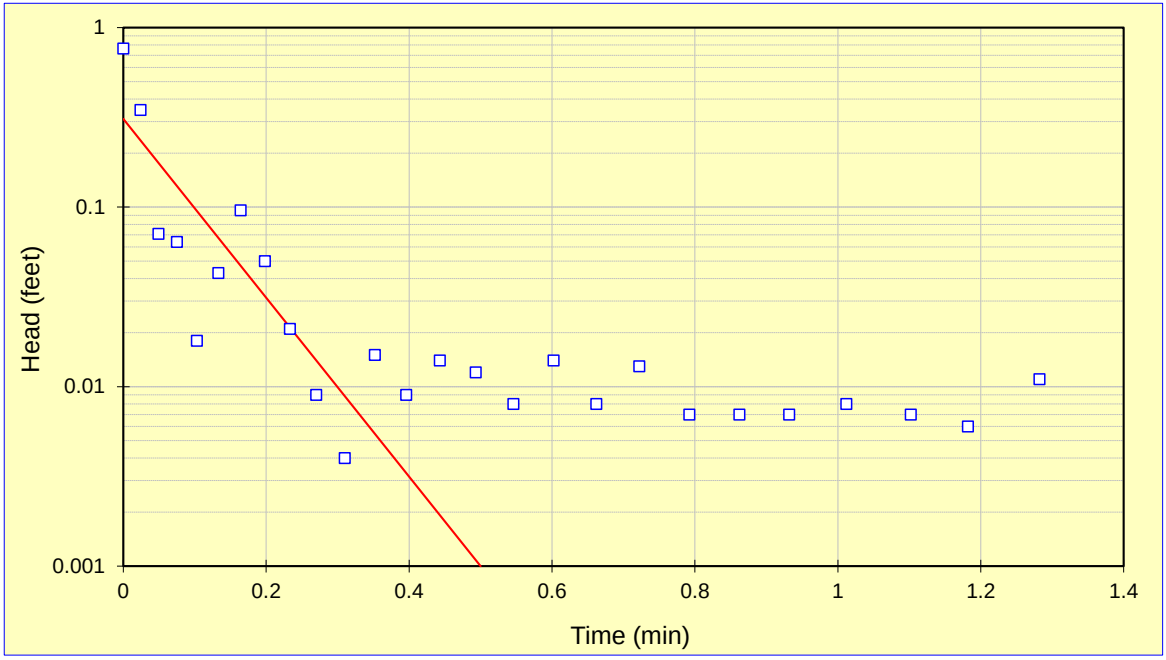
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.87
y_0 =	0.31
y_t =	0.001
t =	0.5

RESULTS

K=	5.81E-03	cm/sec
K=	1.65E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

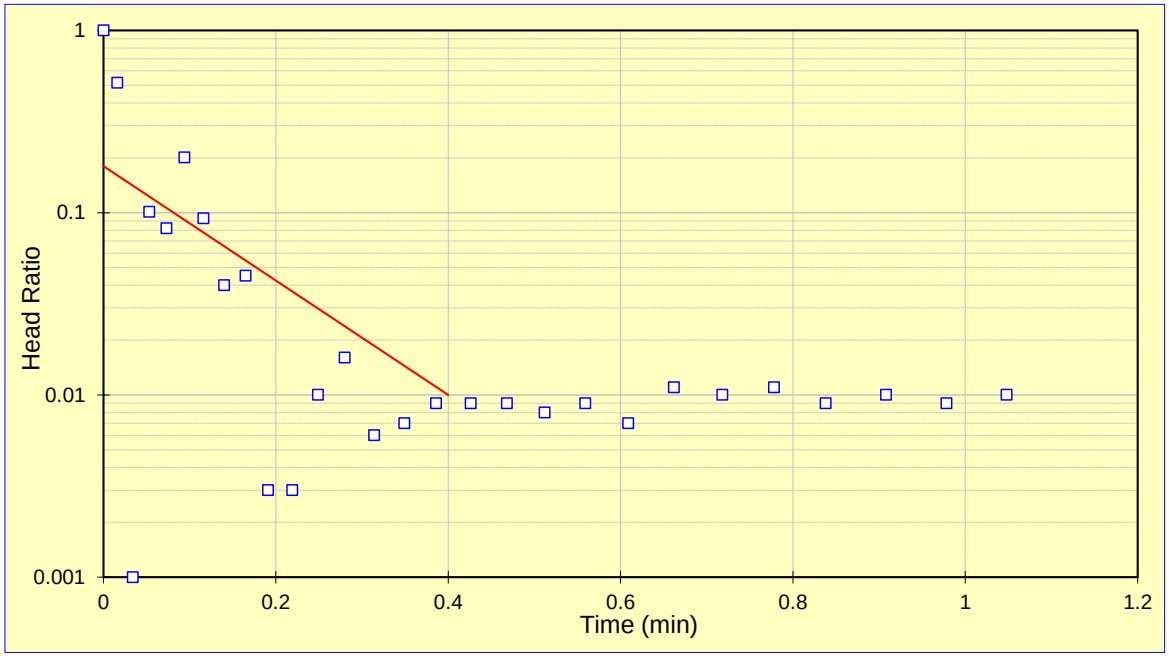
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-03B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	4.30E-03	cm/sec
t_1 =	0	K=	1.22E+01	ft/day
t_2 =	0.4			
h_1/h_0 =	0.18			
h_2/h_0 =	0.01			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-03B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

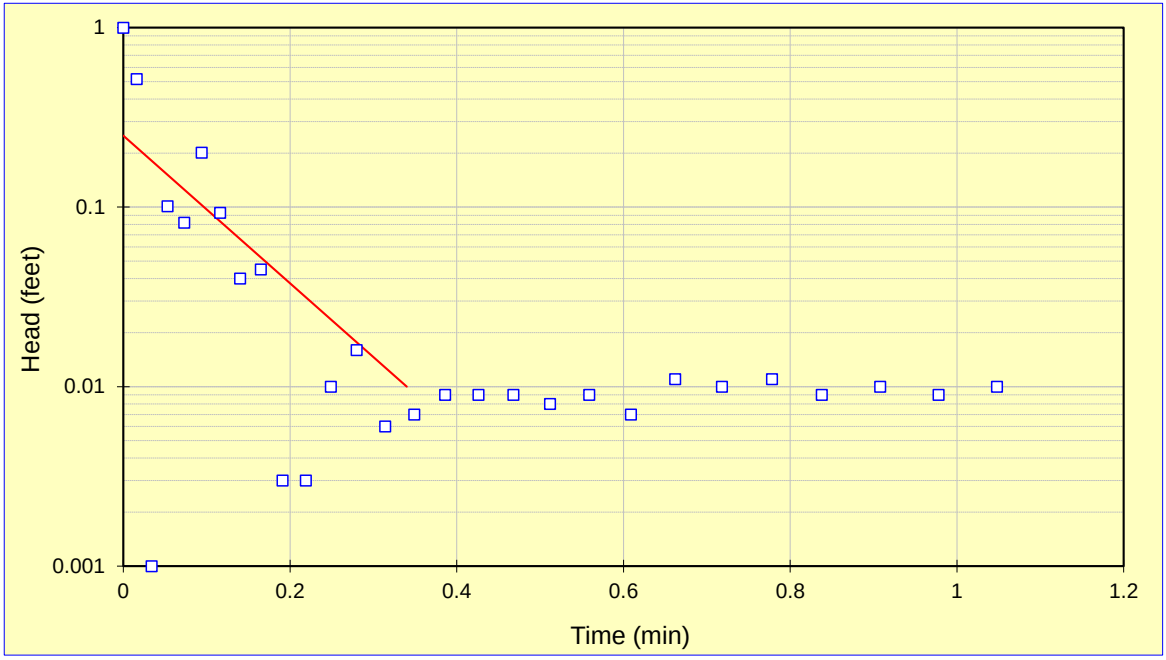
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.87
y_0 =	0.25
y_t =	0.010
t =	0.3

RESULTS

K=	4.79E-03	cm/sec
K=	1.36E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

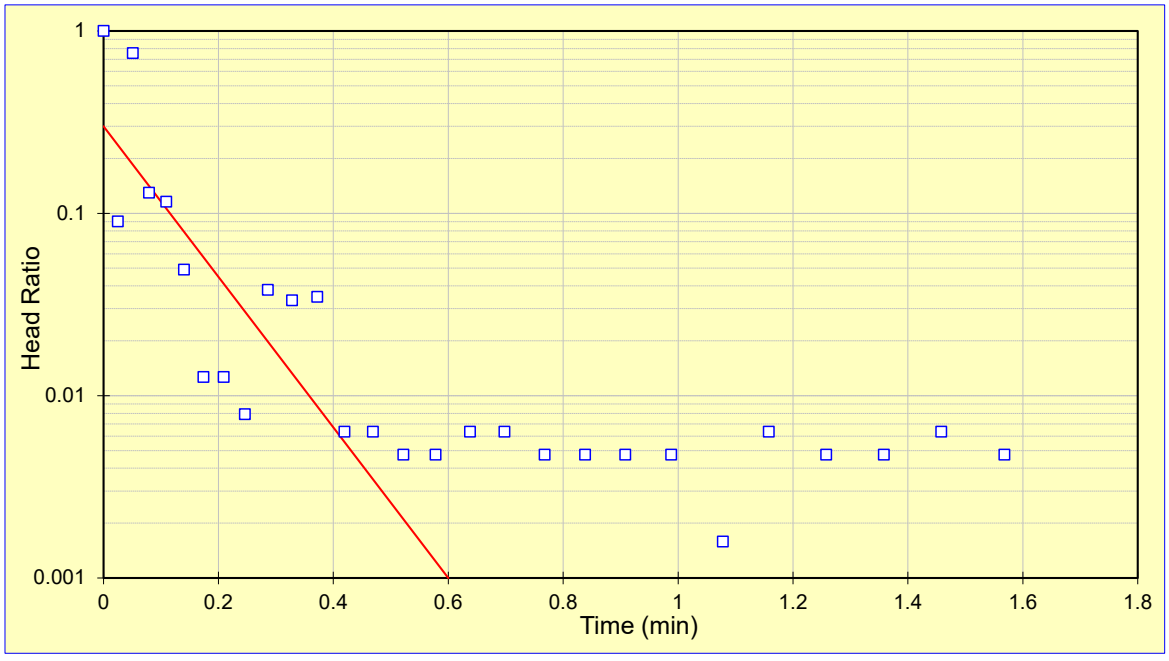
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	5.65E-03	cm/sec
t_1 =	0	K=	1.60E+01	ft/day
t_2 =	0.6			
h_1/h_0 =	0.30			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

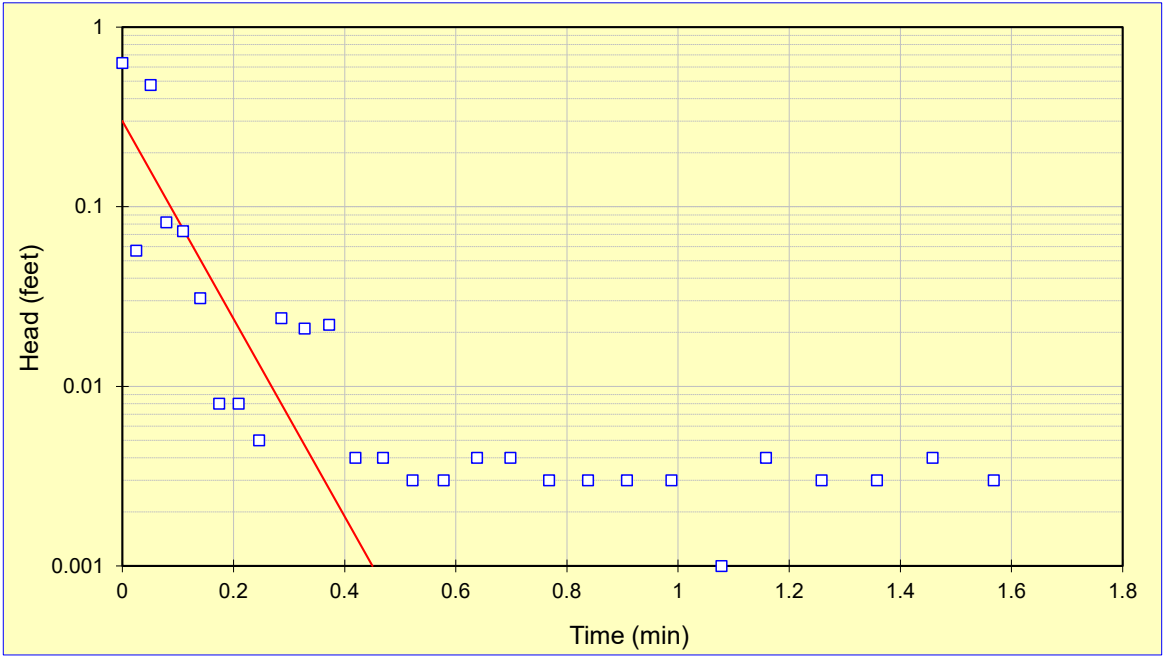
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.87
y_0 =	0.30
y_t =	0.001
t =	0.5

RESULTS

K=	6.42E-03	cm/sec
K=	1.82E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-03B (TEST 2)

$$T = b + a\ln T$$

where:

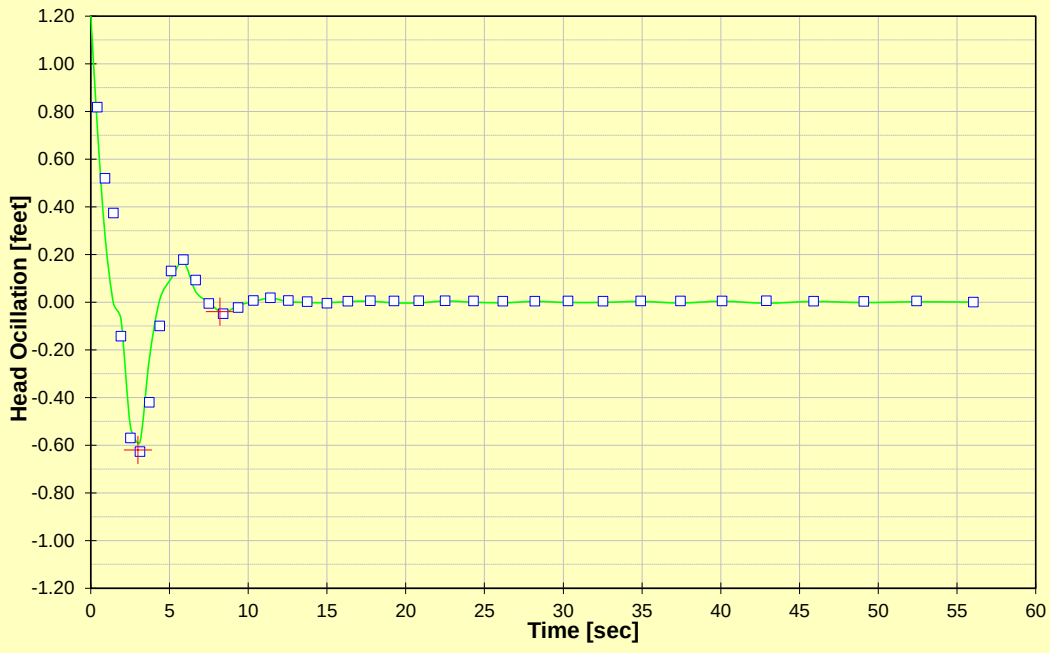
$$b = -a\ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g / L^{1/2}\right) / 8d$$
$$d = \gamma / \left(g / L\right)^{1/2}$$
$$L = g / \left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.31826	ft^2
r_s =	0.08	ft	d =	0.3998	ft^{-1}
L_c =	19.62	ft	a =	0.00286	ft^3
L_s =	10.00	ft	t_1 =	3.00	sec
ω =	1.2083	ft^{-1}	t_2 =	8.20	sec
γ =	0.5271	ft^{-1}	$h(t_1)$ =	0.62	ft
L =	18.52	ft^3/sec^2	$h(t_2)$ =	0.04	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	2.73E-02	ft^2/sec	α < 0.1?	YES
T =	1.53E-02	ft^2/sec	d < 0.7?	YES
T =	1.32E+03	ft^2/day	L_1 =	18.52
K =	4.22E+01	ft/day	L_2 =	24.62
K =	1.49E-02	cm/sec	L_1:L_2 Diff <20% ?	NO



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/08/16

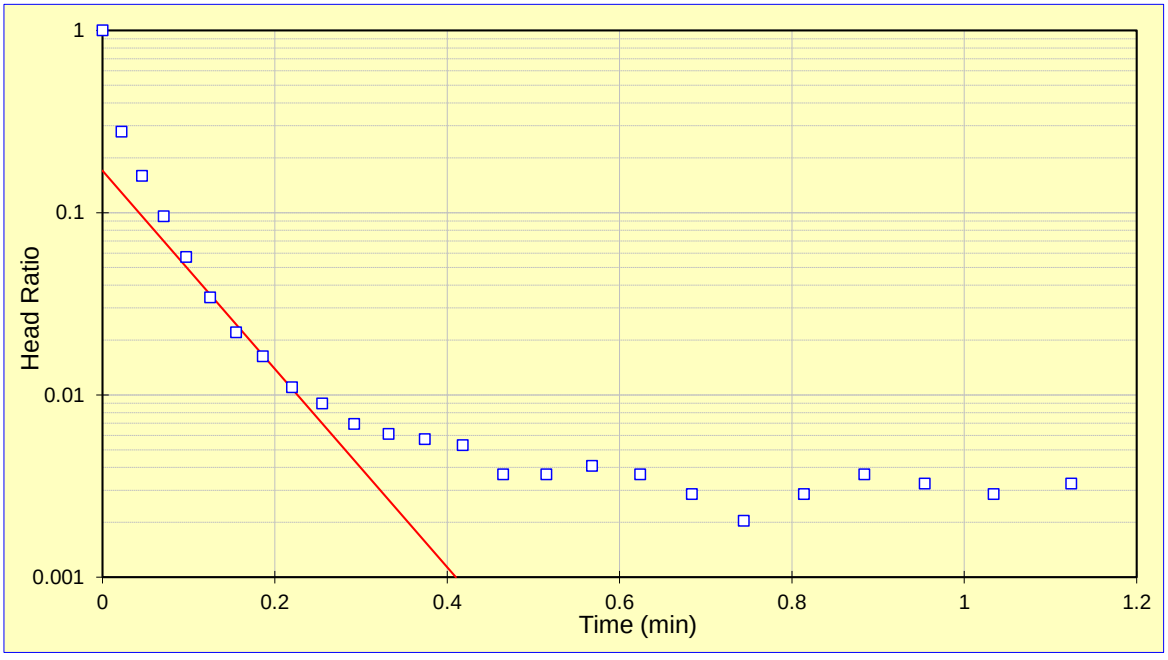
Analysis By: DFS
Checked By: JRS
Analysis Date: 8/8/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	7.45E-03	cm/sec
t_1 =	0	K=	2.11E+01	ft/day
t_2 =	0.41			
h_1/h_0 =	0.17			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

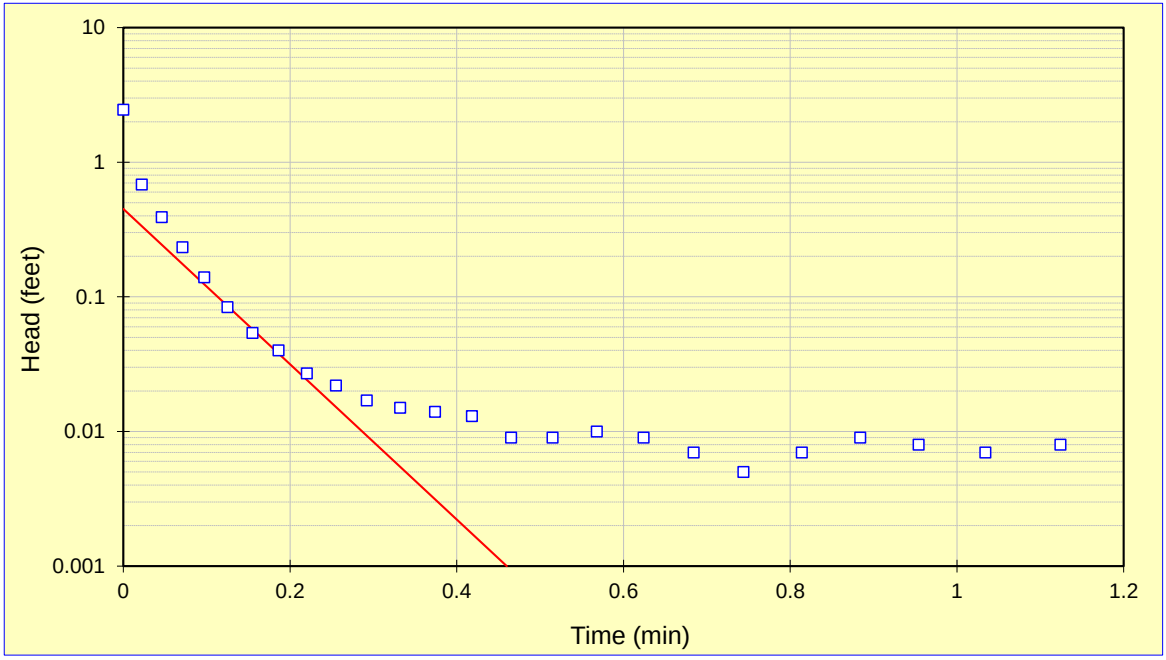
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.23
y_0 =	0.45
y_t =	0.001
t =	0.5

RESULTS

K=	5.22E-03	cm/sec
K=	1.48E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 1)

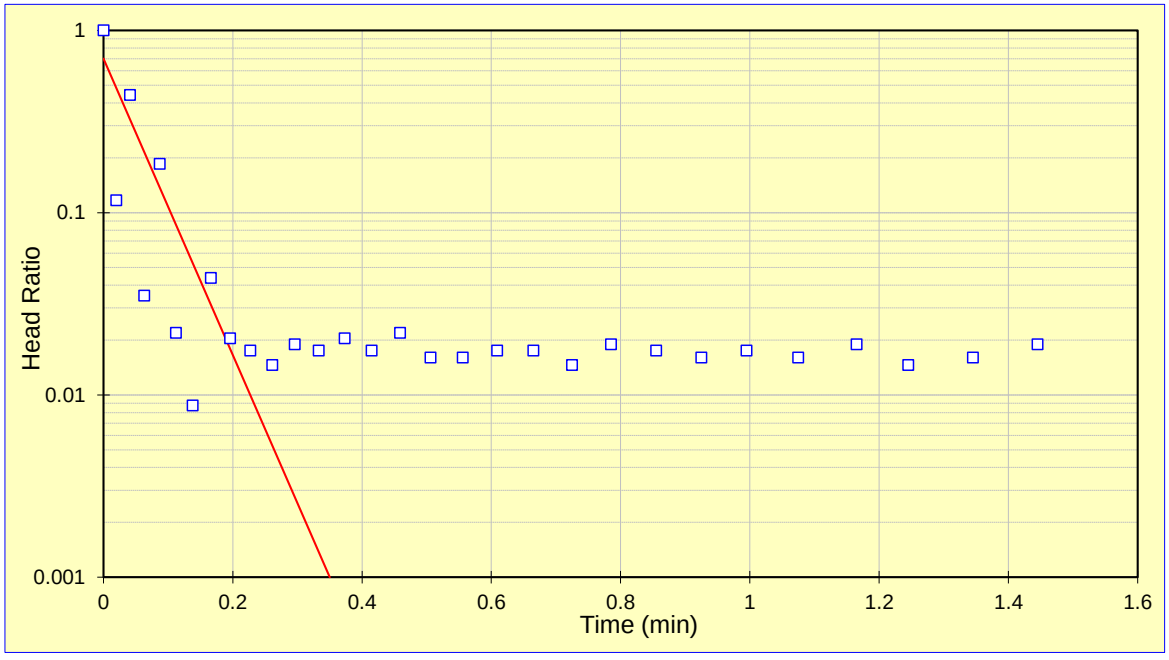
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	10
t_1 =	0
t_2 =	0.35
h_1/h_0 =	0.70
h_2/h_0 =	0.00

RESULTS

K=	1.11E-02	cm/sec
K=	3.15E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

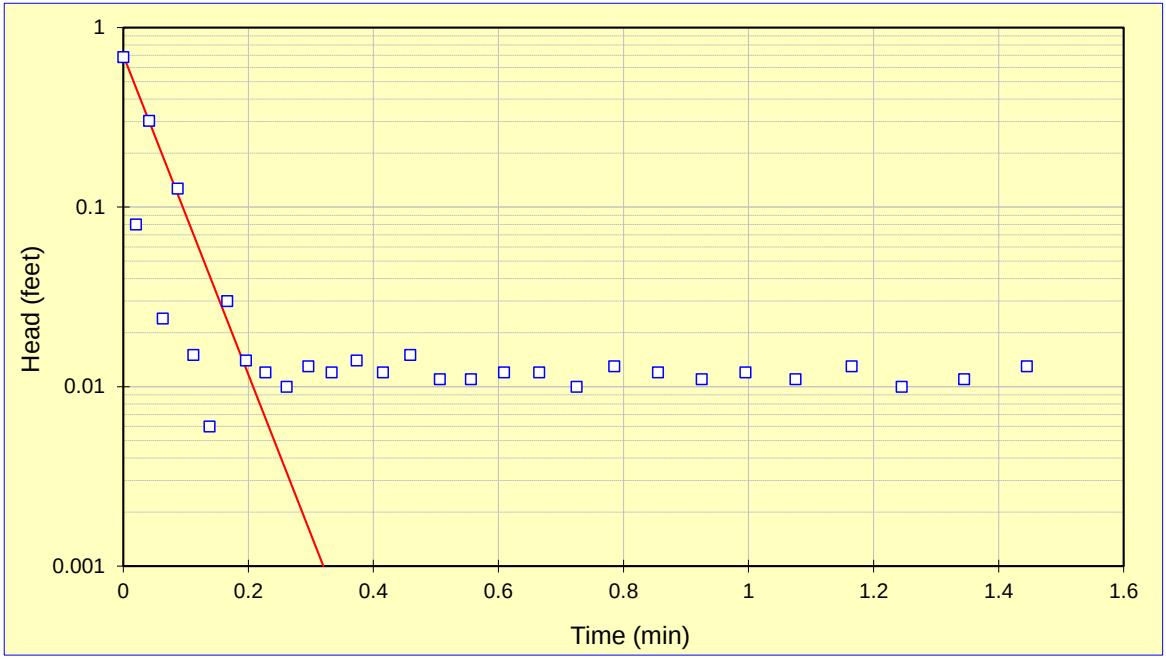
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.22
y_0 =	0.70
y_t =	0.001
t =	0.3

RESULTS

K=	1.16E-02	cm/sec
K=	3.30E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

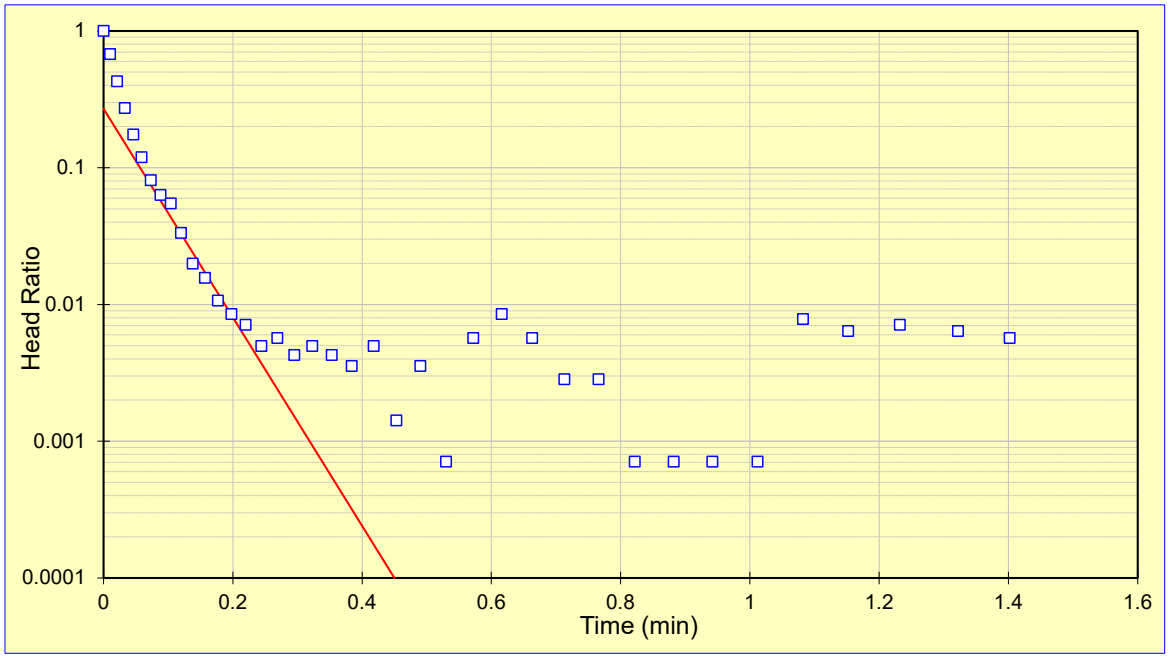
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13 (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
R_e =	0.34			
L_e =	9.037	K=	6.50E-02	cm/sec
t_1 =	0	K=	1.84E+02	ft/day
t_2 =	0.45			
h_1/h_0 =	0.27			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

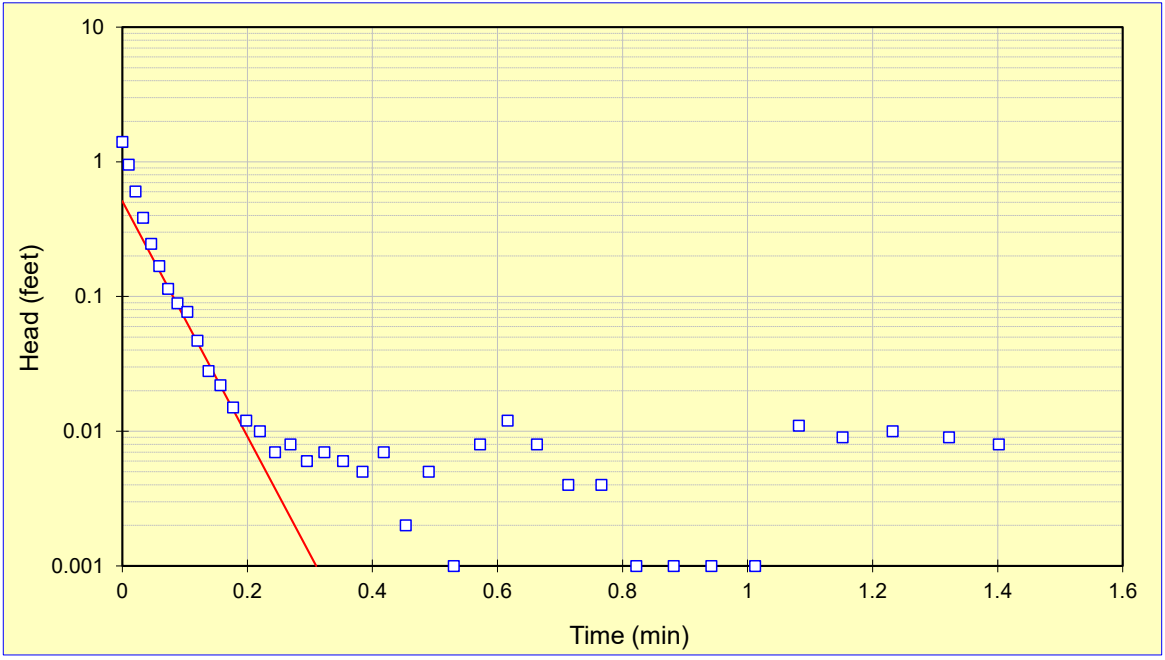
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	9.037
$\ln(R_e/r_w)$=	2.11
y_0 =	0.51
y_t =	0.001
t =	0.3

RESULTS

K=	4.81E-02	cm/sec
K=	1.36E+02	ft/day



Project Name: NIPSCO Schahfer
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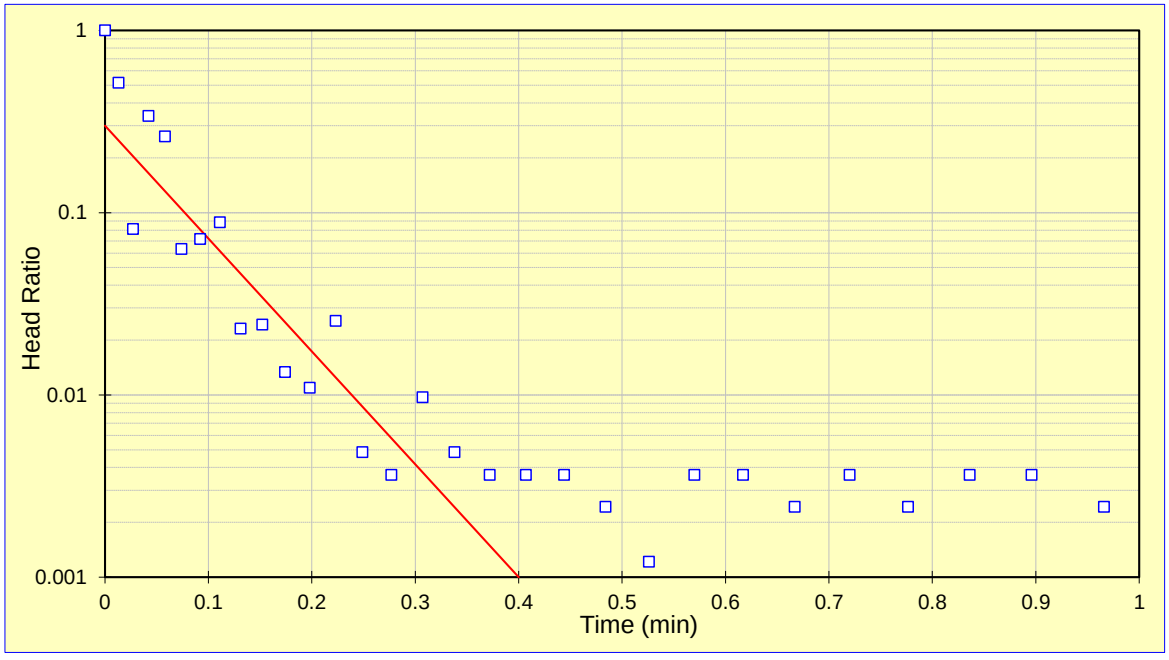
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left|\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right| 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	8.48E-03	cm/sec
t_1 =	0	K=	2.40E+01	ft/day
t_2 =	0.4			
h_1/h_0 =	0.30			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
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BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

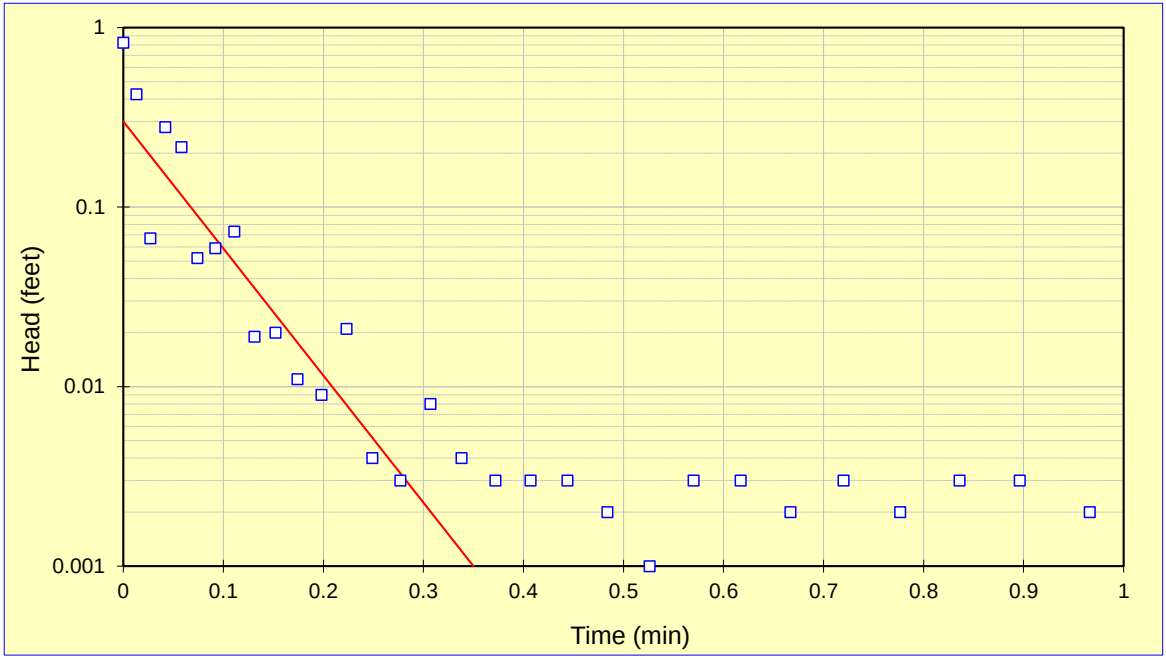
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.22
y_0 =	0.30
y_t =	0.001
t =	0.4

RESULTS

K=	9.27E-03	cm/sec
K=	2.63E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

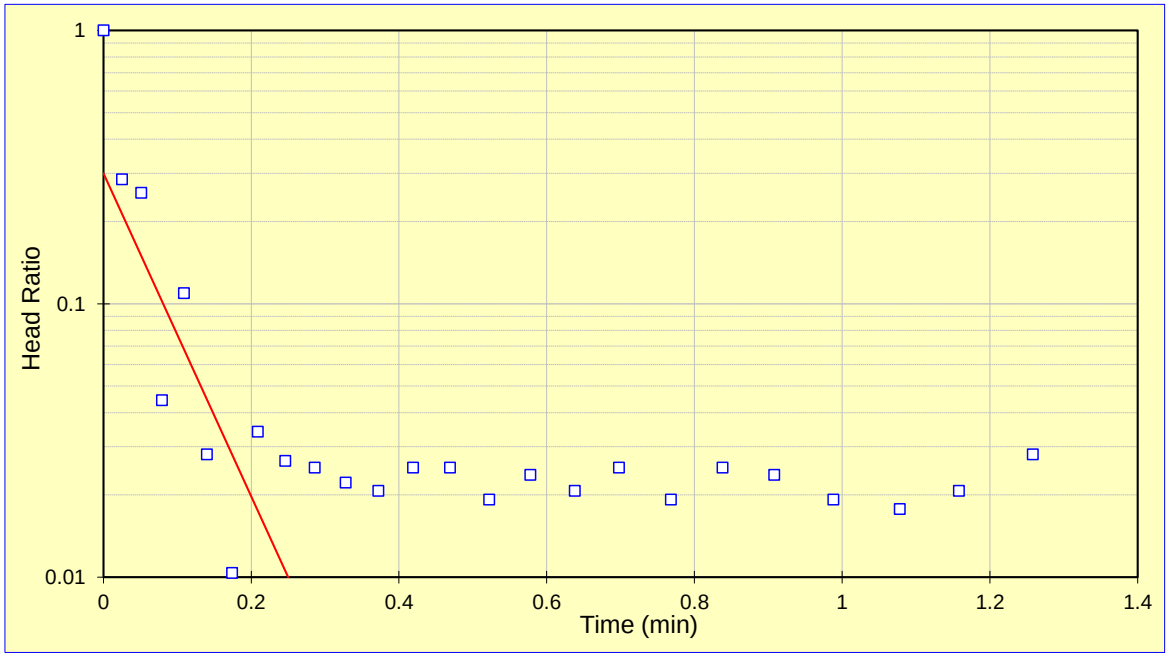
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	8.09E-03	cm/sec
t_1 =	0	K=	2.29E+01	ft/day
t_2 =	0.25			
h_1/h_0 =	0.30			
h_2/h_0 =	0.01			



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Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
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BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

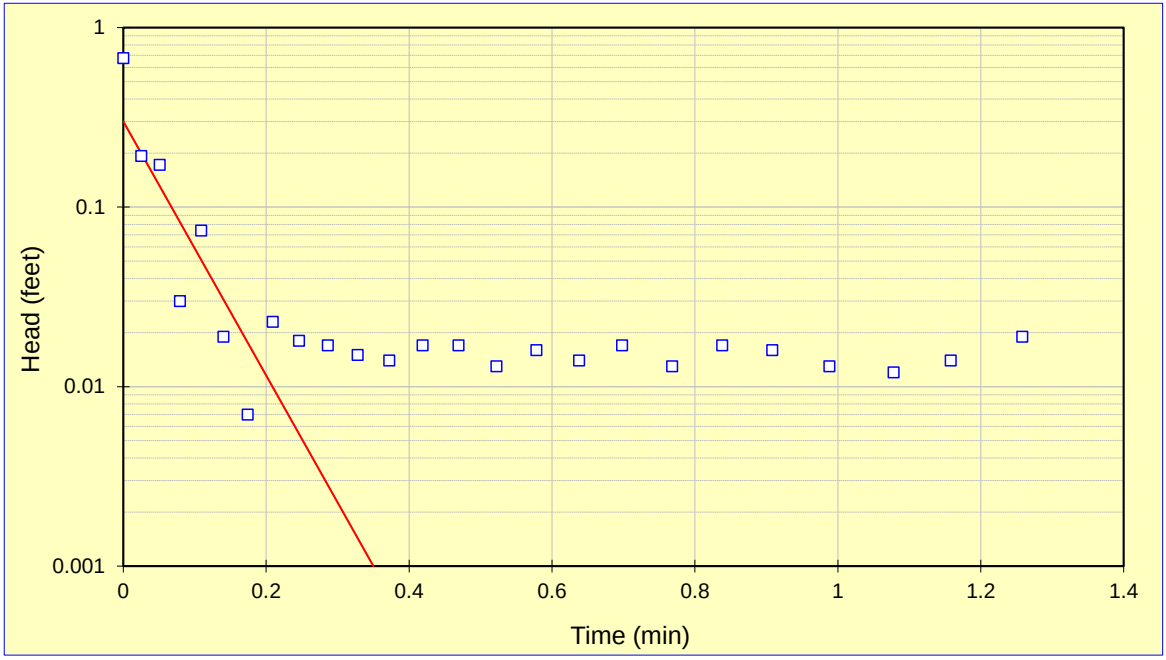
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.22
y_0 =	0.30
y_t =	0.001
t =	0.4

RESULTS

K=	9.27E-03	cm/sec
K=	2.63E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-13B (TEST 1)

$$T = b + a \ln T$$

where:

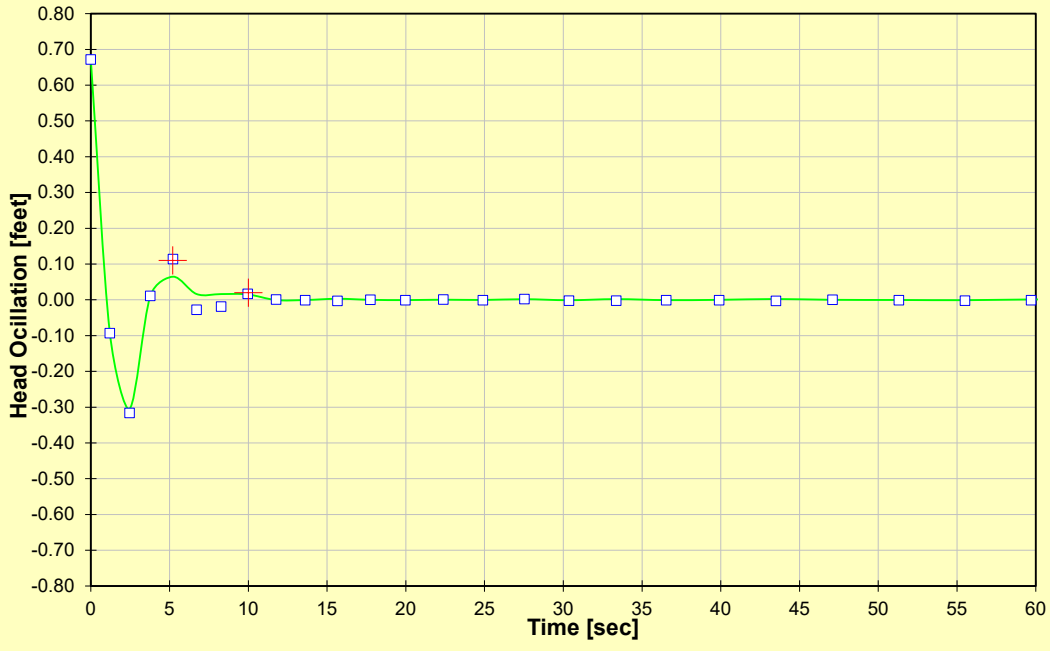
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.35632	ft^2
r_s =	0.08	ft	d =	0.2619	ft^{-1}
L_c =	19.45	ft	a =	0.00450	ft^3
L_s =	9.98	ft	t_1 =	5.20	sec
w =	1.3090	ft^{-1}	t_2 =	10.00	sec
g =	0.3552	ft^{-1}	$h(t_1)$ =	0.11	ft
L =	17.50	ft^3/sec^2	$h(t_2)$ =	0.02	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	4.27E-02	ft^2/sec	$a < 0.1$?	YES
T =	2.64E-02	ft^2/sec	$d < 0.7$?	YES
T =	2.28E+03	ft^2/day	L_1 =	17.50
K =	7.74E+01	ft/day	L_2 =	24.44
K =	2.73E-02	cm/sec	L_1:L_2 Diff <20% ?	NO



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 1)

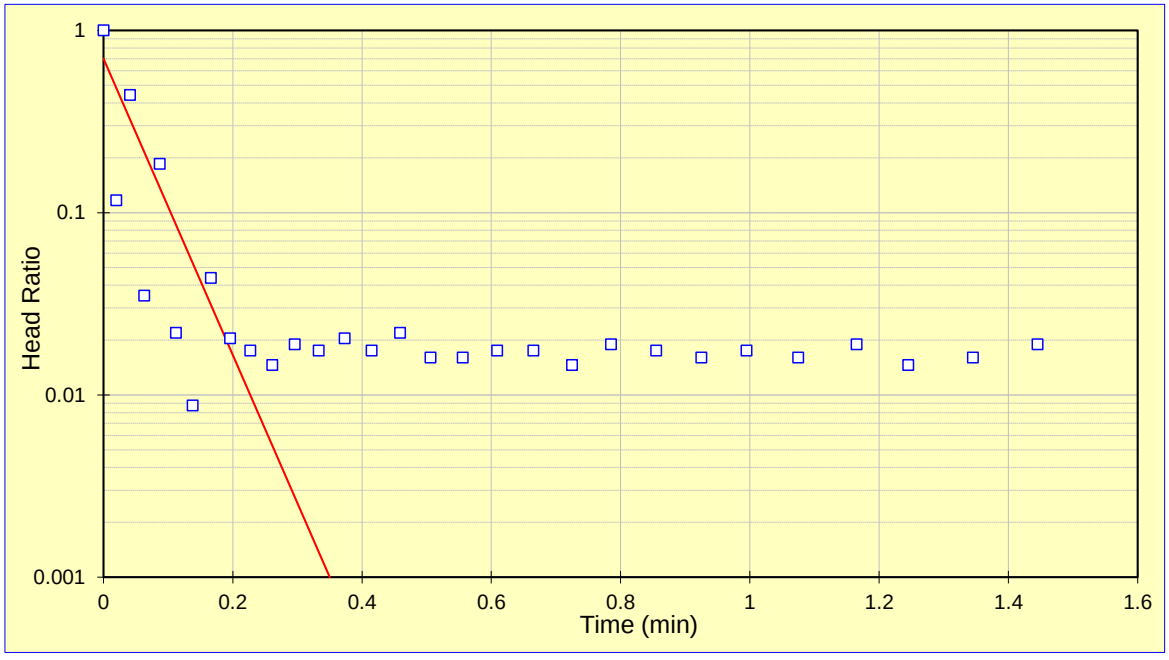
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	10
t_1 =	0
t_2 =	0.35
h_1/h_0 =	0.70
h_2/h_0 =	0.00

RESULTS

K=	1.11E-02	cm/sec
K=	3.15E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

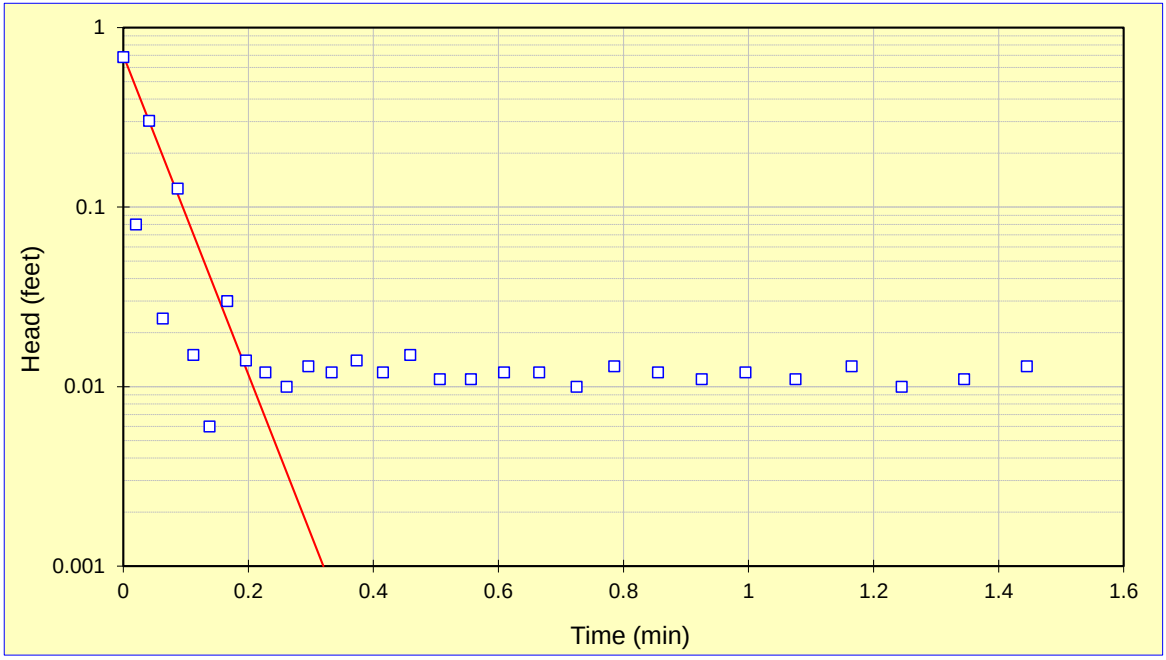
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.22
y_0 =	0.70
y_t =	0.001
t =	0.3

RESULTS

K=	1.16E-02	cm/sec
K=	3.30E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-13B (TEST 2)

$$T = b + a \ln T$$

where:

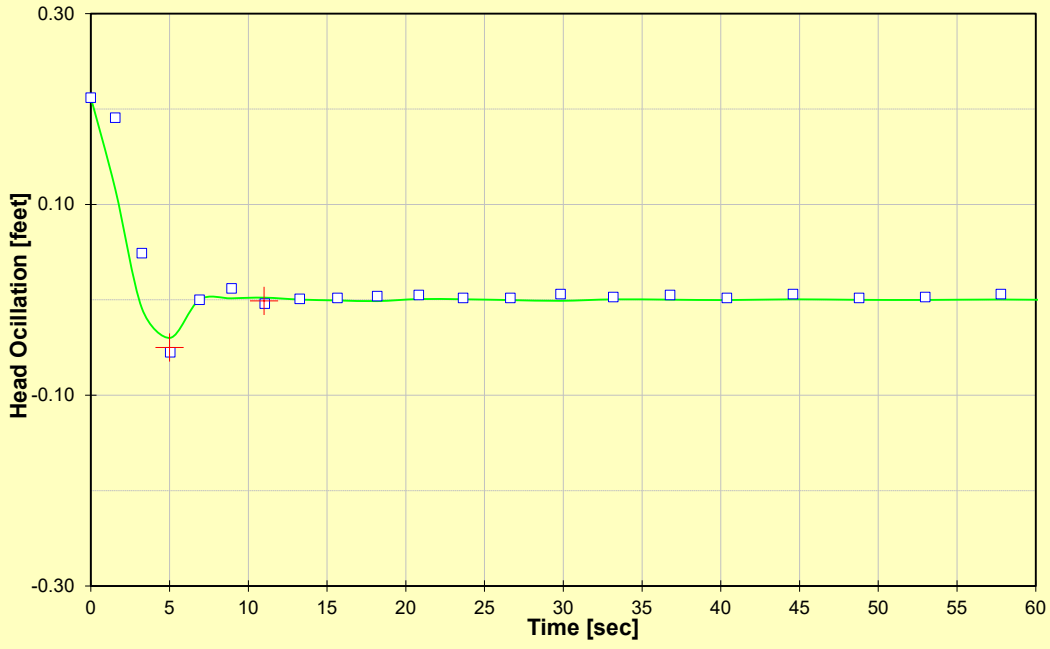
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.23358	ft^2
r_s =	0.08	ft	d =	0.5285	ft^{-1}
L_c =	19.14	ft	a =	0.00203	ft^3
L_s =	9.98	ft	t_1 =	5.00	sec
w =	1.0472	ft^{-1}	t_2 =	11.00	sec
g =	0.6520	ft^{-1}	$h(t_1)$ =	0.05	ft
L =	21.15	ft^3/sec^2	$h(t_2)$ =	0.00	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	1.95E-02	ft^2/sec	a < 0.1?	YES
T =	1.02E-02	ft^2/sec	d < 0.7?	YES
T =	8.77E+02	ft^2/day	L_1 =	21.15
K =	3.01E+01	ft/day	L_2 =	24.13
K =	1.06E-02	cm/sec	L_1:L_2 Diff <20% ?	YES



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

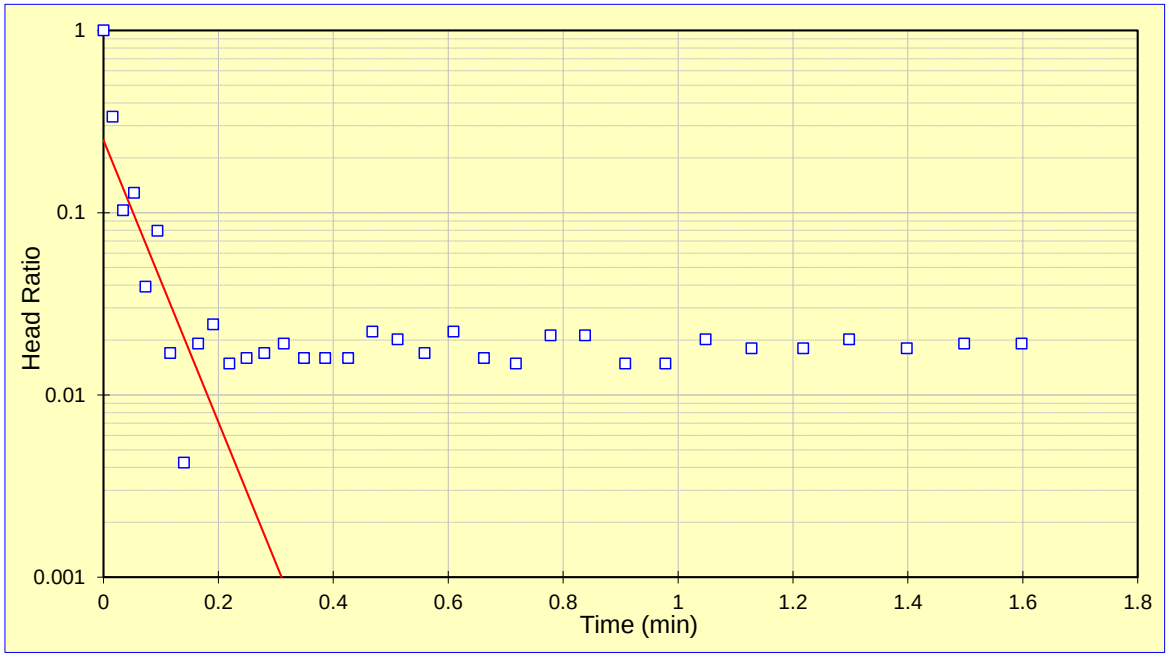
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left| \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right| 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.06E-02	cm/sec
t_1 =	0	K=	3.00E+01	ft/day
t_2 =	0.31			
h_1/h_0 =	0.25			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

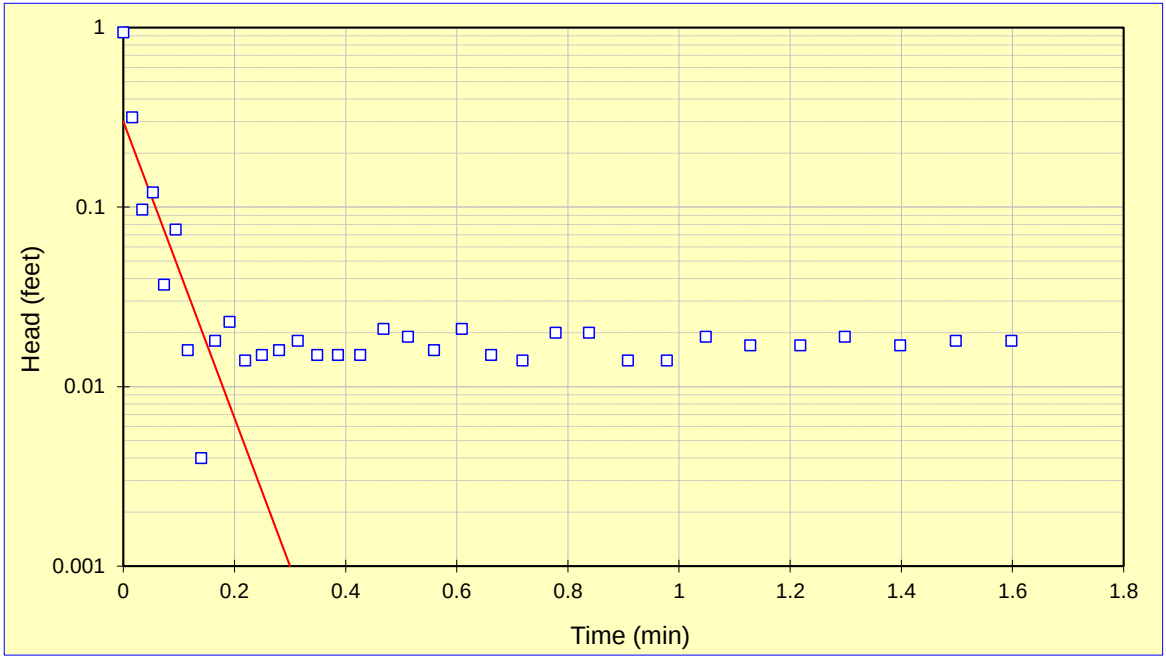
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.22
y_0 =	0.30
y_t =	0.001
t =	0.3

RESULTS

K=	1.08E-02	cm/sec
K=	3.06E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

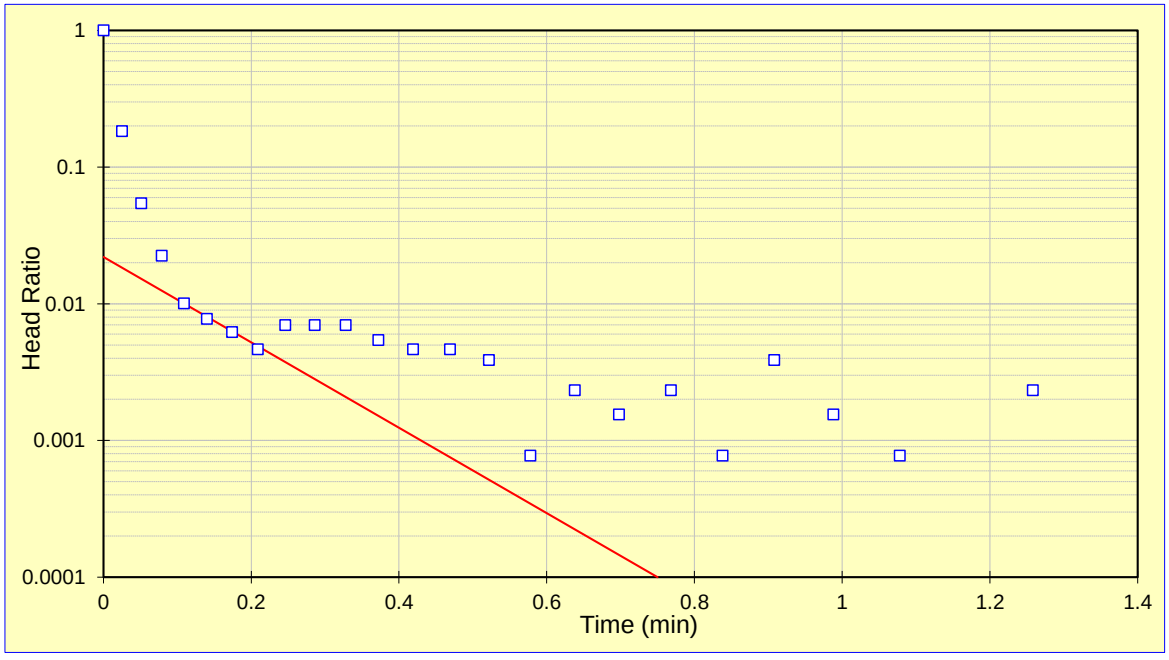
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15 (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
R_e =	0.34			
L_e =	9.417	K=	2.59E-02	cm/sec
t_1 =	0	K=	7.34E+01	ft/day
t_2 =	0.75			
h_1/h_0 =	0.02			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
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Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15 (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

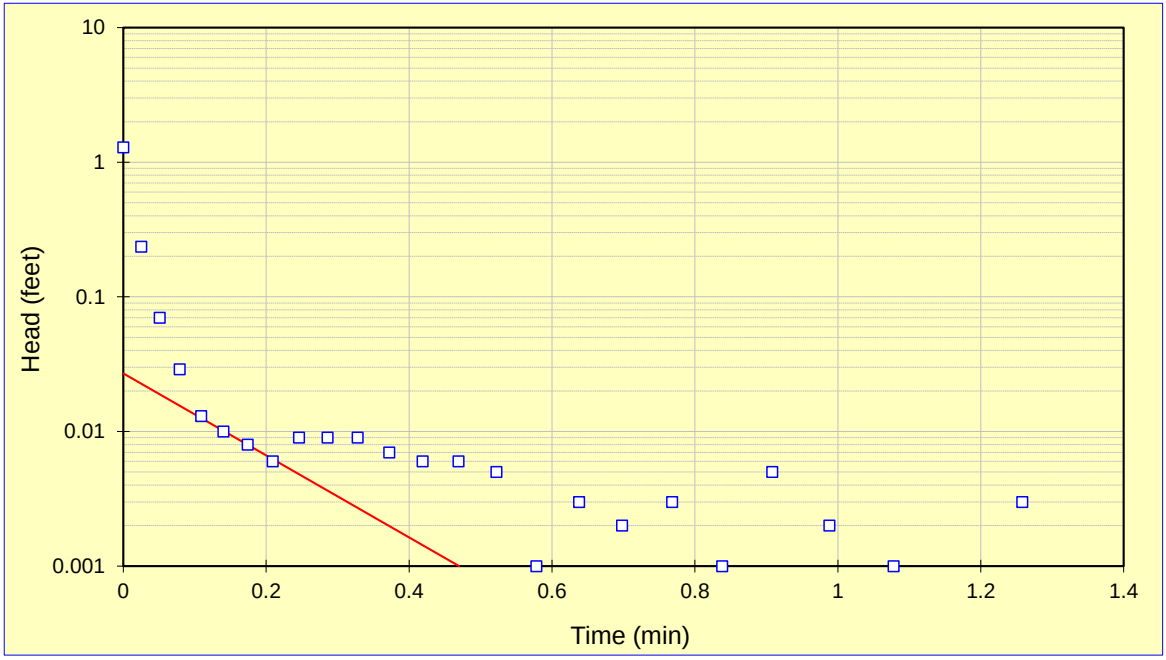
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	9.417
$\ln(R_e/r_w)$=	2.14
y_0 =	0.03
y_t =	0.001
t =	0.5

RESULTS

K=	1.63E-02	cm/sec
K=	4.63E+01	ft/day



Project Name: NIPSCO Schahfer
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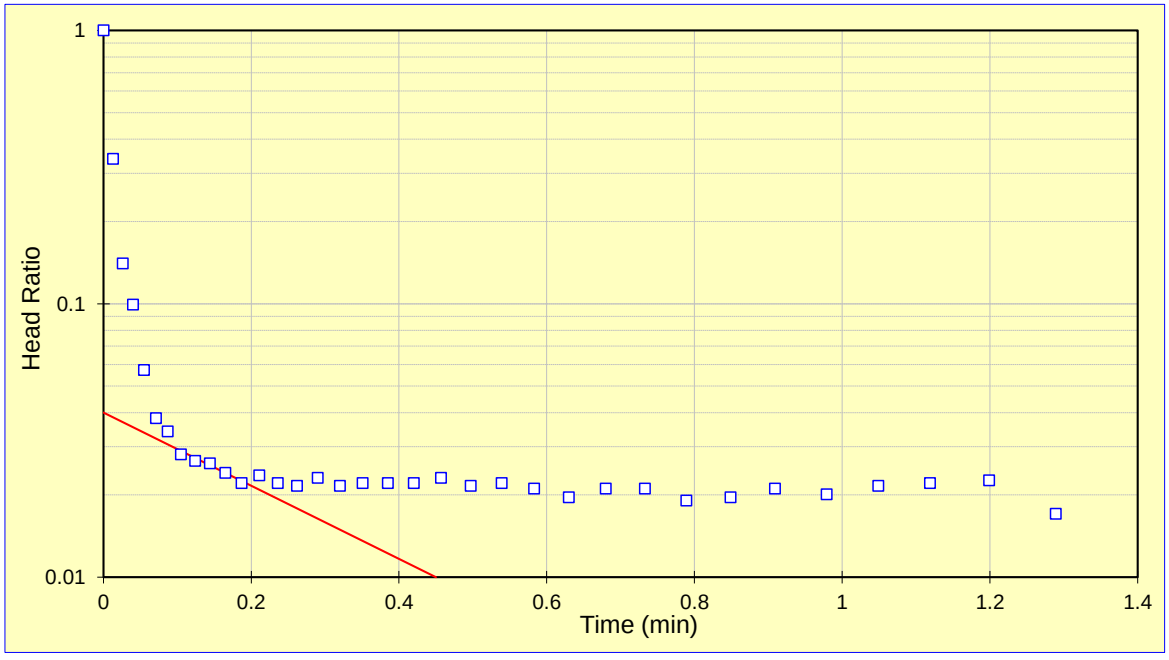
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15 (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
R_e =	0.34			
L_e =	9.348	K=	1.11E-02	cm/sec
t_1 =	0	K=	3.16E+01	ft/day
t_2 =	0.45			
h_1/h_0 =	0.04			
h_2/h_0 =	0.01			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

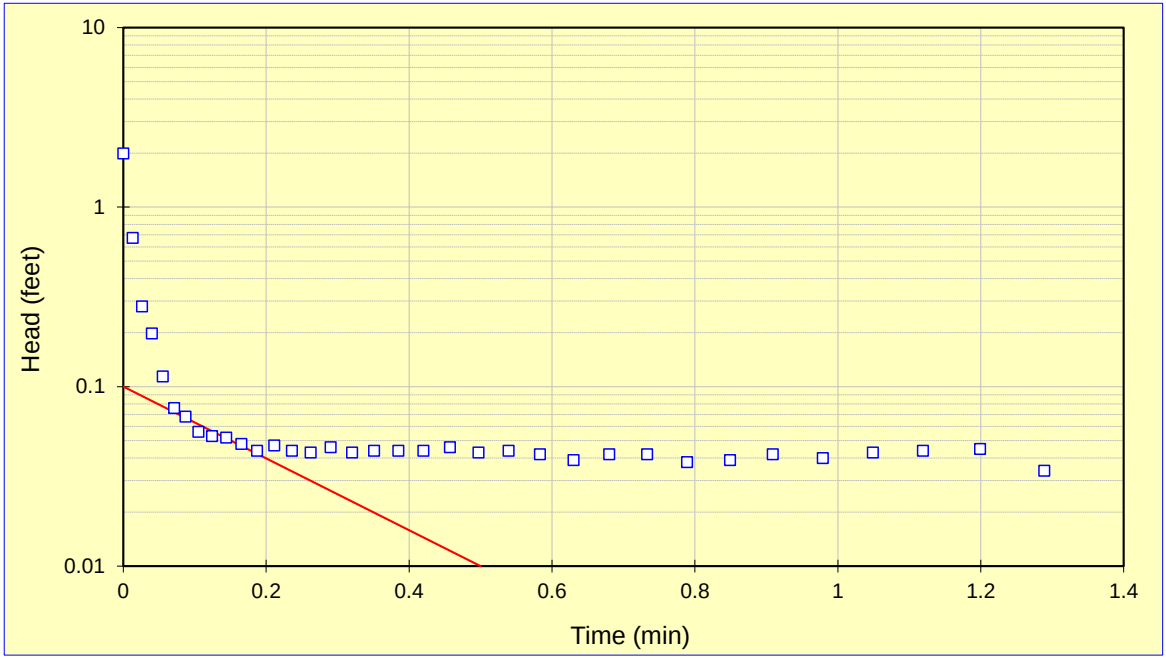
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	9.348
$\ln(R_e/r_w)$=	2.13
y_0 =	0.10
y_t =	0.010
t =	0.5

RESULTS

K=	1.08E-02	cm/sec
K=	3.05E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

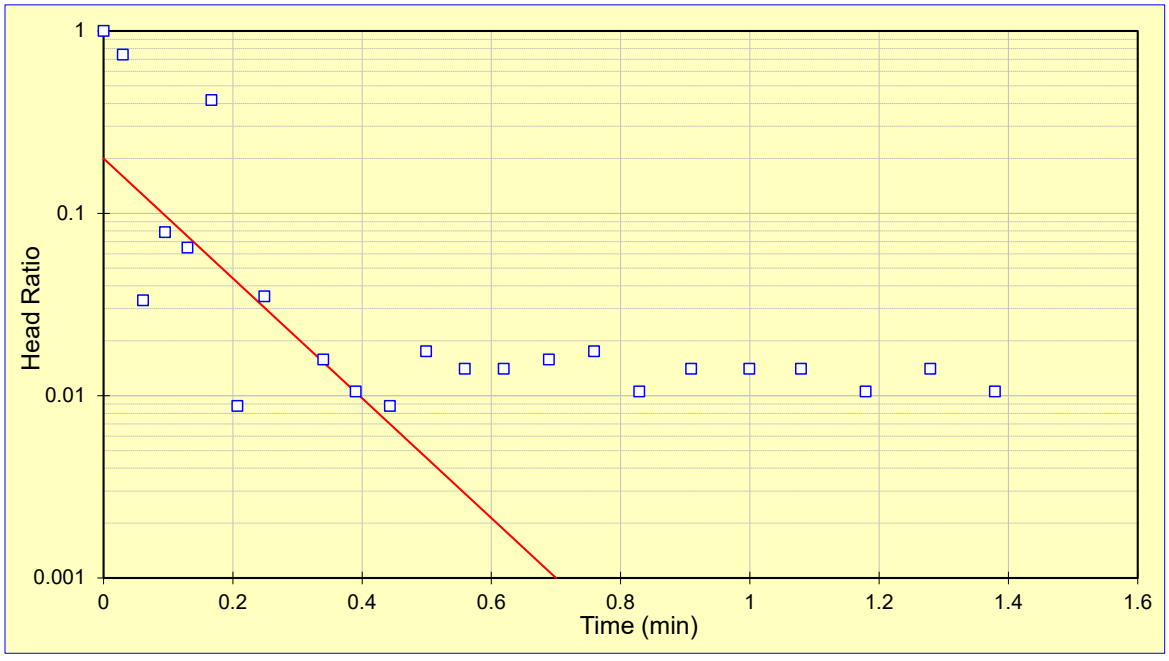
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	4.50E-03	cm/sec
t_1 =	0	K=	1.28E+01	ft/day
t_2 =	0.7			
h_1/h_0 =	0.20			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

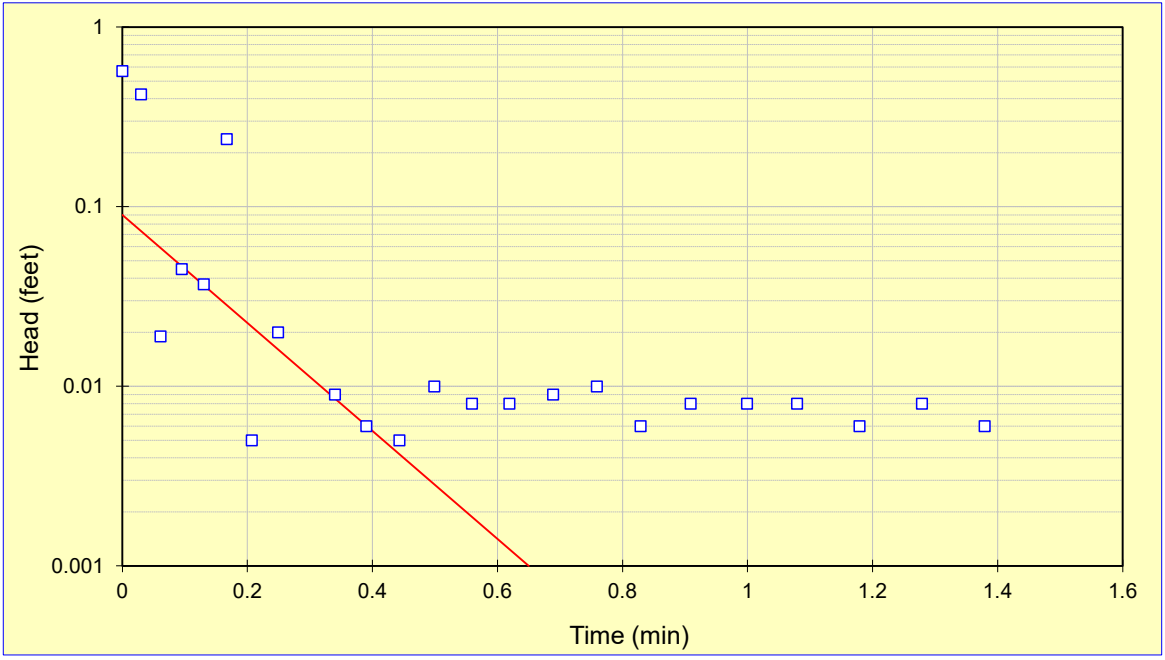
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.83
y_0 =	0.09
y_t =	0.001
t =	0.7

RESULTS

K=	3.45E-03	cm/sec
K=	9.79E+00	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP FALLING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-15B (TEST 2)

$$T = b + a \ln T$$

where:

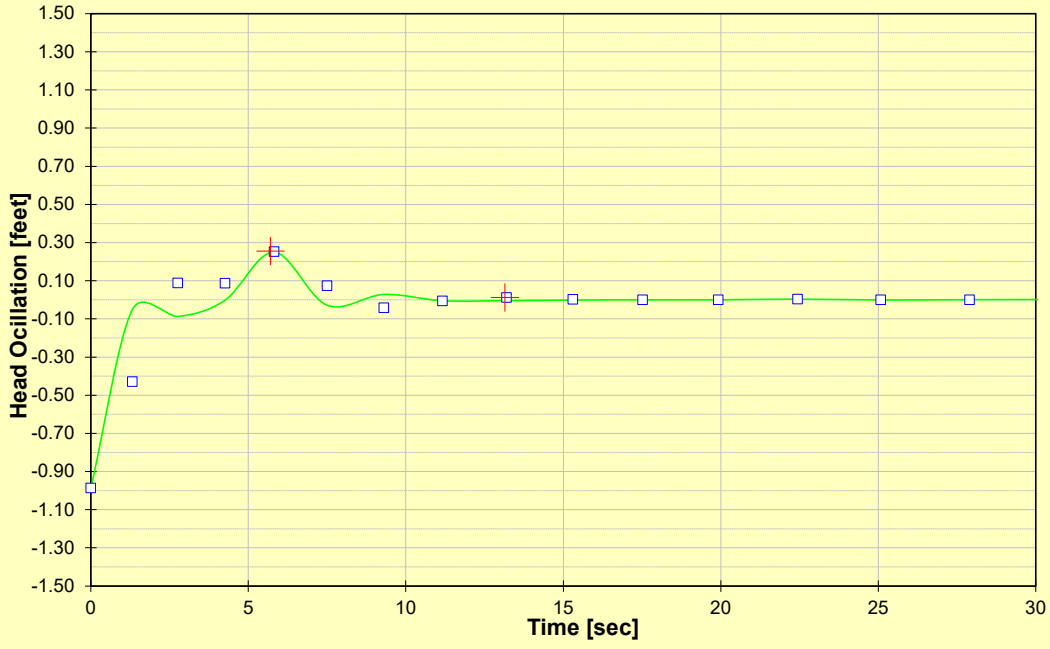
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	0.93787	ft^2
r_s =	0.08	ft	d =	0.4374	ft^{-1}
L_c =	19.23	ft	a =	0.00186	ft^3
L_s =	10.00	ft	t_1 =	5.70	sec
w =	0.8434	ft^{-1}	t_2 =	13.15	sec
g =	0.4102	ft^{-1}	$h(t_1)$ =	0.26	ft
L =	36.60	ft^3/sec^2	$h(t_2)$ =	0.01	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	1.84E-02	ft^2/sec	$a < 0.1$?	YES
T =	9.76E-03	ft^2/sec	$d < 0.7$?	YES
T =	8.44E+02	ft^2/day	L_1 =	36.60
K =	2.70E+01	ft/day	L_2 =	24.23
K =	9.53E-03	cm/sec	L_1:L_2 Diff <20% ?	NO



Project Name: NIPSCO RMSGS
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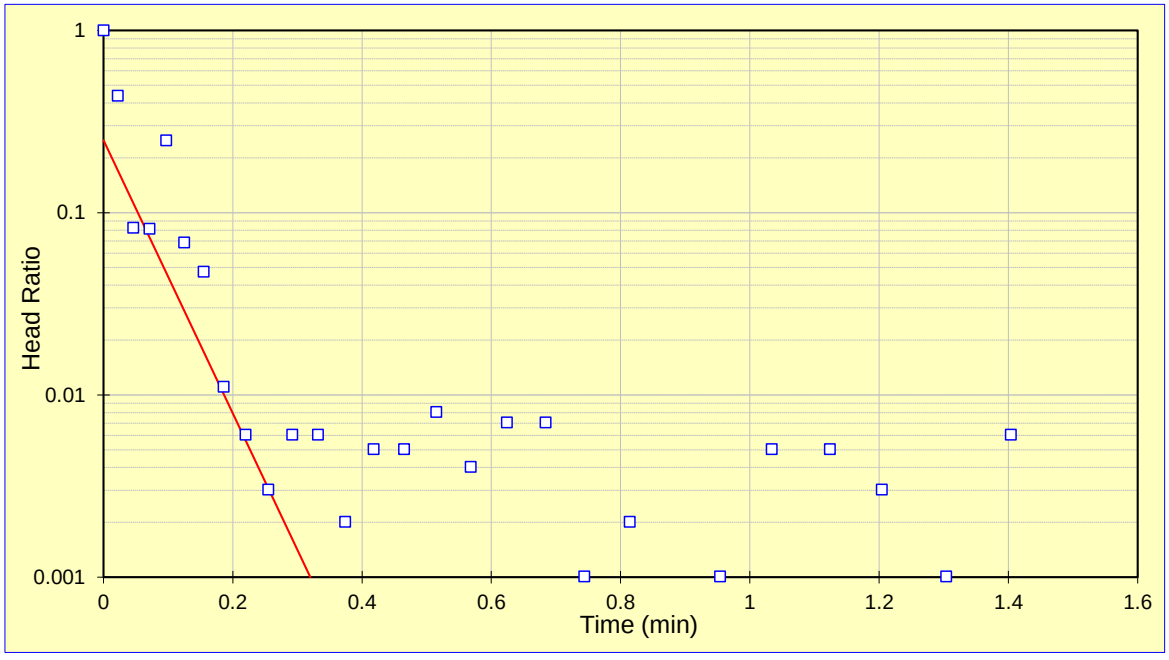
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left|\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right| 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.03E-02	cm/sec
t_1 =	0	K=	2.91E+01	ft/day
t_2 =	0.32			
h_1/h_0 =	0.25			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

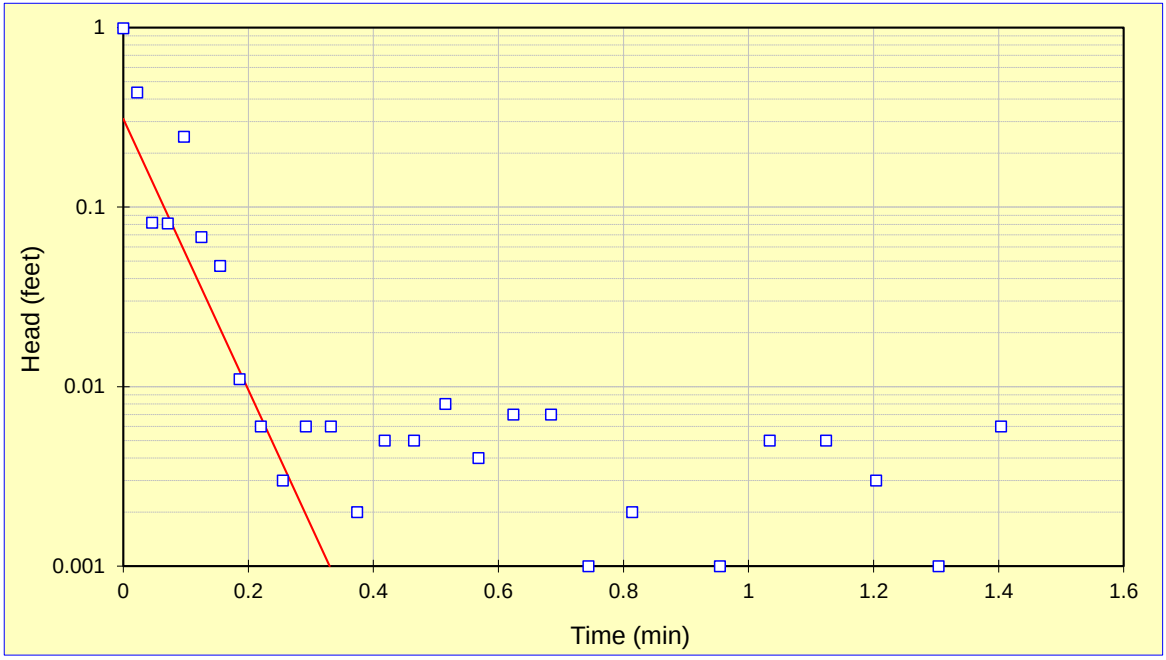
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.85
y_0 =	0.31
y_t =	0.001
t =	0.3

RESULTS

K=	8.75E-03	cm/sec
K=	2.48E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-15B (TEST 1)

$$T = b + a \ln T$$

where:

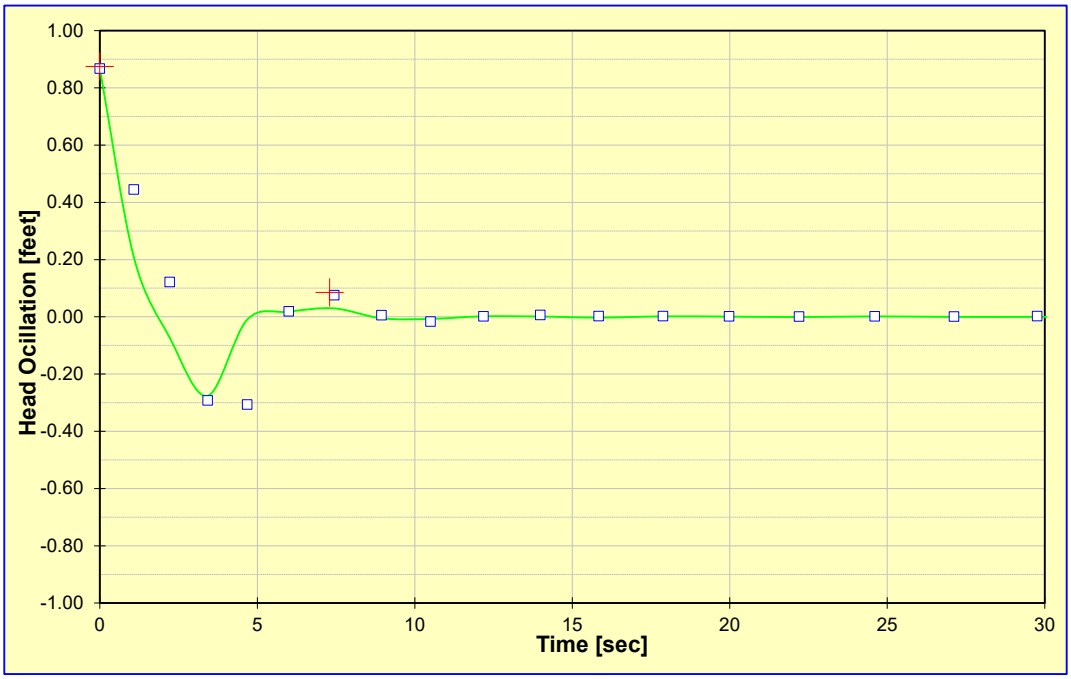
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	0.91806	ft^2
r_s =	0.08	ft	d =	0.3479	ft^{-1}
L_c =	19.23	ft	a =	0.00229	ft^3
L_s =	10.00	ft	t_1 =	0.00	sec
w =	0.8607	ft^{-1}	t_2 =	7.30	sec
g =	0.3194	ft^{-1}	$h(t_1)$ =	0.88	ft
L =	38.19	ft^3/sec^2	$h(t_2)$ =	0.09	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	2.27E-02	ft^2/sec	$a < 0.1$?	YES
T =	1.27E-02	ft^2/sec	$d < 0.7$?	YES
T =	1.09E+03	ft^2/day	L_1 =	38.19
K =	3.50E+01	ft/day	L_2 =	24.23
K =	1.24E-02	cm/sec	L_1:L_2 Diff <20% ?	NO



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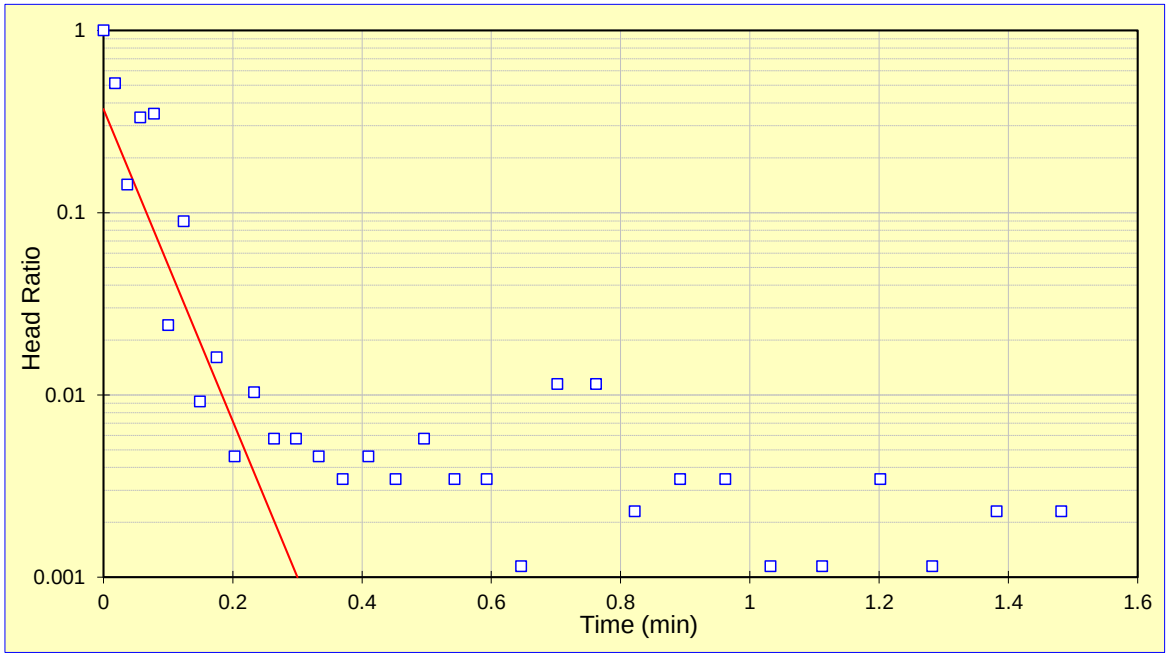
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.17E-02	cm/sec
t_1 =	0	K=	3.32E+01	ft/day
t_2 =	0.3			
h_1/h_0 =	0.37			
h_2/h_0 =	0.00			



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Checked By: JRS
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BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

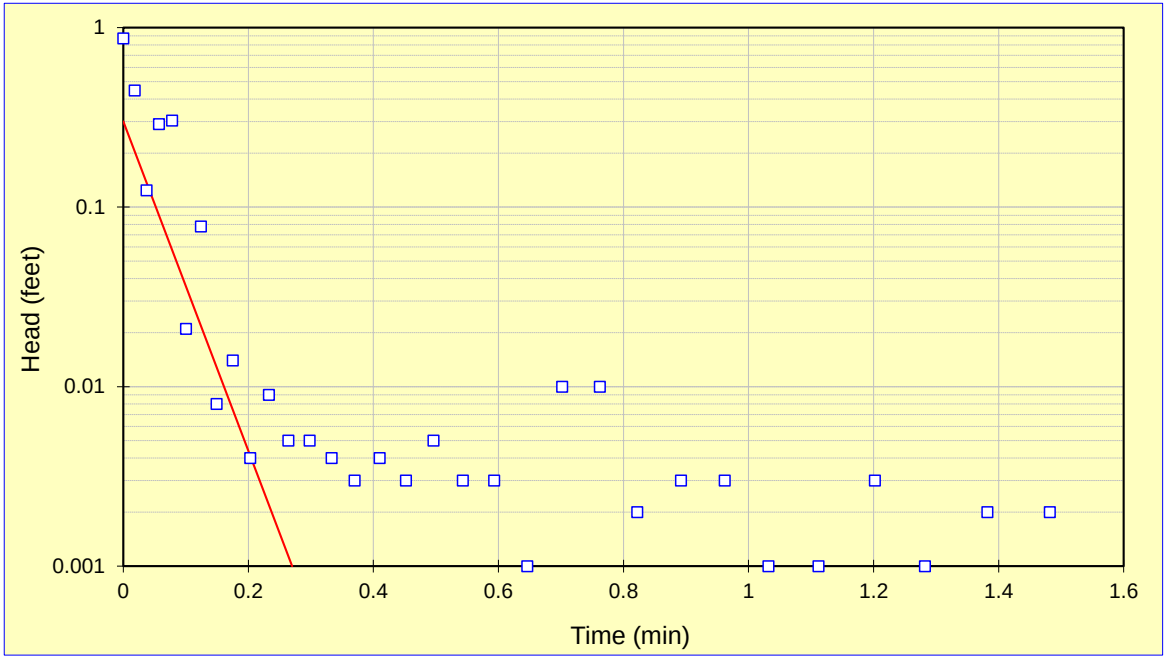
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.85
y_0 =	0.30
y_t =	0.001
t =	0.3

RESULTS

K=	1.06E-02	cm/sec
K=	3.02E+01	ft/day



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Analysis By: DFS
Checked By: JRS
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van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-15B (TEST 2)

$$T = b + a \ln T$$

where:

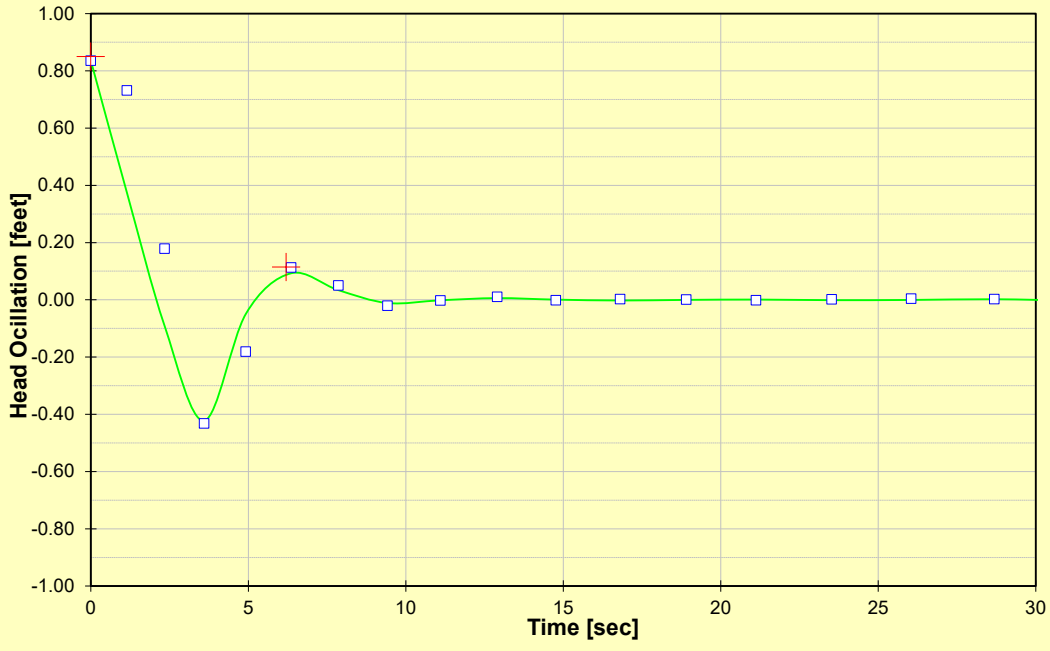
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.06353	ft^2
r_s =	0.08	ft	d =	0.3034	ft^{-1}
L_c =	19.22	ft	a =	0.00304	ft^3
L_s =	10.00	ft	t_1 =	0.00	sec
w =	1.0134	ft^{-1}	t_2 =	6.20	sec
g =	0.3226	ft^{-1}	$h(t_1)$ =	0.85	ft
L =	28.46	ft^3/sec^2	$h(t_2)$ =	0.12	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	2.97E-02	ft^2/sec	$a < 0.1$?	YES
T =	1.73E-02	ft^2/sec	$d < 0.7$?	YES
T =	1.50E+03	ft^2/day	L_1 =	28.46
K =	4.80E+01	ft/day	L_2 =	24.22
K =	1.69E-02	cm/sec	L_1:L_2 Diff <20% ?	YES



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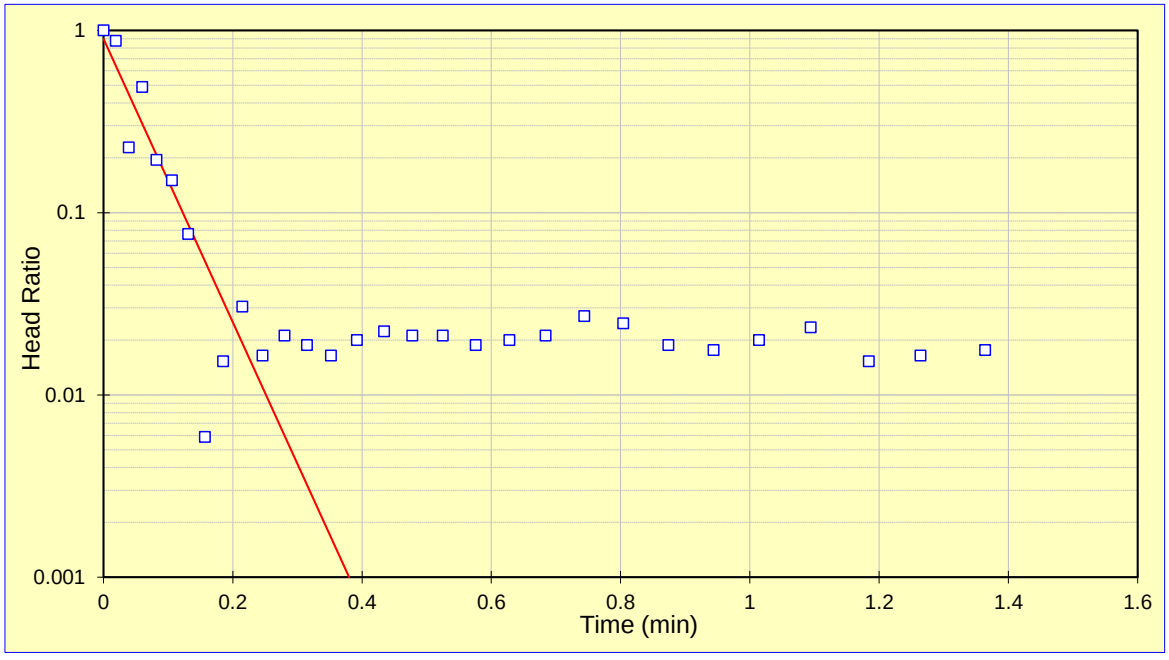
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.06E-02	cm/sec
t_1 =	0	K=	3.02E+01	ft/day
t_2 =	0.38			
h_1/h_0 =	0.90			
h_2/h_0 =	0.00			



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Checked By: JRS
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BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

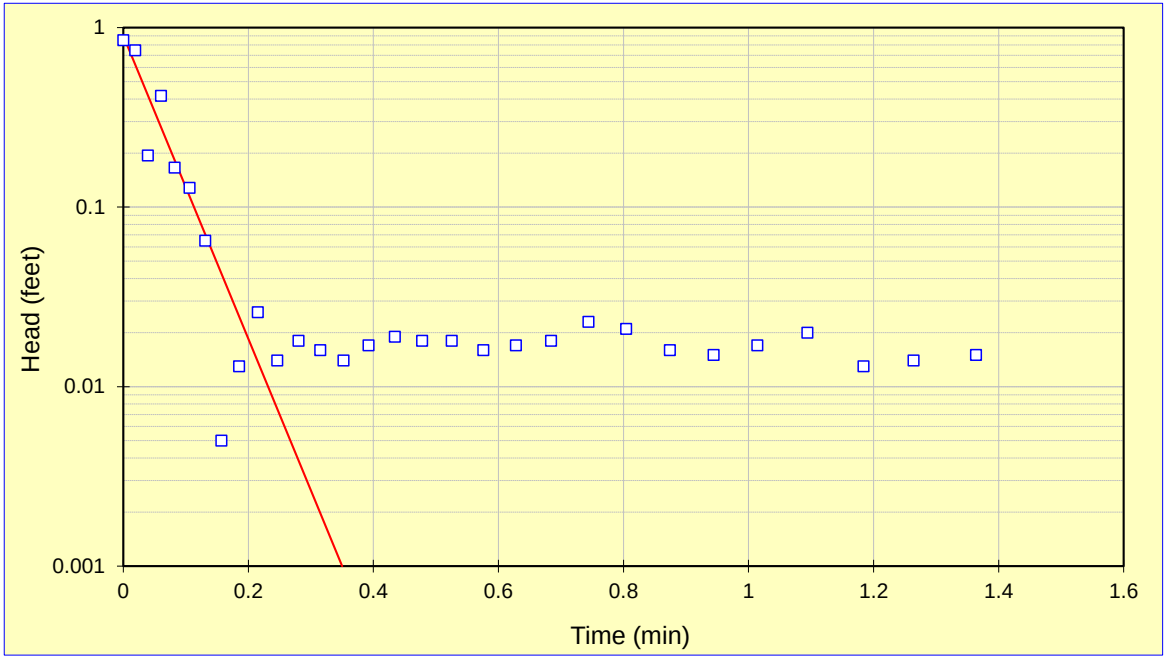
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.85
y_0 =	0.90
y_t =	0.001
t =	0.4

RESULTS

K=	9.79E-03	cm/sec
K=	2.77E+01	ft/day



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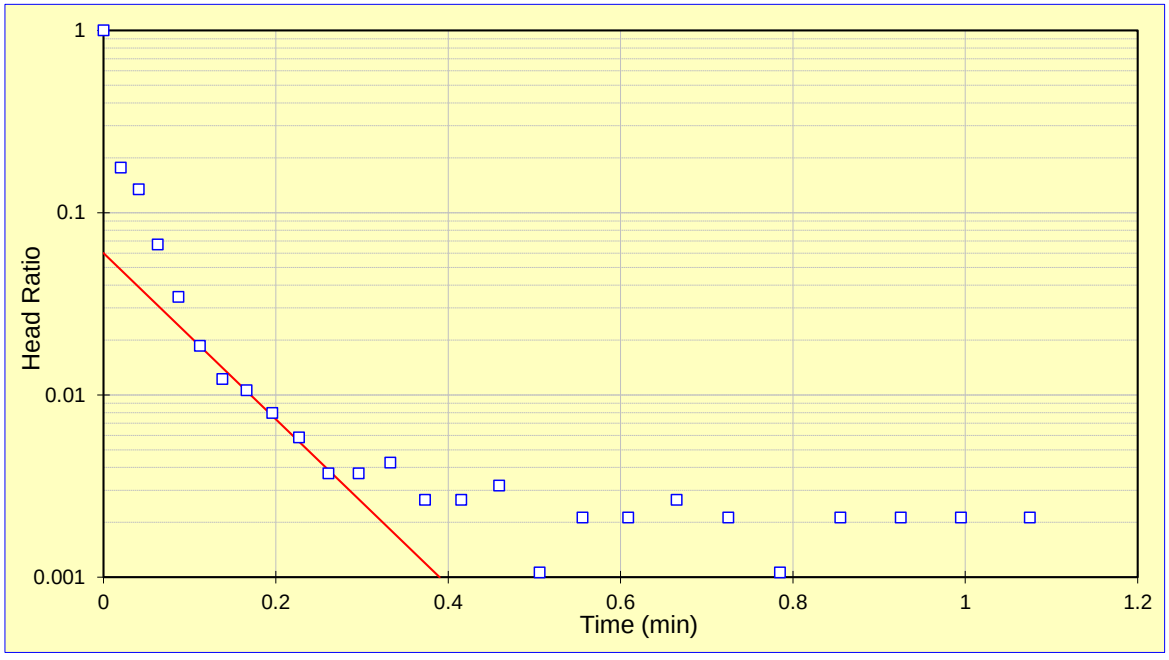
Analysis By: DFS
Checked By: JRS
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HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19 (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left|\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right| 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
R_e =	0.34			
L_e =	9.705	K=	3.70E-02	cm/sec
t_1 =	0	K=	1.05E+02	ft/day
t_2 =	0.39			
h_1/h_0 =	0.06			
h_2/h_0 =	0.00			



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BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19 (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

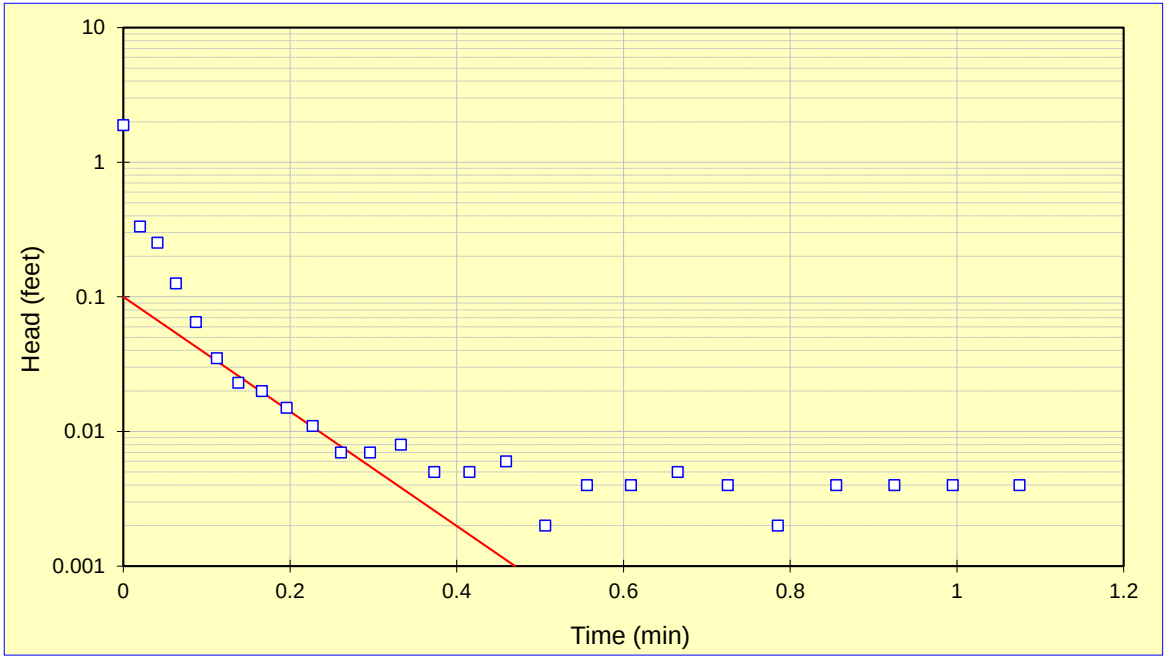
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	9.705
$\ln(R_e/r_w)$=	2.18
y_0 =	0.10
y_t =	0.001
t =	0.5

RESULTS

K=	2.25E-02	cm/sec
K=	6.38E+01	ft/day



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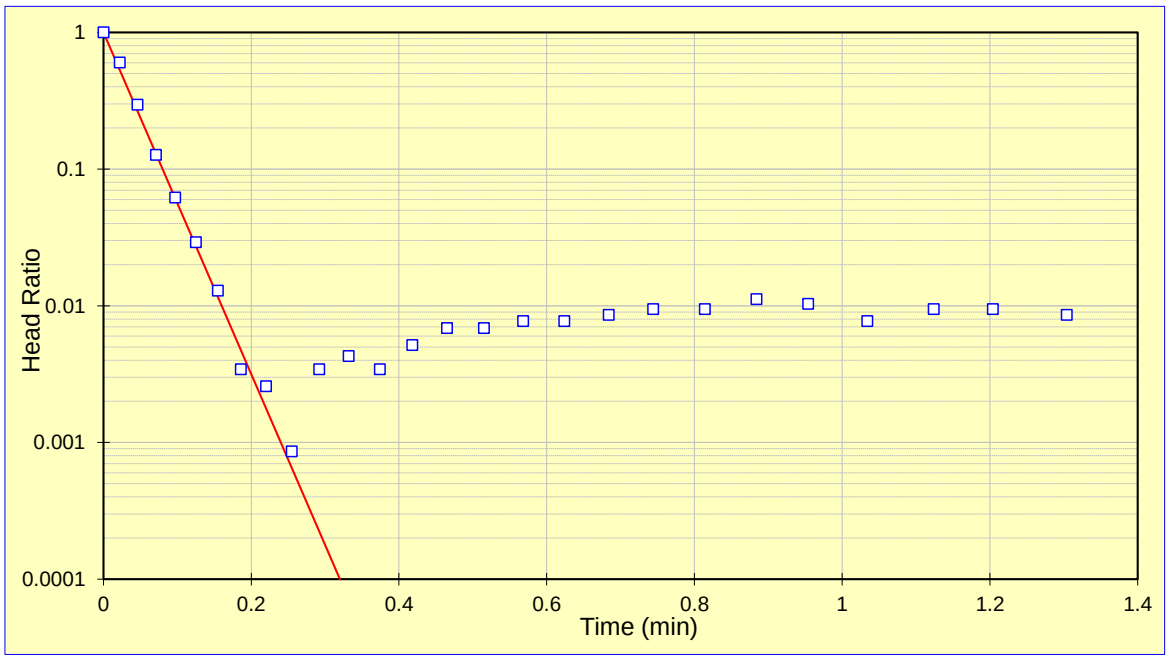
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19 (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
R_e =	0.34			
L_e =	9.735	K=	1.01E-01	cm/sec
t_1 =	0	K=	2.87E+02	ft/day
t_2 =	0.32			
h_1/h_0 =	1.00			
h_2/h_0 =	0.00			



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BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

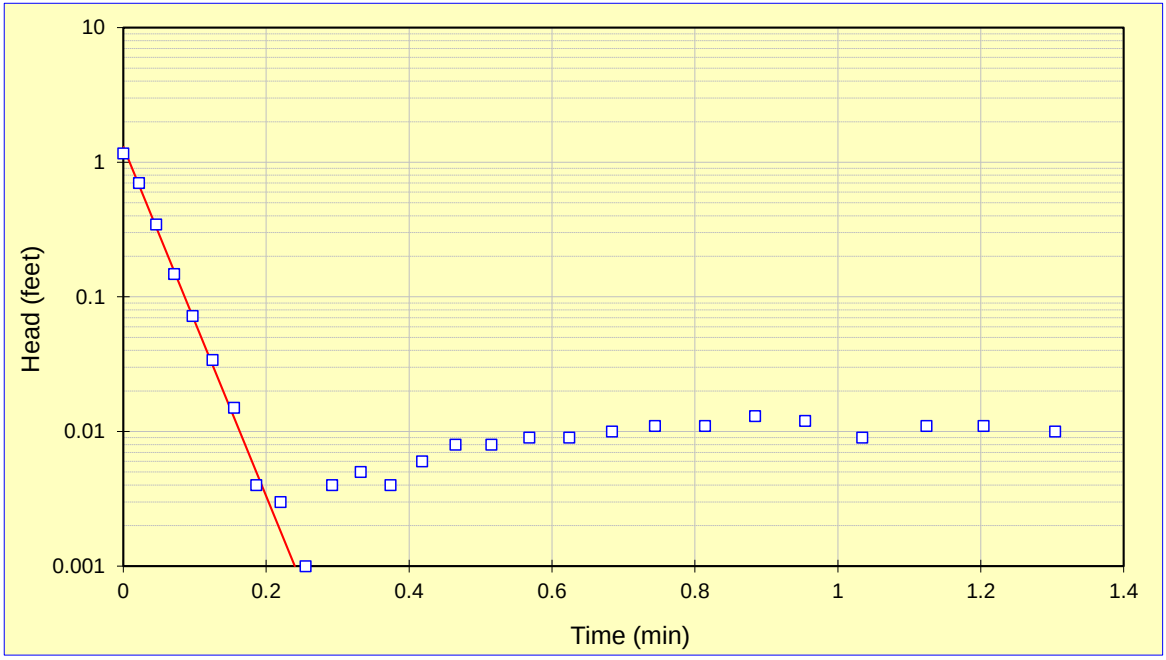
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	9.735
$\ln(R_e/r_w)$=	2.18
y_0 =	1.30
y_t =	0.001
t =	0.2

RESULTS

K=	6.85E-02	cm/sec
K=	1.94E+02	ft/day



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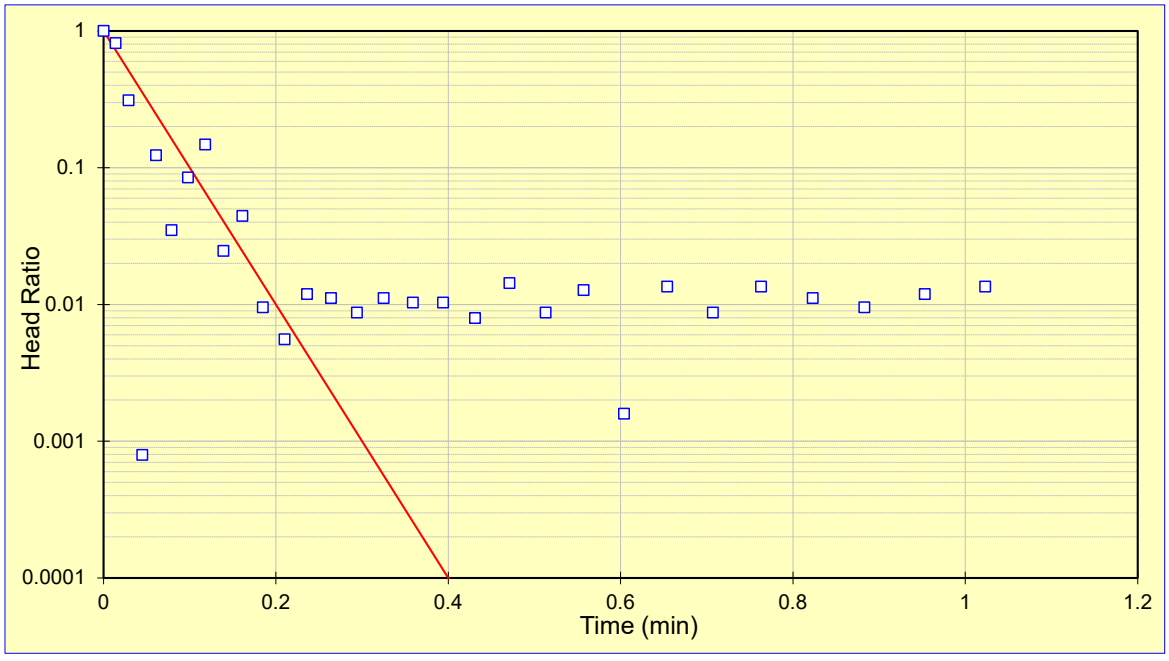
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-19B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.37E-02	cm/sec
t_1 =	0	K=	3.88E+01	ft/day
t_2 =	0.4			
h_1/h_0 =	1.00			
h_2/h_0 =	0.00			



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Analysis By: DFS
Checked By: JRS
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BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-19B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

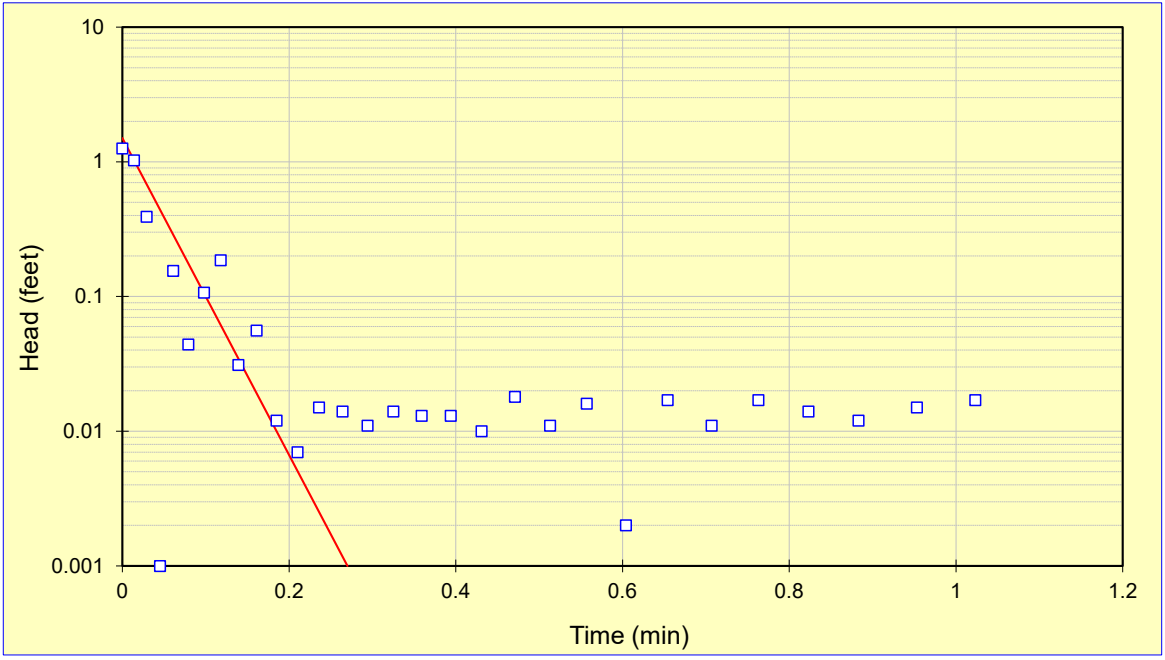
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.02
y_0 =	1.50
y_t =	0.001
t =	0.3

RESULTS

K=	1.44E-02	cm/sec
K=	4.09E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

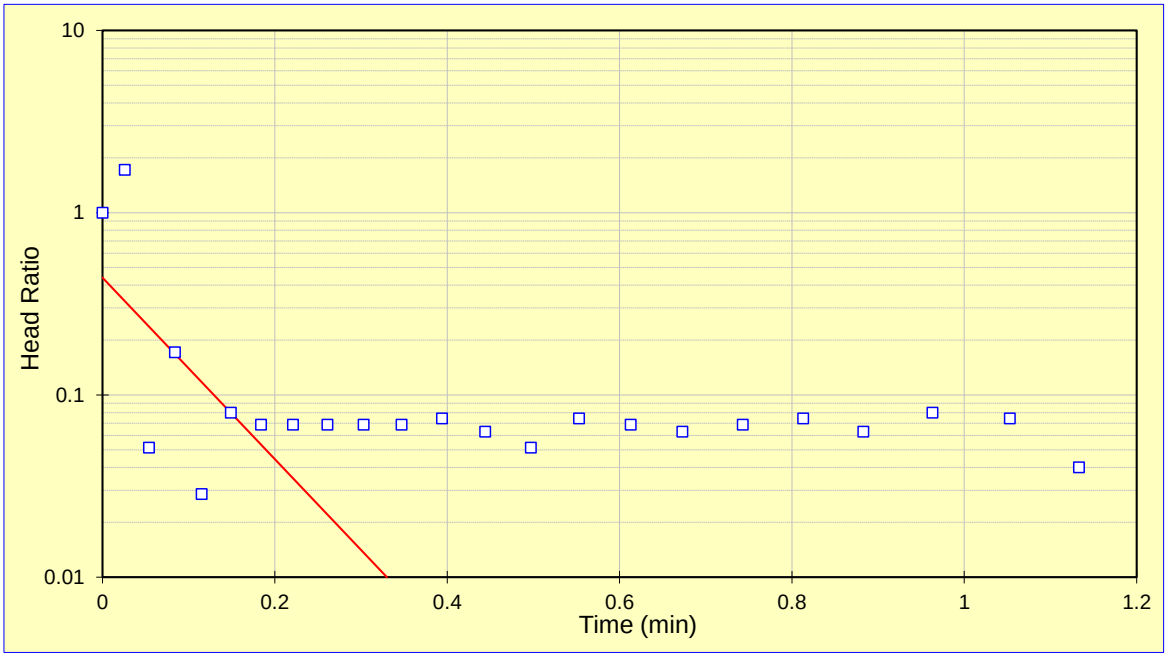
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-19B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	6.82E-03	cm/sec
t_1 =	0	K=	1.93E+01	ft/day
t_2 =	0.33			
h_1/h_0 =	0.44			
h_2/h_0 =	0.01			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-19B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

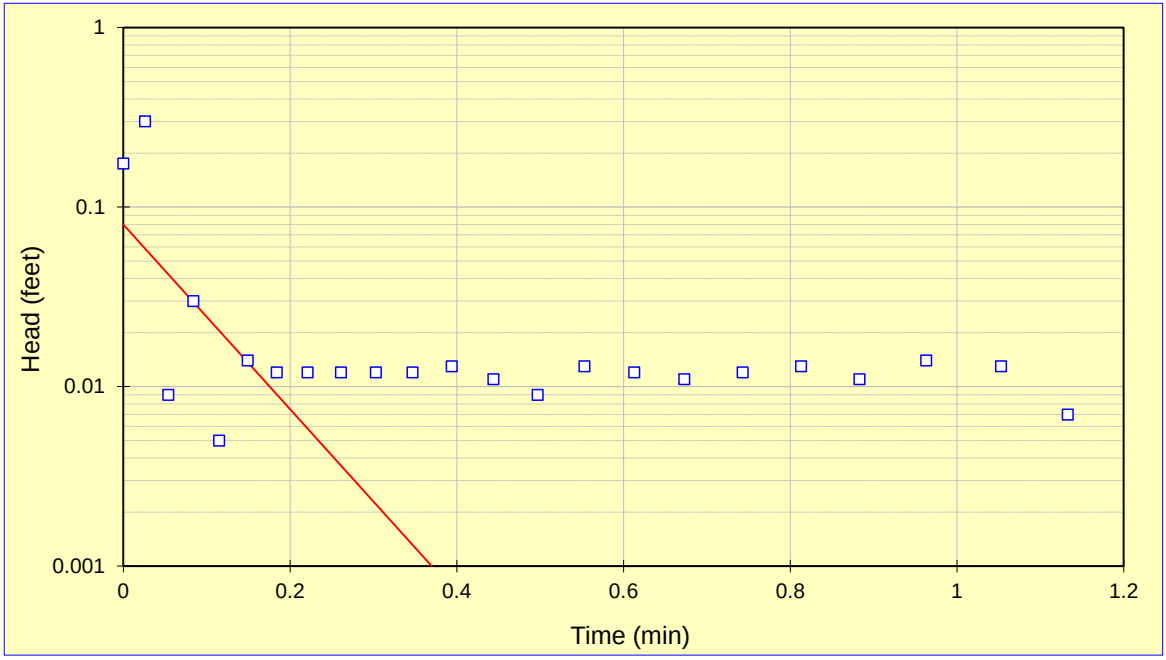
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.02
y_0 =	0.08
y_t =	0.001
t =	0.4

RESULTS

K=	6.31E-03	cm/sec
K=	1.79E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS

UNDERDAMPED SLUG TEST GAMW-19B (TEST 1)

$$T = b + a \ln T$$

where:

$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$

$$a = r_c^2 \left(g / L^{1/2}\right) / 8d$$

$$d = \gamma / (g/L)^{1/2}$$

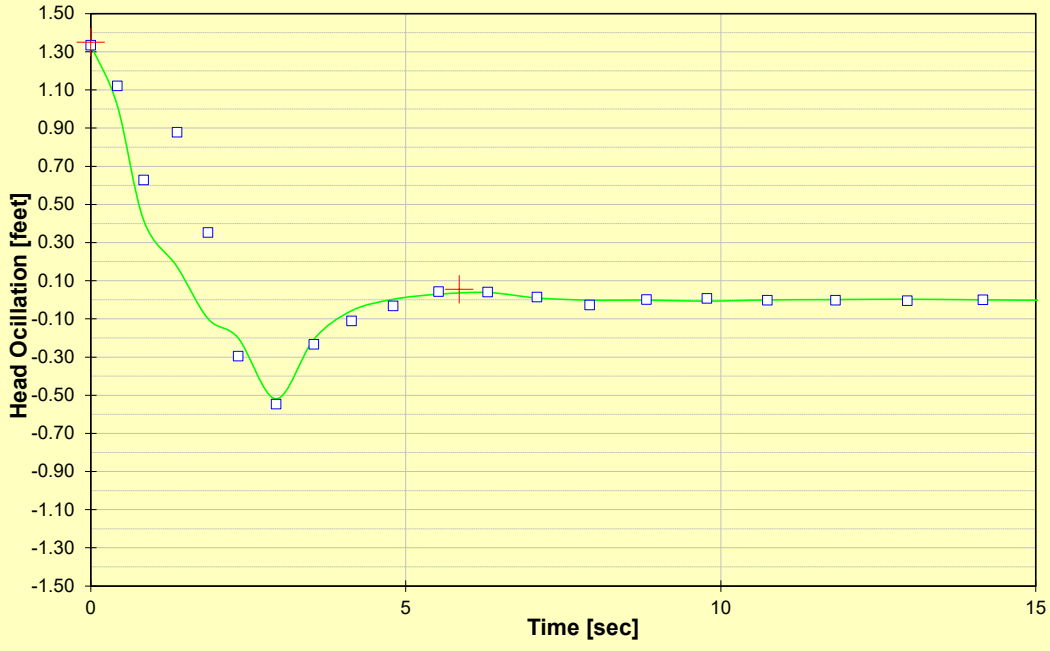
$$L = g / \left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.20536	ft^2
r_s =	0.08	ft	d =	0.4539	ft^{-1}
L_c =	17.92	ft	a =	0.00231	ft^3
L_s =	10.00	ft	t_1 =	0.00	sec
w =	1.0740	ft^{-1}	t_2 =	5.85	sec
g =	0.5471	ft^{-1}	$h(t_1)$ =	1.35	ft
L =	22.16	ft^3/sec^2	$h(t_2)$ =	0.06	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	2.22E-02	ft^2/sec	$a < 0.1$?	YES
T =	1.20E-02	ft^2/sec	$d < 0.7$?	YES
T =	1.04E+03	ft^2/day	L_1 =	22.16
K =	3.67E+01	ft/day	L_2 =	22.92
K =	1.29E-02	cm/sec	L_1:L_2 Diff <20% ?	YES



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19B (TEST 1)

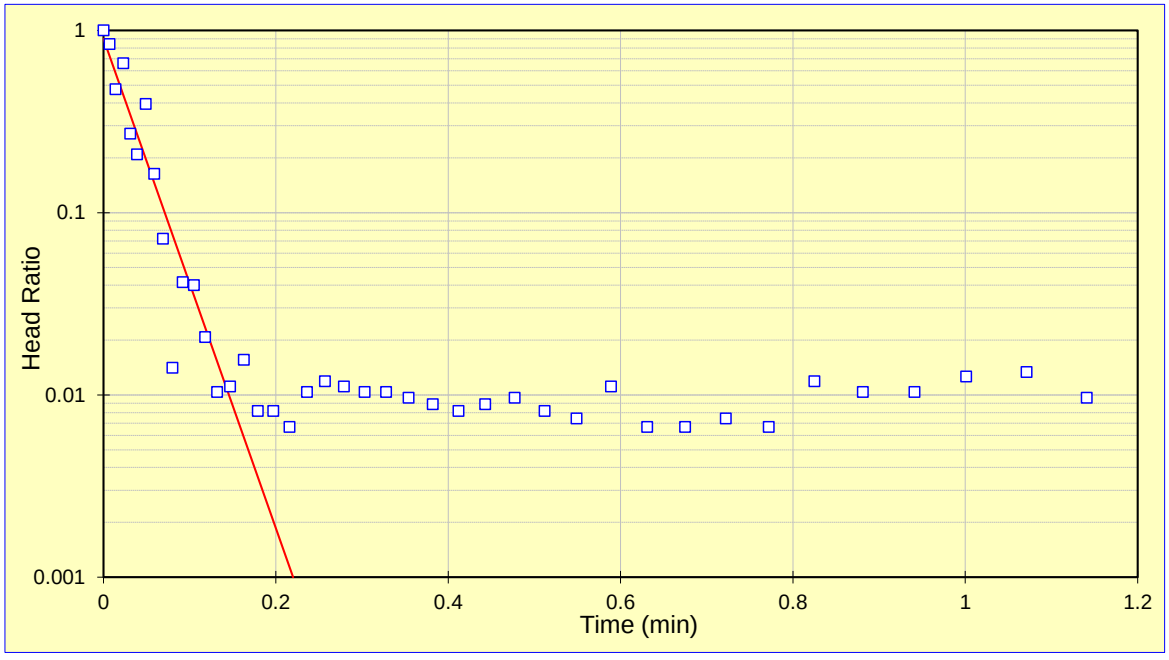
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	10
t_1 =	0
t_2 =	0.22
h_1/h_0 =	0.90
h_2/h_0 =	0.00

RESULTS

K=	1.84E-02	cm/sec
K=	5.21E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

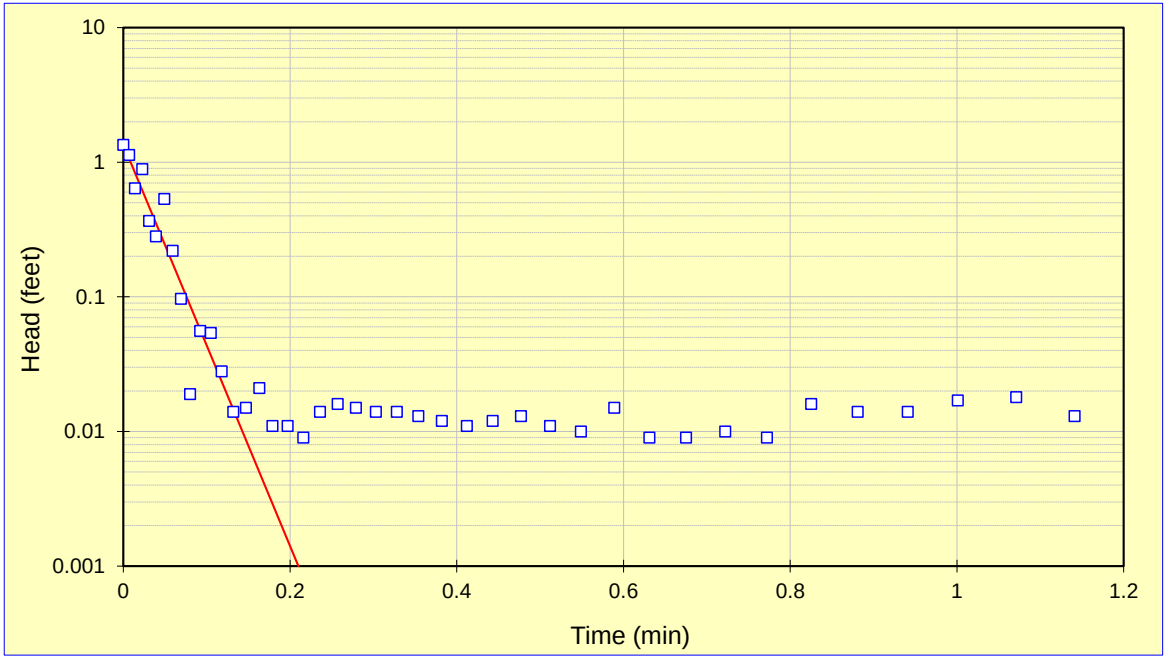
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.02
y_0 =	1.35
y_t =	0.001
t =	0.2

RESULTS

K=	1.83E-02	cm/sec
K=	5.18E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-19B (TEST 2)

$$T = b + a \ln T$$

where:

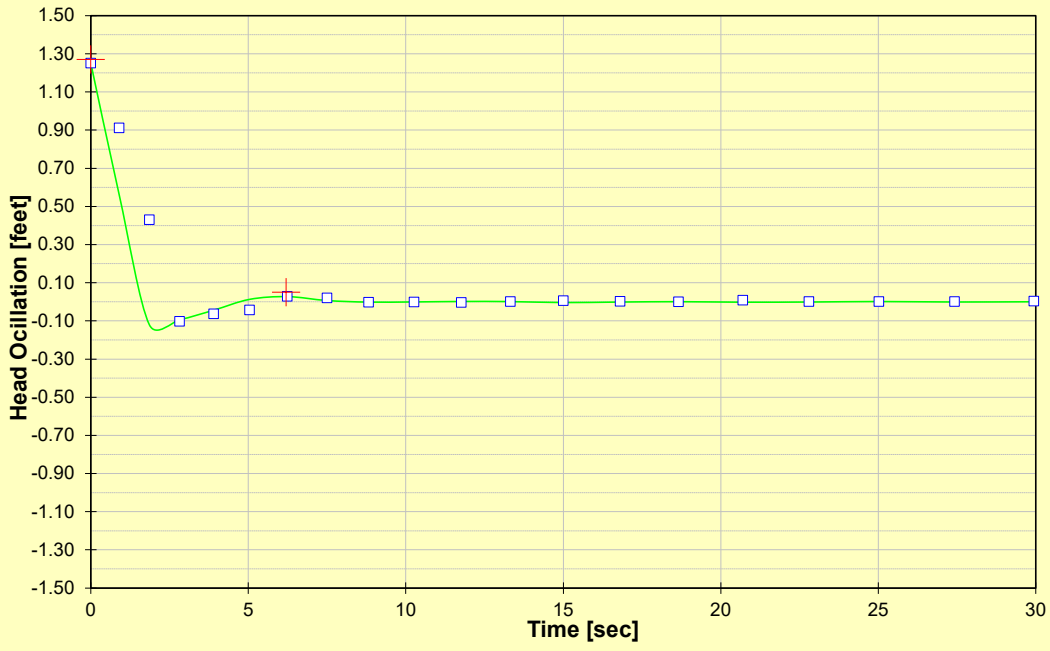
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.13983	ft^2
r_s =	0.08	ft	d =	0.4577	ft^{-1}
L_c =	17.95	ft	a =	0.00216	ft^3
L_s =	10.00	ft	t_1 =	0.00	sec
w =	1.0134	ft^{-1}	t_2 =	6.20	sec
g =	0.5217	ft^{-1}	$h(t_1)$ =	1.27	ft
L =	24.78	ft^3/sec^2	$h(t_2)$ =	0.05	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	2.09E-02 ft^2/sec	$a < 0.1$?	YES
T =	1.12E-02 ft^2/sec	$d < 0.7$?	YES
T =	9.69E+02 ft^2/day	L_1 =	24.78
K =	3.43E+01 ft/day	L_2 =	22.95
K =	1.21E-02 cm/sec	L_1:L_2 Diff <20% ?	YES



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

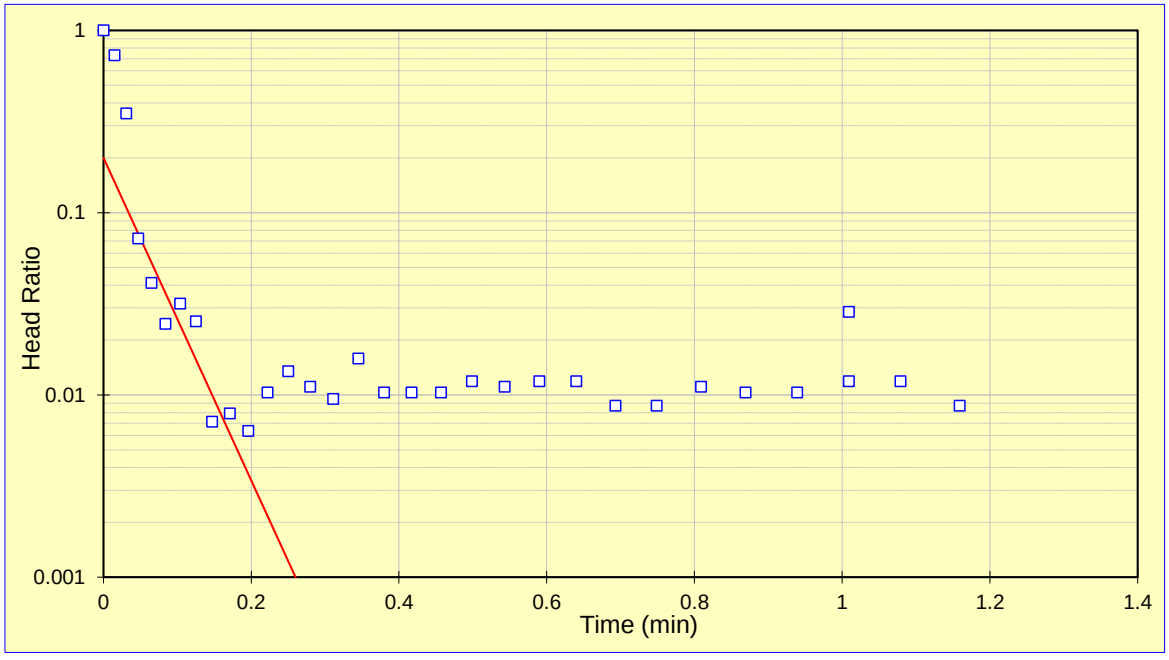
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.21E-02	cm/sec
t_1 =	0	K=	3.43E+01	ft/day
t_2 =	0.26			
h_1/h_0 =	0.20			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

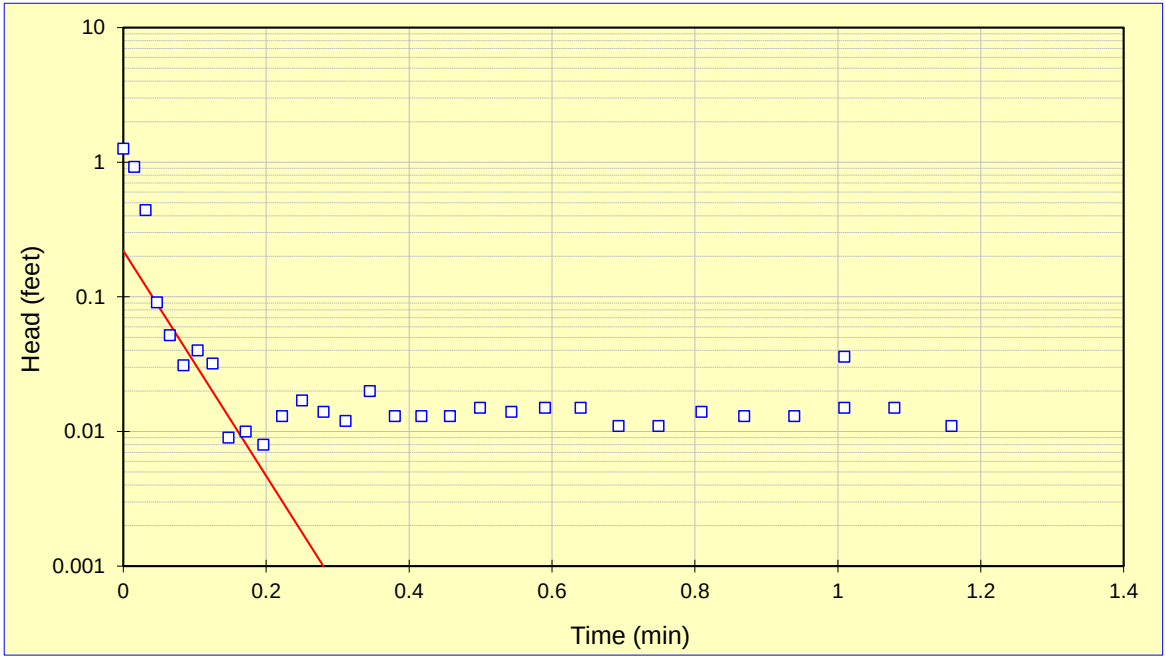
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.02
y_0 =	0.22
y_t =	0.001
t =	0.3

RESULTS

K=	1.03E-02	cm/sec
K=	2.91E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

APPENDIX C

Vertical Gradient Calculation

Appendix C
VERTICAL GRADIENT FLOW CALCULATIONS

Monitoring Well Locations	Ground Surface Elevation (ft-msl)	Top of Casing Elevation (ft-msl)	Screen Interval				June 13, 2016				July 11, 2016				September 6, 2016				November 7, 2016			
			Top (ft-bgs)	Bottom (ft-bgs)	Center (ft bgs)	Center (ft msl)	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction
GAMW07	666.55	669.89	5	15	10	656.55	10.17	659.72	NA	NA	10.48	659.41	NA	NA	8.57	661.32	NA	NA	7.88	662.01	-1.08E-01	Down
GAMW07B	666.83	669.39	30	40	35	631.83	-	-			-	-			-	-			10.04	659.35		
GAMW08	665.95	669.66	5	15	10	655.95	8.91	660.75	NA	NA	-	-	NA	NA	9.86	659.80	NA	NA	10.40	659.26	-3.95E-02	Down
GAMW08B	665.92	668.47	26	36	31	634.92	-	-			-	-			-	-			10.04	658.43		
GAMW09	665.1	668.99	5	15	10	655.51	9.02	659.97	-2.19E-02	Down	10.09	658.90	-2.14E-02	Down	8.41	660.58	-2.24E-02	Down	8.92	660.07	-2.34E-02	Down
GAMW09B	665.35	668.29	24.5	34.5	29.5	635.87	8.75	659.54			9.81	658.48			8.15	660.14			8.68	659.61		
GAMW15	665.01	668.25	5	15	10	654.54	8.59	659.66	-4.91E-04	Down	8.82	659.43	0.00E+00	Up	7.32	660.93	1.97E-03	Up	6.76	661.49	0.00E+00	Up
GAMW15B	665.14	668.05	27.7	37.7	32.7	634.19	8.40	659.65			8.62	659.43			7.08	660.97			6.56	661.49		
GAMW16	665.2	668.37	5	15	10	655.17	9.21	659.16	-1.33E-02	Down	9.61	658.76	4.44E-04	Up	8.08	660.29	4.44E-04	Up	8.24	660.13	4.39E-02	Up
GAMW16B	665.16	667.76	27.75	37.75	32.75	632.63	8.90	658.86			8.99	658.77			7.46	660.30			6.64	661.12		
GAMW17	668.81	671.93	5	15	10	658.93	13.13	658.80	4.22E-04	Up	9.72	662.21	-1.66E-01	Down	12.05	659.88	-4.22E-04	Down	12.60	659.33	-4.22E-04	Down
GAMW17B	668.86	670.6	28	38	33	635.26	11.79	658.81			12.31	658.29			10.73	659.87			11.28	659.32		
GAMW18	666.04	669.07	5	15	10	656.04	8.75	660.32	NA	NA	9.96	659.11	NA	NA	8.44	660.63	NA	NA	8.86	660.21	-8.86E-02	Down
GAMW18B	665.94	668.47	25	35	30	635.94	-	-			-	-			-	-			10.04	658.43		
GAMW46	661.99	664.80	5	15	10	651.99	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	7.04	657.76	-1.18E-03	Down
GAMW46B	661.98	664.79	22	32	27	634.98	-	-			-	-			-	-			7.05	657.74		
GAMW52	664.07	666.79	5	15	10	654.07	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	7.04	659.75	4.64E-03	Up
GAMW52B	664.50	666.90	27	37	32	632.50	-	-			-	-			-	-			7.05	659.85		
GAMW53	664.68	667.24	5	15	10	654.68	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	6.05	661.19	1.42E-03	Up
GAMW53B	664.62	667.29	26	36	31	633.62	-	-			-	-			-	-			6.07	661.22		
GAMW54	663.87	666.37	5	15	10	653.87	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	6.05	660.32	4.74E-03	Up
GAMW54B	663.98	666.47	22	32	27	636.98	-	-			-	-			-	-			6.07	660.40		
GAMW55	665.06	667.64	5	15	10	655.06	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	10.04	657.60	-1.56E-02	Down
GAMW55B	665.18	667.53	25	35	30	635.18	-	-			-	-			-	-			10.24	657.29		
GAMW56	665.43	667.91	5	15	10	655.43	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	7.04	660.87	-4.98E-03	Down
GAMW56B	665.33	667.82	25	35	30	635.33	-	-			-	-			-	-			7.05	660.77		

Notes:
ft-bgs = Feet below ground surface
ft-msl = Feet above mean sea level
ft-btoc = Feet below top of casing
ft/ft = Feet/Feet
NA= not applicable

Appendix C
VERTICAL GRADIENT FLOW CALCULATIONS

Monitoring Well Locations	Ground Surface Elevation (ft-msl)	Top of Casing Elevation (ft-msl)	Screen Interval				January 4, 2017				February 27, 2017				April 24, 2017				June 26, 2017			
			Top (ft-bgs)	Bottom (ft-bgs)	Center (ft bgs)	Center (ft msl)	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction
GAMW07	666.55	669.89	5	15	10	656.55	10.09	659.80	-1.62E-03	Down	8.82	661.07	-6.67E-02	Down	8.56	661.33	NA	NA	9.52	660.37	NA	NA
GAMW07B	666.83	669.39	30	40	35	631.83	9.63	659.76			9.97	659.42			-	-			-	-		
GAMW08	665.95	669.66	5	15	10	655.95	10.82	658.84	5.41E-15	Up	10.62	659.04	-2.57E-02	Down	9.71*	659.95	NA	NA	10.15	659.51	NA	NA
GAMW08B	665.92	668.47	26	36	31	634.92	9.63	658.84			9.97	658.50			-	-			-	-		
GAMW09	665.1	668.99	5	15	10	655.51	8.95	660.04	-2.09E-02	Down	8.50	660.49	-2.09E-02	Down	7.59	661.40	-1.93E-02	Down	8.30	660.69	-2.14E-02	Down
GAMW09B	665.35	668.29	24.5	34.5	29.5	635.87	8.66	659.63			8.21	660.08			7.27	661.02			8.02	660.27		
GAMW15	665.01	668.25	5	15	10	654.54	8.63	659.62	0.00E+00	Up	7.35	660.90	4.91E-04	Up	7.00	661.25	1.47E-03	Up	8.00	660.25	0.00E+00	Up
GAMW15B	665.14	668.05	27.7	37.7	32.7	634.19	8.43	659.62			7.14	660.91			6.77	661.28			7.80	660.25		
GAMW16	665.2	668.37	5	15	10	655.17	9.18	659.19	4.44E-04	Up	8.66	659.71	2.22E-03	Up	7.87	660.50	8.87E-04	Up	8.72	659.65	1.33E-03	Up
GAMW16B	665.16	667.76	27.75	37.75	32.75	632.63	8.56	659.20			8.00	659.76			7.24	660.52			8.08	659.68		
GAMW17	668.81	671.93	5	15	10	658.93	NA	-	NA	NA	12.67	659.26	0.00E+00	Up	11.75	660.18	8.45E-04	Up	12.30	659.63	1.65E-02	Up
GAMW17B	668.86	670.6	28	38	33	635.26	11.62	658.98			11.34	659.26			10.40	660.20			10.58	660.02		
GAMW18	666.04	669.07	5	15	10	656.04	8.96	660.11	-6.32E-02	Down	8.55	660.52	-1.00E-01	Down	7.45	661.62	NA	NA	8.55	660.52	NA	NA
GAMW18B	665.94	668.47	25	35	30	635.94	9.63	658.84			9.97	658.50			-	-			-	-		
GAMW46	661.99	664.80	5	15	10	651.99	6.75	658.05	-5.88E-04	Down	7.05	657.75	5.88E-04	Up	-	-	NA	NA	-	-	NA	NA
GAMW46B	661.98	664.79	22	32	27	634.98	6.75	658.04			7.03	657.76			-	-			-	-		
GAMW52	664.07	666.79	5	15	10	654.07	6.75	660.04	5.10E-03	Up	7.05	659.74	6.03E-03	Up	-	-	NA	NA	-	-	NA	NA
GAMW52B	664.50	666.90	27	37	32	632.50	6.75	660.15			7.03	659.87			-	-			-	-		
GAMW53	664.68	667.24	5	15	10	654.68	5.85	661.39	2.37E-03	Up	6.07	661.17	2.37E-03	Up	-	-	NA	NA	-	-	NA	NA
GAMW53B	664.62	667.29	26	36	31	633.62	5.85	661.44			6.07	661.22			-	-			-	-		
GAMW54	663.87	666.37	5	15	10	653.87	5.85	660.52	5.92E-03	Up	6.07	660.30	5.92E-03	Up	-	-	NA	NA	-	-	NA	NA
GAMW54B	663.98	666.47	22	32	27	636.98	5.85	660.62			6.07	660.40			-	-			-	-		
GAMW55	665.06	667.64	5	15	10	655.06	9.63	658.01	-1.56E-02	Down	9.97	657.67	-1.51E-02	Down	-	-	NA	NA	-	-	NA	NA
GAMW55B	665.18	667.53	25	35	30	635.18	9.83	657.70			10.16	657.37			-	-			-	-		
GAMW56	665.43	667.91	5	15	10	655.43	6.75	661.16	-4.48E-03	Down	7.05	660.86	-3.48E-03	Down	-	-	NA	NA	-	-	NA	NA
GAMW56B	665.33	667.82	25	35	30	635.33	6.75	661.07			7.03	660.79			-	-			-	-		

Notes:
ft-bgs = Feet below ground surface
ft-msl = Feet above mean sea level
ft-btoc = Feet below top of casing
ft/ft = Feet/Feet
NA= not applicable

Appendix C
VERTICAL GRADIENT FLOW CALCULATIONS

Monitoring Well Locations	Ground Surface Elevation (ft-msl)	Top of Casing Elevation (ft-msl)	Screen Interval				August 21, 2017				October 2, 2017				February 26, 2018				March 12, 2018			
			Top (ft-bgs)	Bottom (ft-bgs)	Center (ft bgs)	Center (ft msl)	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction
GAMW07	666.55	669.89	5	15	10	656.55	9.08	660.81	NA	NA	10.16	659.73	NA	NA	-	-	NA	NA	8.8	661.09	NA	NA
GAMW07B	666.83	669.39	30	40	35	631.83	-	-			-	-			-	-			-	-		
GAMW08	665.95	669.66	5	15	10	655.95	10.15	659.51	NA	NA	NA	-	NA	NA	-	-	NA	NA	8.38	661.28	NA	NA
GAMW08B	665.92	668.47	26	36	31	634.92	-	-			-	-			-	-			-	-		
GAMW09	665.1	668.99	5	15	10	655.51	8.11	660.88	-2.24E-02	Down	10.06	658.93	-2.29E-02	Down	-	-	NA	NA	6.23	662.76	-2.14E-02	Down
GAMW09B	665.35	668.29	24.5	34.5	29.5	635.87	7.85	660.44			9.81	658.48			-	-			5.95	662.34		
GAMW15	665.01	668.25	5	15	10	654.54	7.56	660.69	1.47E-03	Up	9.02	659.23	2.46E-03	Up	-	-	NA	NA	7.38	660.87	9.83E-04	Up
GAMW15B	665.14	668.05	27.7	37.7	32.7	634.19	7.33	660.72			8.77	659.28			-	-			7.16	660.89		
GAMW16	665.2	668.37	5	15	10	655.17	8.45	659.92	0.00E+00	Up	10.56	657.81	4.44E-04	Up	-	-	NA	NA	7.38	660.99	4.44E-03	Up
GAMW16B	665.16	667.76	27.75	37.75	32.75	632.63	7.84	659.92			9.94	657.82			-	-			6.67	661.09		
GAMW17	668.81	671.93	5	15	10	658.93	12.24	659.69	-1.69E-03	Down	NA	-	NA	NA	-	-	NA	NA	10.45	661.48	4.80E-15	Up
GAMW17B	668.86	670.6	28	38	33	635.26	10.95	659.65			13.33	657.27			-	-			9.12	661.48		
GAMW18	666.04	669.07	5	15	10	656.04	8.23	660.84	NA	NA	10.03	659.04	NA	NA	-	-	NA	NA	6.3	662.77	NA	NA
GAMW18B	665.94	668.47	25	35	30	635.94	-	-			-	-			-	-			-	-		
GAMW46	661.99	664.80	5	15	10	651.99	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA
GAMW46B	661.98	664.79	22	32	27	634.98	-	-			-	-			-	-			-	-		
GAMW52	664.07	666.79	5	15	10	654.07	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA
GAMW52B	664.50	666.90	27	37	32	632.50	-	-			-	-			-	-			-	-		
GAMW53	664.68	667.24	5	15	10	654.68	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA
GAMW53B	664.62	667.29	26	36	31	633.62	-	-			-	-			-	-			-	-		
GAMW54	663.87	666.37	5	15	10	653.87	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA
GAMW54B	663.98	666.47	22	32	27	636.98	-	-			-	-			-	-			-	-		
GAMW55	665.06	667.64	5	15	10	655.06	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA
GAMW55B	665.18	667.53	25	35	30	635.18	-	-			-	-			-	-			-	-		
GAMW56	665.43	667.91	5	15	10	655.43	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA
GAMW56B	665.33	667.82	25	35	30	635.33	-	-			-	-			-	-			-	-		

Notes:
ft-bgs = Feet below ground surface
ft-msl = Feet above mean sea level
ft-btoc = Feet below top of casing
ft/ft = Feet/Feet
NA= not applicable

Appendix C
VERTICAL GRADIENT FLOW CALCULATIONS

Monitoring Well Locations	Ground Surface Elevation (ft-msl)	Top of Casing Elevation (ft-msl)	Screen Interval				April 18, 2018				June 12, 2018				August 27-28, 2018				October 22-24, 2018			
			Top (ft-bgs)	Bottom (ft-bgs)	Center (ft bgs)	Center (ft msl)	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction
GAMW07	666.55	669.89	5	15	10	656.55	8.9	660.99	1.78E-01	Up	9.15	660.74	1.75E-01	Up	9.95	659.94	2.83E-03	Up	10.62	659.27	8.09E-04	Up
GAMW07B	666.83	669.39	30	40	35	631.83	4	665.39			4.32	665.07			9.38	660.01			10.1	659.29		
GAMW08	665.95	669.66	5	15	10	655.95	9.58	660.08	2.09E-01	Up	9.55	660.11	1.92E-01	Up	10.22	659.44	4.28E-03	Up	10.6	659.06	2.85E-03	Up
GAMW08B	665.92	668.47	26	36	31	634.92	4	664.47			4.32	664.15			8.94	659.53			9.35	659.12		
GAMW09	665.1	668.99	5	15	10	655.51	7.42	661.57	-2.04E-02	Down	7.5	661.49	-2.19E-02	Down	8.36	660.63	-2.04E-02	Down	8.65	660.34	-2.04E-02	Down
GAMW09B	665.35	668.29	24.5	34.5	29.5	635.87	7.12	661.17			7.23	661.06			8.06	660.23			8.35	659.94		
GAMW15	665.01	668.25	5	15	10	654.54	7.62	660.63	9.83E-04	Up	7.9	660.35	5.06E-02	Up	8.56	659.69	1.97E-03	Up	9.15	659.1	1.47E-03	Up
GAMW15B	665.14	668.05	27.7	37.7	32.7	634.19	7.4	660.65			6.67	661.38			8.32	659.73			8.92	659.13		
GAMW16	665.2	668.37	5	15	10	655.17	8.15	660.22	3.99E-03	Up	8.28	660.09	3.11E-03	Up	8.94	659.43	1.77E-03	Up	9.3	659.07	3.11E-03	Up
GAMW16B	665.16	667.76	27.75	37.75	32.75	632.63	7.45	660.31			7.6	660.16			8.29	659.47			8.62	659.14		
GAMW17	668.81	671.93	5	15	10	658.93	11.75	660.18	4.80E-15	Up	11.65	660.28	0.00E+00	Up	12.28	659.65	-2.11E-03	Down	12.7	659.23	-2.11E-03	Down
GAMW17B	668.86	670.6	28	38	33	635.26	10.42	660.18			10.32	660.28			11	659.6			11.42	659.18		
GAMW18	666.04	669.07	5	15	10	656.04	7.17	661.9	1.28E-01	Up	7.72	661.35	1.39E-01	Up	8.86	660.21	0.00E+00	Up	9.5	659.57	2.89E-02	Up
GAMW18B	665.94	668.47	25	35	30	635.94	4	664.47			4.32	664.15			8.26	660.21			8.32	660.15		
GAMW46	661.99	664.80	5	15	10	651.99	-	-	NA	NA	7.55	657.25	-5.88E-04	Down	9.24	655.56	-5.88E-04	Down	8.75	655.75	-7.23E-02	Down
GAMW46B	661.98	664.79	22	32	27	634.98	-	-			7.55	657.24			9.24	655.55			9.80	654.52		
GAMW52	664.07	666.79	5	15	10	654.07	-	-	NA	NA	-	-	NA	NA	8.50	658.29	4.64E-04	Up	8.80	657.99	4.64E-04	Up
GAMW52B	664.50	666.90	27	37	32	632.50	-	-			-	-			8.60	658.30			8.90	658.00		
GAMW53	664.68	667.24	5	15	10	654.68	-	-	NA	NA	7.13	660.11	7.12E-03	Up	8.80	658.44	4.27E-03	Up	9.10	658.14	4.75E-03	Up
GAMW53B	664.62	667.29	26	36	31	633.62	-	-			7.03	660.26			8.76	658.53			9.05	658.24		
GAMW54	663.87	666.37	5	15	10	653.87	7.20	-7.20	5.92E-03	Up	7.93	658.44	9.47E-03	Up	7.58	658.79	-4.14E-03	Down	7.90	658.47	-2.96E-03	Down
GAMW54B	663.98	666.47	22	32	27	636.98	7.10	-7.10			7.87	658.60			7.75	658.72			8.05	658.42		
GAMW55	665.06	667.64	5	15	10	655.06	-	-	NA	NA	8.64	659.00	2.52E-03	Up	8.68	658.96	-2.52E-03	Down	8.92	658.72	-2.01E-03	Down
GAMW55B	665.18	667.53	25	35	30	635.18	-	-			8.48	659.05			8.62	658.91			8.85	658.68		
GAMW56	665.43	667.91	5	15	10	655.43	-	-	NA	NA	7.55	660.36	-4.48E-03	Down	8.92	658.99	4.98E-04	Up	9.05	658.86	4.98E-04	Up
GAMW56B	665.33	667.82	25	35	30	635.33	-	-			7.55	660.27			8.82	659.00			8.95	658.87		

Notes:
ft-bgs = Feet below ground surface
ft-msl = Feet above mean sea level
ft-btoc = Feet below top of casing
ft/ft = Feet/Feet
NA= not applicable

Appendix C
VERTICAL GRADIENT FLOW CALCULATIONS

Monitoring Well Locations	Ground Surface Elevation (ft-msl)	Top of Casing Elevation (ft-msl)	Screen Interval				February 25, 2019				Average Vertical Gradient (ft/ft)	Flow Direction
			Top (ft-bgs)	Bottom (ft-bgs)	Center (ft bgs)	Center (ft msl)	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction		
GAMW07	666.55	669.89	5	15	10	656.55	8.85	661.04	4.85E-03	Up	0.0232	Up
GAMW07B	666.83	669.39	30	40	35	631.83	8.23	661.16				
GAMW08	665.95	669.66	5	15	10	655.95	9.46	660.2	6.66E-03	Up	0.0437	Up
GAMW08B	665.92	668.47	26	36	31	634.92	8.13	660.34				
GAMW09	665.1	668.99	5	15	10	655.51	6.78	662.21	-2.04E-02	Down	-0.0214	Down
GAMW09B	665.35	668.29	24.5	34.5	29.5	635.87	6.48	661.81				
GAMW15	665.01	668.25	5	15	10	654.54	7.78	660.47	3.44E-03	Up	0.0042	Up
GAMW15B	665.14	668.05	27.7	37.7	32.7	634.19	7.51	660.54				
GAMW16	665.2	668.37	5	15	10	655.17	8.28	660.09	6.21E-03	Up	0.0037	Up
GAMW16B	665.16	667.76	27.75	37.75	32.75	632.63	7.53	660.23				
GAMW17	668.81	671.93	5	15	10	658.93	11.46	660.47	-1.27E-03	Down	-0.0111	Down
GAMW17B	668.86	670.6	28	38	33	635.26	10.16	660.44				
GAMW18	666.04	669.07	5	15	10	656.04	6.69	662.38	1.19E-02	Up	0.0070	Up
GAMW18B	665.94	668.47	25	35	30	635.94	5.85	662.62				
GAMW46	661.99	664.80	5	15	10	651.99	7.05	657.75	5.88E-04	Up	-0.0106	Down
GAMW46B	661.98	664.79	22	32	27	634.98	7.03	657.76				
GAMW52	664.07	666.79	5	15	10	654.07	8.10	658.69	4.64E-04	Up	0.0029	Up
GAMW52B	664.50	666.90	27	37	32	632.50	8.20	658.70				
GAMW53	664.68	667.24	5	15	10	654.68	8.45	658.79	7.12E-03	Up	0.0042	Up
GAMW53B	664.62	667.29	26	36	31	633.62	8.35	658.94				
GAMW54	663.87	666.37	5	15	10	653.87	6.90	659.47	-5.92E-03	Down	0.0024	Up
GAMW54B	663.98	666.47	22	32	27	636.98	7.10	659.37				
GAMW55	665.06	667.64	5	15	10	655.06	8.03	659.61	5.03E-03	Up	-0.0062	Down
GAMW55B	665.18	667.53	25	35	30	635.18	7.82	659.71				
GAMW56	665.43	667.91	5	15	10	655.43	7.91	660.00	-5.66E-15	Down	-0.0023	Down
GAMW56B	665.33	667.82	25	35	30	635.33	7.82	660.00				

Notes:
ft-bgs = Feet below ground surface
ft-msl = Feet above mean sea level
ft-btoc = Feet below top of casing
ft/ft = Feet/Feet
NA= not applicable

Prepared by: ERW
Checked by: TK
Reviewed by: MAH

APPENDIX D

Monitored Natural Attenuation Evaluation

REPORT

MONITORED NATURAL ATTENUATION EVALUATION

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November 2020

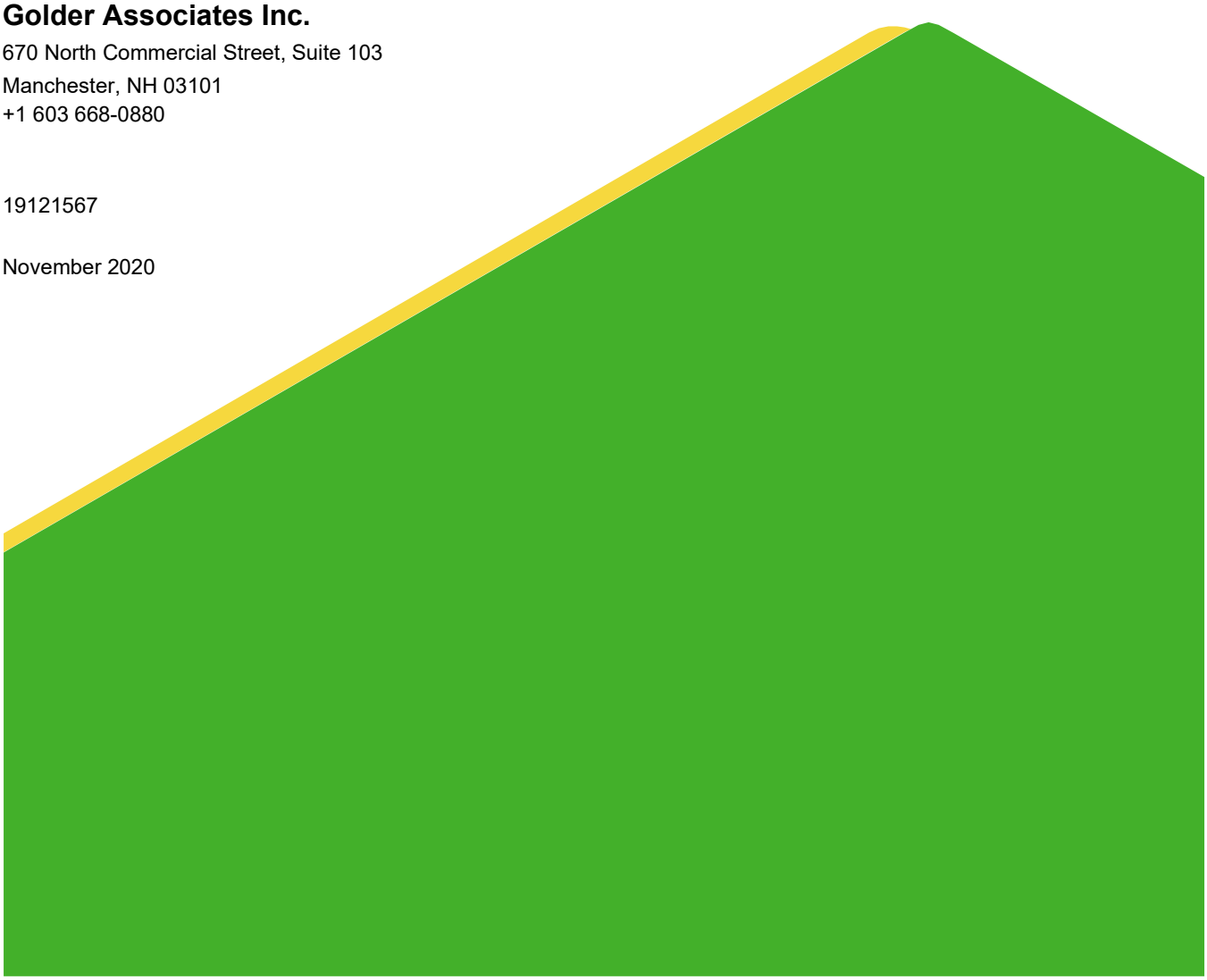


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APPENDICES

APPENDIX A
Groundwater and Porewater Monitoring Data

APPENDIX B
Groundwater Flow Model Technical Memorandum

Acronyms

ACM	Assessment of Corrective Measures
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
DO	Dissolved Oxygen
Eh	Reduction Potential
ft bgs	feet below ground surface
g	Gram
GMPIM	Groundwater Monitoring Program Implementation Manual
GWPS	Groundwater Protection Standards
IAP	Ion Activity Product
IDEM	Indiana Department of Environmental Management
ITRC	Interstate Technology Regulatory Council
kg	kilogram
Ksp	Solubility Product
MCL	Maximum Contaminant Level
MCWB	Metal Cleaning Waste Basin
mg	milligram
mg/L	milligram per liter
MNA	Monitored Natural Attenuation
mV	millivolt
MSRB	Material Storage Runoff Basin
NIPSCO LLC	Northern Indiana Public Service Company LLC
ORP	Oxidation-Reduction Potential
RMSGS	R. M. Schahfer Generating Station
SCM	surface complexation model
SEP	Sequential Extraction Potential
SI	Saturation Index
SSL	Statistically Significant Level
SU	Standard Unit
TAL	Target Analyte List
TDS	Total Dissolved Solids
USEPA	United States Environmental Protection Agency
XRD	X-ray diffraction

1.0 OVERVIEW

Groundwater and solid materials were evaluated to determine the feasibility of Monitored Natural Attenuation (MNA) as part of the assessment of corrective measures process for the Coal Combustion Residuals (CCR) surface impoundments (i.e., Material Storage Runoff Basin (MSRB), Metal Cleaning Waste Basin (MCWB), and the Drying Area (together, the CCR Unit) at the Northern Indiana Public Service Company LLC (NIPSCO LLC) Rollin M. Schahfer Generating Station (RMSGS, or Site). The structure of this feasibility evaluation closely follows the United States Environmental Protection Agency (USEPA) guidance on using MNA as a remedial strategy (USEPA 2007a and 2007b) and considers best practices from the Interstate Technology Regulatory Council (ITRC) document: “A Decision Framework for Applying Monitored Natural Attenuation Processes to Metals and Radionuclides in Groundwater” (ITRC 2010).

RMSGS manages CCR in the surface impoundments subject to applicable requirements of 40 Code of Federal Regulations (CFR) Part 257 as amended (CCR Rule). In April 2019, pursuant to 40 CFR §257.96(a), an assessment of corrective measures (ACM) was completed for the CCR Unit. This evaluation identified MNA as a potential remedial alternative for cobalt due to a detection at a Statistically Significant Level (SSL) in groundwater. Additionally, arsenic, boron, lithium, and molybdenum were evaluated as part of this assessment due to the potential for future SSLs, should they ever occur. The results of the evaluation will be used to assess the performance and reliability of MNA as a potential remedial alternative as required by 40 CFR §257.97, Golder determined the overall feasibility of MNA for the CCR Unit by evaluating the following tiers (USEPA 2007a,b):

1) Demonstrate active constituent removal from groundwater and dissolved plume stability (Tier I)

2) Determine the mechanisms and rates of the operative attenuation processes (Tier II)

3) Determine the long-term capacity for attenuation and the stability of immobilized constituents (Tier III)

Following completion of this multi-tier evaluation, the fourth and final tier of an MNA program, which involves the design of a performance monitoring program and the development of a contingency plan, will be developed.

2.0 APPROACH

Golder evaluated the feasibility, mechanisms, rates, and stability of MNA as a remedy for groundwater impacts from the CCR Unit. In order to perform the evaluation, Golder collected samples of groundwater and overburden soil between July 24, 2018 and March 3, 2020 for geochemical analysis. The supplemental MNA assessment included the following activities:

- Groundwater:
  - Characterization to identify temporal and geographical trends, where present, and to estimate site-wide attenuation rates using temporal and spatial trends in groundwater quality data.
  - Geochemical modeling to identify the major chemical species and evaluate saturation indices of minerals relevant to attenuation of arsenic, boron, cobalt, lithium, and molybdenum.
  - Determination of the capacity of different mechanisms to attenuate arsenic, boron, cobalt, lithium, and molybdenum, including adsorption, precipitation and co-precipitation, and physical attenuation (dilution/dispersion).
  - Geochemical modeling to assess the stability and reversibility of attenuation due to adsorption.

- Overburden soil:
  - Mineralogical analysis of overburden soils to identify and quantify the major mineral components.
  - Chemical analysis of overburden soils to quantify the total metal content and identify the environmentally-available fraction of metals.

The results generated by this supplemental assessment were used by Golder to complete the Tier I, Tier II, and Tier III evaluation (USEPA 2007a,b). In addition, groundwater data collected during previous sampling events were used. The results of the Tier I, Tier II, and Tier III are described in the subsequent sections to establish a basis for the likely success of MNA at the RMSGS site.

2.1 Groundwater and Porewater Sampling

2.1.1 Sample Collection

Golder personnel collected groundwater and porewater samples in accordance with the Golder RMSGS Groundwater Monitoring Program Implementation Manual (GMPIM, Golder 2017) from the background, downgradient, Assessment, and property boundary monitoring wells presented in Table 1, and from piezometers located within the CCR Unit. Piezometer GAPIEZ-06 is located interior of the slurry wall on the western edge of the MSRB and is screened within the CCR materials. Piezometers DAPZ-02A and DAPZ-02B (abandoned in April 2020) were installed interior of the slurry wall on the eastern edge of the Drying Area and were screened in native materials (i.e., below the extent of CCR) from approximately five to 20 feet below ground surface (ft bgs) and 33 to 38 ft bgs, respectively. The monitoring well and former piezometer locations are shown in Figure 1.

Table 1: Overview of the Wells Used in the Monitored Natural Attenuation Assessment

Background Wells	Downgradient Wells	Assessment Wells	Property Boundary Wells
GAMW-04, GAMW-07, GAMW-07B, GAMW-15, GAMW-15B	GAMW-08, GAMW-08B, GAMW-09, GAMW-09B, GAMW-16, GAMW-16B, GAMW-17, GAMW-17B, GAMW-18, GAMW-18B	GAMW-52, GAMW-52B, GAMW-53, GAMW-53B, GAMW-54, GAMW-54B, GAMW-55/55R, GAMW-55B, GAMW-56, GAMW-56B	GAMW-46, GAMW-46B

2.1.2 Groundwater and Porewater Analysis

The geochemical characterization of porewater and groundwater samples included the measurement of field parameters and the laboratory analysis of samples for total metals and major cations and anions. The field parameters and laboratory analyses included:

Field Parameters: Parameters measured in the field included pH, dissolved oxygen (DO), oxidation reduction potential (ORP), conductivity, and temperature. These measurements were used to determine general geochemical conditions in the groundwater and support geochemical modeling.

Metals: Analysis of Appendix III and IV metals concentrations was conducted to understand the geochemical composition of groundwater and porewater. Metals analysis allows for the delineation of a potential plume, evaluation of mineral saturation indices, development of partitioning coefficients (in conjunction with solid material analyses), and evaluation of background contributions from natural sources or anthropogenic sources.

Major Cations and Anions: Geochemical modeling of mineral solubility, metals attenuation and background contributions requires analysis of major cations and anions because they affect and participate in sorption and mineral dissolution or precipitation reactions.

The groundwater and porewater samples were analyzed using the following methods:

- pH following SW846 9040C “pH Electrometric Measurement” (USEPA 2004)
- Total dissolved solids standard method (SM) 2540C “Total Dissolved Solids Dried at 180°C” (USEPA 1993a)
- Total hardness following SM 2340B (USEPA 1997)
- Chloride, fluoride, and sulfide following USEPA SW846 9056A “Determination of Inorganic Anions by Ion Chromatography”, Revision 1 (USEPA 2007c)
- Nitrate and nitrite following USEPA 353.2 “Determination of Nitrate-Nitrite Nitrogen by Automated Colorimetry, Revision 2.0” (USEPA 1993b)
- Alkalinity following SM 2320B “Alkalinity by Titration” (USEPA 2005a)
- Phosphorous following SM 4500-P E “Phosphorous by Ascorbic Acid Method” (USEPA 2005b)
- Total Target Analyte List (TAL) metals following USEPA SW846 6010C “Inductively Coupled Plasma-Atomic Emission Spectrometry”, Revision 3, SW846 6020B “Inductively Coupled Plasma-Mass Spectrometry”, Revision 2, and SW846 6020A “Inductively Coupled Plasma-Mass Spectrometry”, Revision 1 (USEPA 1998a)

2.2 Overburden Soil Sampling and Analysis

2.2.1 Sample Collection

Golder subcontracted a licensed well driller to advance borings into the overburden soil and install monitoring wells using roto sonic drilling methods. During boring operations, the driller collected continuous drill cores from all deep wells (i.e.” B” flagged wells). From the drill cores, Golder staff collected overburden samples from the depth of the screened intervals (i.e. 10-foot screened interval) from one background well soil boring (SB-07B), two downgradient well soil borings (SB-08B and SB-18B) and from five Assessment Monitoring well soil borings (SB-52B, SB-53B, SB-54B, SB-55B, and SB-56B). Golder staff also collected an additional sample from SB-53B (25’-27’) at the top of the screened interval due to minor unidentified visual soil staining encountered within the planned interval itself. An additional soil boring was completed just external to the slurry wall on the eastern side of the MCWB (OW-9) and samples were collected on approximately 10-foot intervals.

The driller used a “marsh buggy” with a hollow stem auger drill rig specifically designed to work in the wet, soft soil/ash conditions inside the CCR Unit to advance eight soil borings within the Drying Area. From these eight borings, 23 samples were analyzed for total metals with one of these samples (DA-14_4-6’) also analyzed using the 7-step sequential extraction. The only sample for which data are included in this report is DA-14_4-6’; all other data, which were obtained for other purposes, are provided in the Ash Pond Assessment Report (Golder 2020).

Soil borings were numbered to match the equivalent monitoring wells, where applicable. Golder field staff prepared a composite overburden sample from boreholes by selecting a two-foot interval from each drill core and submitting it to the laboratory for analysis under chain-of-custody procedures. The unique descriptions used to

identify the samples included the boring name and depth of the sample below ground surface (e.g., SB-07B-35'-37'). The sample type and analytical testing conducted on each sample are provided in Table 2.

Table 2: Summary of Overburden Soil Samples/Analyses

Sample Location	Number of Samples	Analyses
Background boring (SB-07B) 35'-37'	1	Total metals, sequential extraction
Downgradient boring (SB-08B) 30'-32'	1	Total metals, sequential extraction
Downgradient boring (SB-18B) 32'-34'	1	Total metals, sequential extraction
Assessment boring (SB-52B) 35'-37'	1	Total metals, sequential extraction, mineralogical composition
Assessment boring (SB-53B) 25'-27' & 30'-32'	2	Total metals, sequential extraction
Assessment boring (SB-54B) 30'-32'	1	Total metals, sequential extraction, mineralogical composition
Assessment boring (SB-55B) 30'-32'	1	Total metals, sequential extraction
Assessment boring (SB-56B) 30'-32'	1	Total metals, sequential extraction, mineralogical composition
Downgradient boring (OW-9) 10'-12' & 18'-20'	2	Total metals, sequential extraction, mineralogical composition
Drying area boring (DA-14) 4'-6'	1	Total metals, sequential extraction

2.2.2 Overburden Soil Analyses

Multiple geochemical methods were used to assess the mineralogical and chemical composition of the overburden soil samples. The selected geochemical test methods included the following:

- **Mineralogical composition:** The mineralogical analysis was used to identify and quantify the crystalline mineral phases in each sample. This information is required for geochemical modeling as the release or attenuation of constituents of interest is influenced by the mineral phase(s) present in the aquifer (Hem 1985). The mineralogical testing laboratory (SGS Minerals Services) performed the mineralogical analysis using quantitative (Rietveld) X-ray diffraction (XRD) and a Bruker AXS D8 Advance Diffractometer.
- **Total metals:** This analysis was used to quantify the chemical composition of overburden soils. The total mass of metals, in combination with the results of sequential extraction testing, can be used to determine the provenance of metals and verify sequential extraction results. The laboratory analyzed a target analyte list of

metals following the methods USEPA SW846 6010C “Inductively Coupled Plasma-Atomic Emission Spectrometry”, Revision 3 (November 2000) and USEPA SW846 7471B “Mercury in Solid or Semisolid Wastes (Manual Cold-Vapor Technique)”, Revision 2.

- **Sequential extraction:** The sequential extraction procedure (SEP) consisted of a seven-step procedure to extract metals from solids, as per Tessier et al. (1979), to identify the provenance of constituents of interest (i.e. the operationally-defined fraction that contains the metal)[1] and determine their potential environmental mobility. For instance, metals bound in the carbonate fraction, or that are exchangeable, are much more likely to become mobile due to changes in groundwater conditions than metals bound within a sulfide or silicate fraction. The summed concentration of a metal measured from all seven steps (SEP SUM) can be compared to the concentration determined from a total metals analysis (SEP Total) for compositional accountability. The laboratory analyzed the metals content of the extracted samples using the method USEPA SW846 6020B “Inductively Coupled Plasma-Mass Spectrometry”, Revision 2 (July 2014).

2.3 Groundwater Assessment Monitoring

Following the installation of a groundwater monitoring system in 2016 and throughout calendar year 2017, Golder collected background groundwater samples and performed Detection Monitoring around the CCR Unit pursuant to the requirements of 40 CFR §257.94. In 2018, Golder performed the first and second Assessment Monitoring sampling events pursuant to the requirements of 40 CFR §257.95. Following the first Assessment Monitoring sampling event, including verification sampling, the constituents that were detected above the groundwater protection standards (GWPS) at SSLs included:

- Cobalt and Lithium at GAMW-08
- Molybdenum at GAMW-18

The GWPS is the larger value of the Maximum Contaminant Level (MCL) or the unit-specific background concentration for each analyte based on a tolerance/prediction limit statistical procedure. However, USEPA amended the CCR Rule (i.e., Phase 1 Part 1 amendment) and created health-based standards for cobalt, lead, lithium, and molybdenum, constituents that do not have MCLs, as of August 29, 2018. Pursuant to 40 CFR §257.95(h)(2), the health-based standards can be used in place of background levels to calculate the GWPS. Consequently, after the second Assessment Monitoring event (October 2018), cobalt in monitoring well GAMW-08 remained as the only constituent detected at an SSL. Arsenic has never been detected above the GWPS or at an SSL, however, Golder also assessed arsenic as part of this evaluation due to sporadic detections at or above the MCL.

[1] Sequential extraction of metals from overburden samples consisted of seven discrete steps for this investigation:

Step 1 - Exchangeable Phase: This extraction includes trace elements that are reversibly adsorbed to overburden minerals, amorphous solids, and/or organic material by electrostatic forces.

Step 2 - Carbonate Phase: This extraction targets trace elements that are adsorbed or otherwise bound to carbonate minerals.

Step 3 – Non-Crystalline Materials Phase: This extraction targets trace elements that are complexed by amorphous minerals (e.g., iron).

Step 4 - Metal Hydroxide Phase: Trace elements bound to hydroxides of iron, manganese, and/or aluminum.

Step 5 - Organic Phase: This extraction targets trace elements strongly bound via chemisorption to organic material.

Step 6 - Acid/Sulfide Fraction: The extraction is used to identify trace elements precipitated as sulfide minerals.

Step 7 - Residual Fraction: Trace elements remaining in the overburden after the previous extractions will be distributed between silicates, phosphates, and refractory oxides.

Although boron is not currently an Appendix IV constituent, USEPA is reportedly considering adding it to the Appendix IV list. The Indiana Department of Environmental Management (IDEM) has, however, established a health-based standard as part of the state cleanup program. Boron is frequently used as a tracer to indicate the extent of a release from a CCR management unit. Due to these characteristics and as a conservative measure, boron was selected by Golder to assess the nature and extent of groundwater impacts at the Site.

The health-based standards, unit-specific background concentration, and groundwater protection standards used in this evaluation are summarized in Table 3.

Table 3: Summary of Health-Based Standards, Background Concentrations, and Groundwater Protection Standards for the Constituents of Interest

Constituent	Health-Based Standard (mg/L)	Background Concentration (mg/L)	Groundwater Protection Standard (mg/L)
Arsenic	0.01	0.091	0.091
Boron	4(1)		
Cobalt	0.006	0.01	0.01
Lithium	0.04	0.01	0.04
Molybdenum	0.1	0.05	0.1

(1) IDEM health-based standard, not currently part of the CCR Rule

2.4 Groundwater and Porewater Geochemical Analysis

2.4.1 Estimation of Attenuation Rates

To evaluate the attenuation of arsenic, boron, cobalt, lithium, and molybdenum in groundwater at the Site and to assess the rate of attenuation, Golder applied the point decay method (USEPA 2011). The point decay method is used to determine the rate at which a constituent's concentrations are increasing or decreasing in groundwater at a single well between sampling events and this method can thus be used to predict when the constituent's concentrations will fall back below regulatory limits. Equation 1 describes first-order decay for a constituent:

$$Ln(C_t) = kt + Ln(C_0) \qquad \text{(Equation 1)}$$

where C_0 is the initial constituent concentration, C_t is the constituent concentration at time t, t is the amount of time in years that has passed since the initial concentration measurement, and k is the first-order decay rate constant (1 per year). Equation 2 shows Equation 1 reorganized to solve for the decay rate constant:

$$k = (Ln(C_t) - Ln(C_0))/t \qquad \text{(Equation 2)}$$

Groundwater water quality data from the background and downgradient wells collected between July 2016 and November 2019 were used to determine the mean first-order decay rate for each constituent of interest. Due to variable detection limits, results that were reported as below detection limits were not used in the point decay analysis. Using Equation 1 and the mean first-order decay rate, Golder calculated the number of years that it would take for constituents of interest concentrations greater than the GWPS to decrease below their respective thresholds.

2.4.2 Geochemical Speciation Modeling Methods

Golder conducted geochemical modeling to evaluate general groundwater and porewater composition, determine the potential for precipitation of sorbent media, evaluate the potential for mineral precipitation or adsorption in the aquifer, and determine the speciation of metals of interest. The geochemical computer code developed by the United States Geological Survey (USGS), PHREEQC (Parkhurst and Appelo 2013), was used for these simulations. PHREEQC version 3.4 is a general-purpose geochemical modeling code used to simulate reactions in water and between water and solid mineral phases (e.g., rocks and sediments). Reactions include aqueous equilibria, mineral dissolution and precipitation, ion exchange, surface complexation, solid solutions, gas-water equilibrium, and kinetic biogeochemical reactions. The widely-accepted thermodynamic database, Minteq.v4, 2017 edition, was used as a basis for the thermodynamic constants required for modeling (USEPA 1998b).

The Geochemist's Workbench version 12 (Bethke 2015) was used to generate graphical representations of geochemical modeling outputs in the form of predominance, or Pourbaix diagrams (also known as Eh-pH diagrams) for the species of interest (i.e. arsenic, boron, cobalt, lithium, and molybdenum) and trilinear plots (also known as Piper plots) displaying the relative abundance of major ions. The Minteq.v4 database was used as the basis for the Pourbaix diagrams.

2.4.3 Predictive Geochemical Modeling Methods

Golder performed geochemical modeling to assess viable attenuation mechanisms and to predict the quantity and stability of the attenuated constituents of concern.

2.4.3.1 Capacity of Adsorption as an Attenuation Mechanism

Adsorption is an important mechanism by which constituents in groundwater can be attenuated. The adsorptive partitioning between dissolved and solid phases was simulated using a two-layer surface complexation model (SCM). The SCM approach is described in Davis and Kent (1990), with additional parameterization based on Dzombak and Morel (1990) and Karamalidis and Dzombak (2011) utilizing iron (hydrous ferric oxide [Hfo]) as ferrihydrite [$Fe(OH)_{3(am)}$], and aluminum (hydrous aluminum oxide [Hao]) as gibbsite [$Al(OH)_{3(am)}$], as adsorbing surfaces.

The amount of Hfo and Hao available at the site for attenuation was based on the amorphous and metal hydroxide phase iron and aluminum concentrations measured in the SEP as described in Section 3.2.2. The minimum, mean, and maximum concentrations in soil borings were used in the adsorption models to capture the range of expected site concentrations. The Hfo and Hao surface properties (i.e., surface area, site density, and types of sites) from Dzombak and Morel (1990) and Karamalidis and Dzombak (2011) were used to quantify the iron and aluminum adsorption sites per mole of mineral.

The calculation methodology of Appelo and Postma (2010) was used to determine the specific quantity of sites on each mineral surface type as a function of the amount of mineral available to participate in these reactions. The methodology assumes the number of surface sites (sites) equals the product of the moles of iron ([Fe]) and the moles of surface sites per mole of iron ([sites]/[Fe]= 0.2 moles of sites per mole of iron). For the amount of ferrihydrite available for sorption, the Appelo and Postma methodology further assumes the mass of ferrihydrite (M_{HFO}) in grams (g) available equals the product of the [Fe] and the molecular weight of ferrihydrite (MW_{HFO} = 88.85 g/mole). The same approach was used to calculate the number of sites from gibbsite, assuming the [sites]/[Al] is 0.41 moles of sites per mole of aluminum and the molecular weight of gibbsite is 78.003 g/mole.

The geochemical thermodynamic database Minteq V.4 was used to conduct adsorption modeling. However, new and updated thermodynamic data have been released in scientific literature. These new data are important to include in the geochemical modeling exercises for certain elements or minerals as they allow further refinement of potential reactions, or for correction of previous data that may have been less accurate or more broadly defined. For groundwater modeling at the Site, Golder made numerous updates to the Minteq V.4 database, including the addition of data relating to partitioning coefficients for metals on gibbsite, developed by Karamalidis and Dzombak (2011). Of the five constituents of interest, the database did not contain partitioning coefficients for ferrihydrite or gibbsite for lithium, so its potential for adsorption could not be assessed.

To quantify current levels of adsorption, the concentration of constituents that adsorb in soils (as milligram (mg) of constituent/kilogram (kg) of soil) was modeled for the minimum, maximum, and mean Hfo and Hao contents when equilibrated with the range of groundwater qualities observed at the Site. To quantify the capacity of soil to adsorb additional amounts of each constituent, Golder simulated a step-wise increase in arsenic, boron, cobalt, and molybdenum concentrations (similar in concept to a titration, using the mean proportions observed in porewater) into the range of observed groundwater qualities while allowing equilibration with the sorption surfaces in soils (minimum, maximum and mean Hfo and Hao). The model was then used to predict the quantity of each constituent that would adsorb with this titration of additional arsenic, boron, cobalt, and molybdenum.

2.4.3.2 Mineral Precipitation and Co-precipitation

The potential for mineral precipitation was assessed in PHREEQC using a saturation index (SI) calculated according to Equation 3.

$$SI = \log (IAP/Ksp) \quad \text{(Equation 3)}$$

The saturation index is the ratio of the ion activity product (IAP) of a mineral to the solubility product (Ksp). An SI value greater than zero indicates that the solution is supersaturated with respect to a particular mineral phase and, therefore, precipitation of this mineral may occur. An evaluation of precipitation kinetics is then required to determine whether the supersaturated mineral will indeed form. An SI value less than zero indicates the solution is undersaturated with respect to a particular mineral phase. An SI value close to zero indicates equilibrium conditions exist between the mineral and the solution. SI values between -0.5 and 0.5 are considered to represent ‘equilibrium’ in this report to account for the uncertainties inherent in the analytical methods and geochemical modeling.

Co-precipitation was evaluated based on published literature and known association between minerals and constituents of concern. For example, cobalt is known to coprecipitate with iron oxyhydroxides as well as adsorb to Hfo (Norstrom and Alpers 1999). Therefore, to evaluate co-precipitation, minerals identified by PHREEQC to be at equilibrium (SI > -0.5) were evaluated for their potential to host arsenic, boron, cobalt, lithium, and molybdenum.

2.4.3.3 Capacity of Dilution and Dispersion as Attenuation Mechanisms

Dilution and dispersion are physical mechanisms of attenuation by which concentrations of constituents in groundwater decrease with migration along groundwater flowpaths.

To assess the potential for dilution and dispersion downgradient of the CCR Unit, Golder used MODPATH (Pollack 1989) and the calibrated Site Groundwater Flow model (discussed in Section 4.0 and Appendix B) to simulate travel times for particles released from the MCWB. The length of the particle traces produced by

MODPATH along with travel time estimates were used to calculate average groundwater velocities for the following flow paths: (see Figure 1):

- GAMW-16 to GAMW-53
- GAMW-18 to GAMW-55
- GAMW-17 to GAMW-54
- GAMW-09 to GAMW-54

The results of these flow path travel time simulations are presented in Table 4.

Golder estimated the capacity of dilution and dispersion to attenuate constituent concentrations from the CCR Unit using ratios of concentrations measured in monitoring wells along these flow paths, as presented in Table 8. For example, along the flow path from GAMW-16 to GAMW-53, concentrations of boron decreased from 9.7 milligram per liter (mg/L) to 3.1 mg/L, representing an estimated 68% decrease in concentration along the flow path due to dilution and attenuation.

2.4.3.4 Long Term Stability of Attenuated Constituents

Three sensitivity analyses were performed to assess the stability of adsorbed constituents under variable pH, redox, and ionic strength conditions. Variations in pH, redox, and ionic strength are the most likely types of changes that will occur in an aquifer over time affecting the stability of the constituents of interest (ITRC 2010). The sensitivity analyses were conducted applying the minimum, mean, and maximum Hfo and Hao contents determined for the Site soils, equilibrated with the groundwater qualities observed at the Site at the measured pH and redox conditions. For each sensitivity analysis, a single parameter was varied:

- **pH -** Hydrochloric acid or sodium hydroxide addition was modeled to vary the pH between 4 and 12 standard units (SU). A pH range of 4 to 10 is the typical range considered for evaluating metal speciation.
- **Redox -** DO addition was simulated to adjust reduction potential (Eh) values between -200 and +700 millivolts (mV) based on the historical and anticipated range of Eh in the region.
- **Ionic Strength -** Total dissolved solids (TDS) concentrations were increased by titrating in calcium, magnesium, sodium, potassium, chloride, and sulfate in the proportions observed in porewater. TDS concentrations were evaluated up to 10,000 mg/L, which is approximately four times higher than the highest TDS concentration observed in groundwater at the CCR Unit.

2.4.4 Geochemical Modeling Assumptions and Data Handling

Geochemical modeling assumptions and data handling included the following:

- **Groundwater continuity:** Three or four groundwater quality samples were collected from each well during sampling events conducted between September 2018 and November 2019. Samples from this period were selected for the geochemical modeling because all wells related to the CCR Unit were sampled and analyzed for the full suite of parameters described in Section 2.1.2 and the resulting data are assumed to provide a comprehensive overview of groundwater conditions. Temporal trend analysis for arsenic, boron, cobalt, lithium, and molybdenum made use of all available sampling events between July 2016 and November 2019.

- **Porewater chemistry:** Porewater samples collected from GAPIEZ-06 (three samples total in August, September, and October 2018), DAPZ-02A (one sample collected in March 2020), and DAPZ-02B (one sample collected in March 2020) were assumed to be representative of porewater found in the CCR Unit. Data from three sampling events from GAPIEZ-06 were used to evaluate porewater trends.
- **Redox values:** ORP values measured in the field were converted to Eh by adding 200 mV to the field-measured values as per YSI Tech Note (YSI 2015).
- **Non-detect values:** Constituents with concentrations less than their respective method reporting limits were assumed to have a concentration equal to half the reporting limit in model simulations.
- **Total recoverable concentrations:** Total recoverable fraction results were used for geochemical modeling.
- **Charge balance:** Groundwater and porewater compositions with charge balance errors less than 10% were considered valid. Compositions with charge balance errors greater than 10% were flagged as potentially less reliable, but still included in the geochemical modeling effort.

3.0 SUPPLEMENTAL ASSESSMENT RESULTS

3.1 Groundwater and Porewater

3.1.1 Groundwater Characterization

Groundwater quality data for background, downgradient, and Assessment Monitoring wells used for this evaluation were collected from September 2016 to November 2019. Non-regulated (per the CCR Rule) groundwater parameters (e.g., alkalinity, potassium, sodium) are only available from September 2018 to November 2019. The assessment of trends in arsenic, boron, cobalt, lithium, and molybdenum concentrations in groundwater included observations of all validated data collected during that time frame. Groundwater quality monitoring data are presented in Appendix A and can be summarized as follows:

- **Charge balance error:** Charge balance errors could only be assessed for samples for which the full suite of cations and anions was reported. Eleven groundwater samples had charge balance errors greater than 10%. Eight out of the eleven samples (GAMW-07 in November 2019, GAMW-07B in November 2019, GAMW-08B October 2018, GAMW-08B in November 2019, GAMW-18 in October 2018, GAMW-18B in October 2018, GAMW-18B in November 2019 and GAMW-56B in April 2019) reported charge balance errors between 10% and 15%. Only samples from GAMW-07B in September 2018, GAMW-18B in April 2019, and GAMW-56 in April 2019 had a charge balance error greater than 40%. All eleven results were flagged (Table 5) and retained, with the understanding that they may be somewhat less reliable. Upon subsequent sampling, charges balance errors decreased to <10 % in these wells.
- **pH:** Groundwater pH across background, downgradient, and Assessment Monitoring wells ranged from 5.2 to 8.7. The geometric mean pH across all wells was 7.2. GAMW-07B, GAMW-52B, GAMW-54B were the only wells that produced samples with a pH exceeding 8.0.
- **ORP (Redox):** Field-measured redox, corrected to Eh (+200 millivolts [mV]) values, ranged from -115 to +335 mV in the background monitoring well, downgradient monitoring well, Assessment Monitoring well, and porewater samples collected between September 2018 to November 2019. There was no apparent trend in redox conditions based on sample location or depth.

- **Total Dissolved Solids:** Groundwater TDS concentrations were variable. Generally, the lowest TDS concentrations (less than 400 mg/L) were measured in groundwater at Assessment Monitoring wells (GAMW-46, GAMW-46B, GAMW-52, GAMW-53) while TDS concentrations up to an order of magnitude higher were determined in groundwater at wells located immediately downgradient of the CCR Unit (e.g., GAMW-08B). In general, deep wells demonstrated higher TDS concentrations than shallower companion wells at the same locations.

- **Major ion chemistry:** A Piper plot was generated for all porewater samples and groundwater samples from background, downgradient, and Assessment Monitoring wells to facilitate the identification of water types and changes in major ion chemistry over time (Figure 2a-c). The majority of background, downgradient, and porewater samples are calcium-sulfate dominated. In general, deep wells have a higher proportion of sodium and sulfate than the shallower companion wells. The differences between shallow and deep companion wells are more pronounced in the Assessment Monitoring wells. Except for GAMW-54 and GAMW-55, the shallow samples from the assessment wells are calcium-(bi)carbonate dominated and plot in a different location on the Piper plot than background, downgradient, and porewater samples. Shallow wells GAMW-54 and GAMW-55, along with all the deep Assessment Monitoring wells, are calcium-sulfate dominated and plot with background, downgradient, and porewater samples. The water types have remained generally unchanged between September 2018 and November 2019. Generally, this indicates that groundwater types are consistent. However, based on major ion chemistry, there are different water types on the site that are likely influenced by variable site geology.

- **Arsenic:** Arsenic concentrations in groundwater samples collected from downgradient monitoring and Assessment Monitoring wells between September 2016 to November 2019 ranged from non-detect (<0.005 mg/L) to 0.022 mg/L (Figure 4a-c). The highest measured arsenic concentration in groundwater at the CCR Unit (0.091 mg/L) was reported in a sample collected from background well GAMW-15 in September 2018 (Figure 4a). No downgradient monitoring well has ever exceeded the GWPS of 0.091 mg/L designated for the CCR Unit. Arsenic concentrations in groundwater appear to be stable or decreasing in all downgradient monitoring wells (Figure 4b). Arsenic concentrations in the CCR Unit porewater (GAPIEZ-06) ranged from 0.011 to 0.012 mg/L in August and October 2018 (Appendix A-2). Arsenic concentrations collected from the Drying Area in March 2020 (DAPZ-02A and DAPZ-02B) were an order of magnitude lower (<0.0010 and 0.0018 mg/L, respectively). Based on the observed pH and Eh conditions, arsenic predominately occurs as an oxidized arsenate (As^{+5}) species, with arsenic in only a small number of samples present as a reduced arsenite (As^{+3}) species (Figure 3a). Arsenite is less readily adsorbed than arsenate and is thus generally regarded to be more mobile in natural environments (Nordstrom 2014).

- **Boron:** Boron concentrations in downgradient groundwater samples collected between September 2016 to November 2019 ranged from 0.056 mg/L to 25 mg/L (Figure 5a-c). The highest boron concentration (25 mg/L) was measured in monitoring well GAMW-09B in September 2017. Two background wells (GAMW-07B and GAMW-15B), seven downgradient wells (GAMW-08B, GAMW-09, GAMW-09B, GAMW-16B, GAMW-17, GAMW-17B, and GAMW-18B) and two Assessment Monitoring wells (GAMW-54B and GAMW-55B) reported boron concentrations greater than the health-based standards (4 mg/L). Boron concentrations in porewater were between 7.4 mg/L and 13.8 mg/L. Based on pH conditions on the Site, boron in all wells occurs predominately in the form of protonated boric acid (H_3BO_3) (Figure 3b). Generally, boron concentrations in the background and downgradient wells have remained stable or has decreased. This is also the case for all assessment and boundary well except for GAMW-55B, where boron has increased slightly. GAMW-55B is a deep well and heavily influenced by bedrock.

- **Cobalt:** Cobalt concentrations ranged from non-detect (<0.001 mg/L) to 0.059 mg/L in groundwater samples collected between September 2016 to November 2019 at the CCR Unit (Figure 6a-c). GAMW-08 had the highest cobalt concentration of all monitoring wells (0.059 mg/L in November 2016) and generally reported a decreasing trend thereafter (Figure 6b). The second highest concentration (0.010 mg/L in June 2017 and October 2018) occurred in GAMW-07, a background well (Figure 6a). GAMW-08 is the only well on Site to have reported a historic cobalt level greater than the GWPS (0.010 mg/L). Cobalt in porewater ranged from below the laboratory reporting limit (<0.0010 mg/L) to 0.0022 mg/L. Cobalt in all wells occurs predominately as the divalent cation Co^{+2}, based on pH and Eh conditions (Figure 3c). Cobalt concentrations appear to be stable or decreasing in groundwater samples collected from the upgradient, downgradient, and Assessment Monitoring wells.
- **Lithium:** Lithium concentrations in groundwater ranged from non-detect (<0.008 mg/L) to 0.025 mg/L between September 2016 to November 2019 (Figure 7a-c). Two downgradient wells, GAMW-18B and GAMW-08, located directly downgradient of the MCWB, have historically had the highest lithium concentrations (Figure 7b). Lithium concentrations historically have not exceeded 0.040 mg/L, the health-based standard. Lithium levels in GAMW-08 appear generally consistent over time, and a trend cannot be determined for GAMW-18B, as the well was recently installed and fewer than four sampling events have been conducted. Lithium concentrations in groundwater at all other wells downgradient of the CCR Unit appear to be stable. Lithium was not detected above the laboratory reporting limit (0.008 mg/L) in the CCR Unit porewater (GAPIEZ-06). Lithium concentrations collected from the Drying Area in March 2020 (DAPZ-02A and DAPZ-02B) were <0.008 mg/L and 0.016 mg/L, respectively. Lithium predominately occurs as the monovalent cationic species Li^{+} based on field pH and Eh conditions (Figure 3d).
- **Molybdenum:** Molybdenum concentrations in groundwater ranged from non-detect (<0.010 mg/L) to 0.18 mg/L (Figure 8a-c). Although GAMW-18 has reported historical levels of up to 0.18 mg/L, concentrations have been below 0.1 mg/L (the health-based standard) since August 2017. No other CCR Unit monitoring wells have reported concentrations exceeding 0.1 mg/L. The molybdenum concentration in porewater has ranged from 0.063 mg/L to 0.81 mg/L. Molybdenum is predominately present in the form of the divalent anionic molybdate (MoO_4^{-2}) species based on field-measured pH and Eh conditions (Figure 3e).
- **Iron:** Total (un-filtered) iron concentrations were variable, ranging from non-detect (<0.1 mg/L) to 13 mg/L between September 2018 and November 2019 (Appendix A-1). The highest concentration of 13 mg/L was observed in the groundwater sample collected from Assessment Monitoring well GAMW-56. No geographical trend is apparent; however, deeper “B wells” generally tended to have higher total iron contents. Ferric iron (Fe^{+3}) concentrations were higher than ferrous iron (Fe^{+2}) concentrations in all samples, except for those collected from wells GAMW-15, GAMW-55B, and GAMW-56.
- **Nutrients:** Total nitrogen (nitrate + nitrite) was measured in groundwater samples collected in October 2018 and was present at low levels (i.e. less than 2.8 mg/L). Nitrate concentrations were measured in samples collected in 2019 and concentrations ranged from below the detection limit (<0.05 mg/L) to 7.7 mg/L. The highest reported nitrate concentration was found in GAMW-08 in May 2019 (7.7 mg/L-N). The presence of low-level nitrate confirms oxidized conditions surround the CCR Unit. Phosphate concentrations exceeding 1 mg/L were detected in groundwater samples from GAMW-15 and GAMW-16. Phosphate concentrations were below detection in groundwater samples collected from 18 of the 25 wells between September 2018 and November 2019. No geographical or temporal trend is apparent in the phosphate concentrations related to the CCR Unit (Appendix A).

The monitoring data also indicate that sulfate generally occurs at the highest concentrations immediately downgradient of the CCR Unit and in background monitoring wells (Figure 9a-c). As identified in Figure 2a-c, considering major groundwater chemistry and sulfate, the CCR Unit is likely influencing groundwater quality in Assessment Monitoring wells GAMW-54/54B and GAMW-55/55B. However, while affected by the CCR Unit, these wells report low concentrations of arsenic, cobalt, lithium, and molybdenum below health-based standards or below detection limits. Boron concentrations were elevated above its GWPS in both upgradient and downgradient wells, suggesting elevated concentrations are naturally occurring or due to an alternate source at the Site.

3.1.2 Evaluation of Attenuation Rates

The results of the point decay analysis for groundwater at background and downgradient wells (including Assessment Monitoring wells) between September 2016 and November 2019 are provided in Table 6, as mean site attenuation rates. This evaluation reveals that, despite concentrations generally increasing in background wells over time (as indicated by positive point decay constants), boron, cobalt, lithium, and molybdenum concentrations in downgradient wells have decreased (negative point decay constants) over that same monitoring period. The mean downgradient decay rates can be used to estimate the number of years it would take for elevated groundwater concentrations to decrease to the GWPS. Maximum concentrations of boron, cobalt and molybdenum observed in downgradient monitoring wells over the period of monitoring would take approximately 41 years, 39 years, and 20 years, respectively, to attenuate to concentrations below GWPS (or health-based standard for boron) based on these decay rates. The durations required to achieve regulatory standards for arsenic and lithium were not calculated because there are no exceedances of the GWPS for these constituents.

The positive mean point decay rate for arsenic in downgradient monitoring wells indicates that, on average, concentrations are increasing. Given the low concentrations in the porewater samples (≤ 0.012 mg/L), this trend is unlikely to be caused by the CCR Unit. Low-level increasing arsenic concentrations in Assessment Monitoring wells GAMW-52B, GAMW-53B, GAMW-54, and GAMW-54B are driving the positive point decay rate, but the arsenic concentrations in these wells remain sufficiently low (≤ 0.005 mg/L) and are likely caused by natural variability. Although an increasing trend of arsenic at these wells currently may exist, it is unlikely this trend will continue given the potential for attenuation (e.g., through sorption and dilution) to maintain arsenic concentrations below the GWPS.

3.1.3 Mineralogical Controls in Groundwater and Porewater

The results of speciation modeling of groundwater data from background, downgradient, and Assessment Monitoring wells between September 2018 and November 2019 are provided in Table 5, including saturation indices for relevant minerals. Mineral saturation can play an important role in attenuation of metals, either directly by their removal through mineral precipitation, or indirectly by providing sorptive surfaces or opportunities for co-precipitation.

- **Iron-bearing minerals:** Ferrihydrite was indicated to be at equilibrium with groundwater or oversaturated in nearly all samples, indicating a strong potential for ongoing precipitation of solid-phase iron oxides. Only two samples from Assessment Monitoring well GAMW-53 (April 2019 and November 2019) were modeled to be undersaturated with respect to ferrihydrite. Thus, it is assumed that iron (hydr)oxides are prevalent in the Site aquifers.
- **Other minerals:** Nearly all groundwater samples, with the exception of samples from GAMW-07 and GAMW-52, were simulated to be in equilibrium or oversaturated with respect to barite ($BaSO_4$). Fluorite

(CaF_2) equilibrium was indicated in wells GAMW-07B, GAMW-08/08B, GAMW-17, and GAMW-52B. Gypsum ($CaSO_4.2H_2O$) was modeled to be in equilibrium in seven wells (GAMW-07B, GAMW-08B, GAMW-15B, GAMW-16B, GAMW-18, GAMW-18B, and GAMW-55B), most of which were deeper "B-wells" nearer to bedrock. Calcite ($CaCO_3$) equilibrium was indicated in all wells except GAMW-53.

In summary, several mineral phases likely control groundwater composition at some or all wells: barite, calcite, fluorite, ferrihydrite, and gypsum. In the case of ferrihydrite, the dissolved concentrations of constituents of interest can be reduced through its ability to act as a substrate for adsorption.

3.2 Overburden Soil

3.2.1 Mineralogical Composition

Quantitative XRD with Rietveld refinement was used to identify and quantify minerals in five overburden soil samples collected during the drilling activities (Table 7). Three of the samples were collected from the Assessment Monitoring well's soil borings and two samples were collected from the downgradient soil boring (OW-9). These samples were obtained to better understand the mineralogical composition of the aquifer system and identify any minerals that would potentially influence attenuation of constituents of interest. In addition, and in contrast, the presence of certain minerals could also indicate a potential for naturally occurring release of metals into groundwater, for instance due to oxidation of sulfide minerals.

The mineralogical analysis identified the iron sulfide minerals pyrite and marcasite at low levels in three of the five overburden soil samples, at concentrations up to 0.6 wt.%. These minerals can oxidize in the presence of even trace amounts of dissolved oxygen, which would lead to the liberation of trace metals or metalloids known to associate with sulfide minerals (e.g., arsenic, cobalt, and molybdenum) into groundwater (Smith and Huyck 1997). In addition, the associated release of iron creates the potential for formation of minerals with the ability to sorb trace elements.

The presence of the oxidized iron mineral hematite (Fe_2O_3) at 0.3 to 0.6 wt.% in three of the five overburden soil samples in the presence of reduced iron sulfide minerals indicates a spectrum of oxidation occurring in overburden soil samples. As pyrite or marcasite is oxidized, intermediate amorphous iron phases, such as ferrihydrite, would likely occur first. Over time, crystallization would progress, forming iron oxide-oxyhydroxides such as hematite or goethite (FeOOH). Therefore, it is likely a range of iron solid phases is present in the overburden soil, and the potential exists over time for an increased presence of amorphous and crystallized iron oxides-oxyhydroxides with a strong affinity to attenuate certain metals and metalloids (Dzombak and Morel 1990).

The mineralogical analysis also identified the carbonate minerals calcite ($CaCO_3$) and dolomite ($CaMg(CO_3)_2$) in all overburden soil samples, with combined concentrations between 9 and 16 wt.%. Carbonate minerals are known to adsorb cobalt (Brady et al. 2003) while sorption and uptake of arsenic are possible as well (e.g., Romero et al. 2004). Carbonate minerals can dissolve when exposed to sulfuric acid formed by oxidation of sulfide minerals and release associated trace metals and metalloids (Section 3.2.2) into groundwater. Iron can also be released as carbonate minerals dissolve and potentially form metal hydroxide minerals.

3.2.2 Chemical Composition and Sequential Extraction

Chemical analysis and sequential extraction were conducted to determine the chemical composition and the distribution of constituents of interest over various operationally defined fractions of the overburden soil. This testing was completed per Table 2 on nine overburden soil samples from eight monitoring well locations, two samples from the OW-9 borehole, and one sample from within the Drying Area (reported in Table 8). Soil samples

from soil borings that correspond to well locations were collected from within the screened depth (except SB-53B 25'-27' which was collected above the screened depth).

A description of the individual fractions determined by sequential extraction is presented in Section 2.2.2, footnote 1. Metals extracted in steps 1 through 5 are considered environmentally available, whereas metals extracted in steps 6 and 7 are present in refractory fractions and are not expected to be released under conditions typically encountered in aquifers (Tessier et al. 1979). The sum of metal concentrations from the sequential extraction steps is expressed as "SEP SUM" in Table 8 and does not represent an analytically determined value. The concentration measured by total metals analysis is referred to as "SEP Total" in Table 8. Boron was not included in the SEP analysis due to method limitations.

The results from the chemical analysis and sequential extraction can be summarized as follows:

- **Iron:** Iron was present in all twelve samples analyzed, varying from 3,400 milligram per kilogram (mg/kg) (DA-14) to 9,900 mg/kg (SB-54B). In all samples, the refractory sulfide and residual fractions accounted for the largest proportion of total iron and, as such, most of the iron is not environmentally available (Figure 10). The labile fraction in steps 1 through 5 can generally be considered representative of the amount of iron in the overburden that may be available as a sorbing medium. While not a constituent of interest, iron and its minerals commonly represent the most important reservoir for metal/metalloid attenuation in soils or overburden. The labile fraction calculated from sequential extraction, therefore, can be used as a proxy for determining the total number of adsorption sites available for attenuation of arsenic, boron, cobalt, and molybdenum in the environment.
- **Arsenic:** Total arsenic in the soil overburden samples ranged from 1.9 to 6.2 mg/kg while the environmentally-available fraction ranged from 0.44 mg/kg in SB-55B to 3.0 mg/kg in SB-53B, representing from 31% to 59% of total arsenic (Figure 11). The majority of arsenic was present in the refractory fraction, predominantly associated with sulfide minerals. The amorphous metal and metal hydroxide fractions hosted all arsenic that was environmentally available except in SB-52B, where the carbonate fraction represented 8.5% of total arsenic. The highest concentrations of environmentally-available arsenic occurred in sample SB-56B, and the lowest concentrations were encountered in samples DA-14, SB-53B and SB-55B. The Drying Area sample (DA-14) had the second lowest environmentally-available arsenic concentrations (0.45 mg/kg) of all samples analyzed. Arsenic in DA-14 predominantly occurred in the sulfide and insoluble fractions.
- **Cobalt:** Total cobalt in soil borings ranged from 2.5 mg/kg to 6.1 mg/kg while the environmentally-available fraction ranged from 1.1 mg/kg in OW-9 to 2.9 mg/kg in SB-53B, representing from 27% to 60% of total cobalt (Figure 12). Those samples downgradient of the CCR Unit had similar total cobalt in the environmentally-available fraction as the background samples. In all boring samples, cobalt was most abundant in the metal hydroxide, sulfide, and residual fractions. Cobalt was also present in the carbonate phase in the nine soil bore samples (5% to 14% of total). Cobalt in the carbonate phase is most likely sorbed onto or coprecipitated with the calcite that was indicated to be in equilibrium with groundwater in geochemical modeling. Cobalt was not detected in the exchangeable phase. DA-14 reported the lowest total and environmentally-available cobalt concentrations (0.87 mg/L and 0.39 mg/L, respectively) of all samples analyzed, predominantly in the metal hydroxide and sulfide fractions.
- **Lithium:** Total lithium ranged from 4.2 to 11 mg/kg while the environmentally-available fraction ranged from 0.5 mg/kg in DA-14 to 11.4 mg/kg in SB-18B, representing from 12% to 74% of total lithium (Figure 13). The

majority of lithium was present in either the organic or the refractory fraction. The organic, carbonate, and metal hydroxide fractions hosted all lithium that was environmentally available. The highest concentrations of environmentally-available lithium occurred in samples SB-18B, SB-54B, SB-55B and SB-56B, and the lowest amount was encountered in SB-53B. Lithium concentrations in DA-14 were generally lower than in background and downgradient monitoring wells, with the majority of the lithium present in the sulfide and residual fractions.

- **Molybdenum:** Total molybdenum in overburden ranged from 0.15 to 3.8 mg/kg while the environmentally-available fraction ranged from non-detect to 2.83 mg/kg, in SB-53B (25'-27'), and accounted for 100% of all molybdenum in SB-18B and SB-53B (30'-32') (Figure 14). Molybdenum was most commonly present in the amorphous and metal hydroxide fractions. Notably, in background boring SB-07B and in SB-08B, a downgradient boring in close proximity of the CCR Unit, molybdenum was non-detect in overburden soil samples. The soil boring with the highest total molybdenum content, SB-53B, is located further downgradient from the CCR Unit. The Drying Area sample (DA-14) had the highest concentrations (15 mg/kg) of all samples analyzed. Molybdenum in DA-14 was present predominantly in the exchangeable fraction.

In summary, no definitive trends were present for arsenic, cobalt, lithium or molybdenum that indicated a higher concentration immediately downgradient of the CCR Unit relative to background locations or locations further downgradient. Based on the above results, attenuation by adsorption of all four constituents of interest is likely occurring, with the carbonates, amorphous metal oxides, and metal hydroxide fractions accounting for the majority of the attenuation.

4.0 GROUNDWATER MODELING RESULTS

Through standard numerical groundwater modeling procedures, Golder developed a steady state groundwater flow model for the Site that is considered calibrated and verified. Details of the flow model development are presented in Appendix B. This model was utilized to inform the natural attenuation study by simulating travel times for particles released from the MCWB, as presented in Table 4.

5.0 GEOCHEMICAL MODELING RESULTS

5.1 Identification and Capacity of Attenuation Mechanisms

5.1.1 Adsorption to Iron and Aluminum Oxyhydroxides

The Hfo and Hao surface area and sorption site calculations for the minimum, mean, and maximum soil boring iron and aluminum concentrations are presented in Table 10. Adsorption modeling in PHREEQC revealed a large range of adsorption capacities expected for the different constituents at the site. Figure 15 displays the predicted trajectories of aqueous concentrations before and after adsorption onto Hfo and Hao in soils (minimum, mean and maximum Hfo and Hao), as additional arsenic, boron, cobalt, and molybdenum are titrated into solution. The bold lines display the geometric means for all groundwater scenarios within each soil scenario and the grey area represents the range for the 5th to 95th percentile of all soil scenarios. As mentioned in Section 2.4.3.1.2, lithium adsorption to iron and aluminum oxyhydroxides was not modeled due to a lack of available thermodynamic data.

The predicted trajectories are compared against the GWPS and porewater concentrations. On the plots, the further the predicted trajectories are to the right of the 1:1 line, the larger the amount of the constituent that has sorbed to Hfo and Hao surface sites in soils and is no longer predicted to reside in the aqueous phase. For boron, little to no adsorption is predicted by the model, so aqueous concentration before adsorption are almost identical to concentrations after adsorption. For arsenic, a large proportion is expected to adsorb, with a capacity to bring

average arsenic concentrations to below 0.01 mg/L when concentrations are at approximately 10 mg/L or lower prior to adsorption. At higher arsenic concentrations (> 10 mg/L), the relative sorption capacity is diminished as sorption sites are filled and aqueous concentrations after adsorption are predicted to increase above its GWPS. For cobalt and molybdenum, the trajectories run parallel to the 1:1 line, indicating that sorption capacity is directly proportional to the concentration before adsorption. The modeling results suggest that adsorption has the capacity to reduce cobalt concentrations below approximately 0.1 mg/L down to the GWPS of 0.01 mg/L and molybdenum concentrations below approximately 0.2 mg/L down to the GWPS of 0.1 mg/L. The 95th percentile of modeled trajectories show that a minority of pH and redox conditions at site were less favorable for attenuating cobalt or molybdenum, as seen by the proximity to the 1:1 line.

5.1.2 Co-precipitation

In addition to adsorption, co-precipitation or the direct incorporation of trace metals such as cobalt into precipitated iron oxide-oxyhydroxides has been well studied in literature (Butt et al. 2000; Dzombak and Morel 1990; Smith 1999). For the soils analyzed by sequential extraction (Section 3.2.2), all samples had higher concentrations of cobalt in the amorphous and metal hydroxide phases than indicated by adsorption modeling. This suggests that cobalt concentrations also may be attenuated during the formation of ferrihydrite (Butt et al. 2000; Tebo et al. 2004). Cobalt was also identified by SEP to be associated with carbonate minerals, likely due to co-precipitation with the dolomite or calcite identified by mineralogical analysis. Arsenic co-precipitation with amorphous phases of iron and other metal oxyhydroxides is also considered possible. However, per the SEP results, no arsenic was found to be associated with carbonate minerals. Co-precipitation is either not likely or relevant for boron, lithium, and molybdenum.

5.1.3 Physical Attenuation

Table 9 presents the predicted concentrations at Assessment Monitoring wells, assuming the minimum and maximum amount of dilution and dispersion downgradient of the CCR Unit (Section 4.0). The highest concentrations of arsenic, boron, cobalt, lithium, and molybdenum measured in porewater were “diluted” in the geochemical simulations with the maximum concentrations observed in side-gradient wells GAMW-52, GAMW-52B, GAMW-56, and GAMW-56B to provide a conservative estimate of dilution and dispersion.

For arsenic, cobalt, and lithium, the maximum concentrations in porewater were below the GWPS. Dilution and dispersion with groundwater from side-gradient wells generally resulted in a further decrease below the GWPS. At GAMW-56, arsenic and cobalt concentrations were elevated over those in porewater. Consequently, dilution/dispersion of porewater with water from GAMW-56 resulted in higher concentrations relative to porewater, though still below GWPS.

For boron the maximum porewater concentrations were elevated above the health-based standard (345%) and for molybdenum, the maximum porewater concentrations were elevated above the GWPS (810%). The 32 to 63 percent reduction in concentrations by dilution and dispersion alone was not sufficient to bring the maximum porewater concentrations below the relevant standards. For boron, concentrations in background monitoring well GAMW-15 were twice as high as those in porewater. Due to this background source, boron concentrations in side-gradient wells are also relatively high and limit the effectiveness of dilution to reduce boron concentrations downgradient of the CCR Unit. For molybdenum, concentrations in monitoring wells have been below GWPS since March 2018, indicating additional dilution/dispersion or other attenuating processes have reduced porewater concentrations between the CCR Unit and the monitoring wells. As a consequence, molybdenum concentrations will likely remain below the GWPS.

5.2 Long-Term Stability of Attenuated Constituents

The expected variations in dissolved concentration as a function of pH, Eh, and TDS are presented in Figures 16, 17, and 18, respectively. Results are presented along with GWPS values and the range of pH, Eh, or TDS values (5th percentile to 95th percentile) observed at the Site. Responses to changes in pH, Eh, and TDS vary widely by constituent. The results of the adsorption stability modeling for arsenic, boron, cobalt, and molybdenum can be summarized as follows:

- **Arsenic:** For the range of pH values observed at the site, greater than 95% of the arsenic is expected to sorb to Hfo and Hao (Figure 16a). At pH values below 6.0, a conversion of arsenate to arsenite is modeled to release the adsorbed arsenic into groundwater. For alkaline pH values between 8.0 and 10.0, there is a small amount of additional capacity for arsenic to adsorb. At extremely alkaline conditions (pH greater than 10.0), higher proportions of negatively-charged sorption sites on Hfo and Hao limit the effectiveness of sorption of anionic species, resulting in higher amounts of desorbed arsenic. Under reducing conditions (Eh less than -100 mV), arsenic is largely present as arsenite and sorption is limited (Figure 17a). Over intermediate redox conditions (Eh between 0 and 500 mV), adsorbed arsenic is relatively stable. Above 500 mV, arsenic is expected to desorb again. Under increasing TDS concentrations (Figure 18a), arsenic sorption declines as other anions compete with and replace arsenic from sorption surfaces. For arsenic, TDS concentrations at the Site could quadruple relative to observed values before aqueous concentrations increase above the GWPS.
- **Boron:** Based on the relatively small proportion of boron that can be adsorbed to Hfo and Hao surface sites, changes in pH, Eh, and TDS concentrations are modeled to have only a minor impact on aqueous concentrations, as evidenced by the horizontal trends in Figures 16b, 17b, and 18b.
- **Cobalt:** The pH response of cobalt (Figure 16c) is broadly similar to that of arsenic, with cobalt being nearly completely in dissolved form under acidic conditions but generally sorbed under alkaline conditions. Cobalt was generally modeled to be unresponsive to changes in redox conditions (Figure 17c), with little additional cobalt sorbing or desorbing over the range of tested Eh conditions. Cobalt was also not responsive to increases in TDS concentrations (Figure 18c), with sorption remaining relatively unchanged as TDS concentrations increased 4- to 40-fold above the commonly-observed range at the Site.
- **Molybdenum:** For molybdenum, lower pH values (more acidic conditions) were generally more favorable for adsorption (Figure 16d). At alkaline pH values (pH greater than 10), nearly all molybdenum is desorbed and present in the dissolved phase. Over the range of common Eh values at site (Figure 17d), molybdenum sorption is relatively stable. Highly reducing conditions are predicted to increase molybdenum adsorption and highly oxidizing conditions are predicted to reduce adsorption. Molybdenum adsorption is generally insensitive to increases in TDS concentrations (Figure 18d), with TDS concentrations up to 10,000 mg/L less than doubling the aqueous concentrations due to desorption.

6.0 TIER I EVALUATION

The potential for natural attenuation of arsenic, boron, cobalt, lithium, and molybdenum was evaluated in accordance with recommended practices and guidance promulgated by the USEPA and the ITRC (USEPA 2007a; USEPA 2007b; ITRC 2010). According to USEPA (USEPA 2007a), the purpose of the Tier 1 evaluation is to “Demonstrate that the groundwater plume is not expanding and that sorption of the contaminant onto aquifer solids is occurring where immobilization is the predominant attenuation process.” Based on this definition, the following observations support MNA as a viable corrective measure for the CCR Unit:

- **Plume Stability:** Based on the water quality monitoring data presented in this Assessment Monitoring, groundwater concentrations of arsenic, boron, cobalt, lithium, and molybdenum outside of the CCR Unit appear to be stable or decreasing. Evaluation of trend charts generally did not reveal increasing trends in wells downgradient of the CCR Unit (Figures 4 to 8), including for parameters such as boron and sulfate, which are considered common indicators of CCR leaching (Figures 5 and 10). These observations indicate that the distribution of arsenic, boron, cobalt, lithium, and molybdenum in the aquifer is stable.
- **Magnitude of Exceedances:** Arsenic has remained below the CCR Unit GWPS (0.091 mg/L) in all downgradient monitoring wells. Boron concentrations exceed the health-based standard (4 mg/L) in nine of the downgradient (Downgradient Monitoring and Assessment Monitoring) wells, but concentrations are generally within the range of background monitoring well concentrations, suggesting naturally-elevated levels or an alternative source of boron causing the concentrations in groundwater at the Site. The cobalt concentration in groundwater at GAMW-08, the only downgradient monitoring well exceeding the GWPS, has shown a decreasing trend since 2016. The most recent concentration of cobalt (0.011 mg/L in November 2019) was just 0.001 mg/L above the GWPS of 0.010 mg/L. No wells exceed the health-based lithium standard (0.04 mg/L). Molybdenum concentrations in all wells have been consistently below the health-based standard of 0.1 mg/L since August 2017, indicating a low likelihood of a future exceedances based on historical trends.
- **CCR Unit Porewater:** The CCR Unit at RMSGS was placed into service in 1976 and historical records are not available for ash additions or porewater concentrations over the CCR Unit's lifespan. However, based on recent porewater data, the arsenic concentration in the CCR Unit (0.011 mg/L to 0.018 mg/L) is well below the GWPS of 0.091 mg/L. Cobalt and lithium concentrations in porewater in the CCR Unit were low and only detected above their laboratory reporting limit in a single sample (0.0022 mg/L and 0.016 mg/L, respectively). This indicates that the CCR Unit is not a potential source for these metals. Boron concentrations in the porewater (8.3 mg/L to 13.8 mg/L) are elevated above the health-based standard of 4 mg/L but are below levels observed in the two deep background monitoring wells GAMW-07B (15-23 mg/L) and GAMW-15B (13-18 mg/L). Molybdenum in the CCR Unit was measured at concentrations up to 0.81 mg/L, above its GWPS. Even so, molybdenum concentrations in groundwater downgradient of the CCR Unit are currently below the GWPS.
- **Groundwater Chemistry:** The groundwater monitoring results and the findings of the geochemical modeling support the potential for natural attenuation of arsenic, boron, cobalt, lithium, and molybdenum. Equilibrium of groundwater with the mineral phase ferrihydrite was modeled to occur in all groundwater samples and calcite equilibrium was indicated in all downgradient monitoring wells except GAMW-53. This is consistent with the results from the sequential extraction analysis that indicate carbonate, amorphous, and metal hydroxide fractions sequester arsenic, boron, cobalt, lithium, and molybdenum.
- **Confirmation of Attenuation/Immobilization:** Based on both mineralogical and chemical analysis, it is evident that attenuation of arsenic, cobalt, lithium, and molybdenum by aquifer materials is occurring. Iron, capable of forming (hydr)oxide phases that facilitate metals attenuation (Dzombak and Morel 1990), was identified in all overburden samples. Mineralogical analysis confirmed iron was present as an oxide phase in the form of hematite in all overburden samples. Arsenic, cobalt, lithium, and molybdenum demonstrated a high degree of immobilization due to attenuation on carbonate, amorphous, and metal hydroxide fractions. This indicates that these phases have been and are scavenging or attenuating constituents that were once present in solution. Groundwater samples from Assessment Monitoring wells GAMW-53/53B, GAMW-

54/54B, GAMW-55/55B, and GAMW-56/56B report a similar major ion signature as groundwater in monitoring wells proximal to the CCR Unit. However, no arsenic, cobalt, lithium, or molybdenum has been detected in these wells above background levels. In addition, soil borings from these wells contained significant proportions of constituents attenuated in various phases, especially in the case of lithium. As a result, the groundwater concentrations of these constituents are maintained at low levels, demonstrating attenuation.

Based on these findings, arsenic, boron, cobalt, lithium, and molybdenum were considered candidates for an MNA remedy application and were deemed to meet the criteria for Tier I MNA in accordance with USEPA guidance (USEPA 2007a,b).

7.0 TIER II EVALUATION

The purpose of the Tier II evaluation is to "Identify mechanisms and rates of the operative attenuation process." Based on this definition, the following modeling results and observations support MNA as a viable corrective measure for the CCR Unit:

- **Adsorption Capacity Modeling:** PHREEQC modeling results show that adsorption is likely attenuating arsenic, cobalt and, to a lesser degree, molybdenum downgradient of the CCR Unit. This is concluded based on equilibration of site-specific groundwater compositions with the range of Hfo and Hao concentrations observed in SEP results of Site overburden soils. Minor amounts of boron are also expected to attenuate. The sorbing capacity of Hfo and Hao surface sites is partially dependent on the concentrations of the constituents of interest in groundwater. The titration modeling (Figure 15) shows how the soil's capacity to adsorb constituents increases if groundwater concentrations of arsenic, boron, cobalt, and molybdenum were to increase above current levels. In addition to metal oxyhydroxides, clay minerals and/or particular organics can also act as a substrate for attenuation (Goldberg et al. 1993; Goldberg and Forster 1996), but this mechanism was not included in the current evaluation.

  The findings from the modeling are supported by the results of the sequential extraction testing. The presence of arsenic, cobalt, lithium, and molybdenum in the amorphous and metal oxyhydroxide fractions of soils indicates that adsorption is occurring spatially across the monitored area downgradient of the CCR Unit.

- **Co-precipitation:** In addition to adsorption, co-precipitation or the direct incorporation of trace metals such as cobalt into precipitated iron oxide-oxyhydroxides has been well studied in literature (Butt et al. 2000; Dzombak and Morel 1990; Smith 1999). For the soils analyzed by sequential extraction (Section 3.2.2), all samples had higher concentrations of cobalt in the amorphous and metal hydroxide phases than indicated by adsorption modeling. This suggests that cobalt concentrations also may be attenuated during the formation of ferrihydrite (Butt et al. 2000; Tebo et al. 2004). Cobalt was also identified by SEP to be associated with carbonate minerals, likely the result of co-precipitation with dolomite or calcite, which were identified by mineralogical analysis. Arsenic co-precipitation with amorphous phases of iron and other metal oxyhydroxides is also possible. However, there was no arsenic associated with carbonate minerals as identified by SEP. Co-precipitation is either not likely or relevant for boron, lithium, and molybdenum.

- **Estimated Site Attenuation Rates:** Concentrations of boron, cobalt, lithium, and molybdenum are decreasing in downgradient monitoring wells, resulting in negative calculated point decay rates. A positive point decay rate for arsenic suggests that its concentrations are increasing, but low concentrations in porewater indicate that the trend does not imply an impact from the CCR Unit. Increasing arsenic concentrations in Assessment Monitoring wells GAMW-52B, GAMW-53B, GAMW-54, and GAMW-54B are

driving the positive point decay rate, but the arsenic concentrations in these wells are low (less than 0.005 mg/L) and are likely driven by natural variability. Using the mean decay rate, maximum concentrations of boron, cobalt and molybdenum observed in downgradient and Assessment monitoring wells would take approximate 41 years, 39 years, and 20 years, respectively, to attenuate to below GWPS. Arsenic and lithium concentrations in downgradient and Assessment Monitoring wells are already below the GWPS.

- **Advanced Groundwater Modeling:** Groundwater flow results indicate between 32% and 63% dilution and dispersion of groundwater at monitoring wells with upgradient and side-gradient water as it flows towards the Assessment Monitoring wells. This dilution and dispersion attenuate concentrations along the flow paths. Arsenic, cobalt, and lithium concentrations in porewater are already below GWPS in the available monitoring data (August 2018 to March 2020). Dilution and dispersion with groundwater from side-gradient Assessment Monitoring wells (GAMW-52/52B and GAMW-56/56B) would further reduce these concentrations relative to the GWPS. Boron and molybdenum concentrations are elevated above the health-based standards in porewater (and in background wells for boron). As such, while dilution and dispersion reduce concentrations by about 30% to 60%, this is insufficient to dilute porewater to such a degree that the resulting boron and molybdenum concentration decline to below the health-based standards. The concentrations of molybdenum measured in downgradient groundwater at Assessment Monitoring wells have remained below the GWPS, so additional physical and/or chemical attenuation is likely occurring between the CCR Unit and the Assessment Monitoring wells. Modeled groundwater velocities indicate that travel times between downgradient and Assessment Monitoring wells are between 4.5 and 31 years. The modeling results also indicate that groundwater would take between 27 and 130 years to travel from the downgradient monitoring wells to the property boundary (GAMW-46/46B).

Based on these findings, arsenic, boron, cobalt, lithium, and molybdenum were considered to be candidates for an MNA remedy application and deemed to meet the criteria for Tier II MNA in accordance with USEPA guidance (USEPA 2007a and 2007b).

8.0 TIER III EVALUATION

According to USEPA (USEPA 2007a), the purpose of the Tier III evaluation is to eliminate sites for an MNA remedy where (1) “Capacity of the aquifer is insufficient to attenuate the COC mass to regulatory standards” and/or (2) “Stability of the immobilized COC is insufficient to prevent remobilization due to future changes in groundwater chemistry”. Based on this definition, the following observations support MNA as a viable corrective measure for the CCR Unit:

- **Adsorption Capacity Modeling:** For arsenic, titration modeling shows that groundwater concentrations could increase up to approximately 2.5 mg/L before exceeding the capacity of soils (95th percentile of scenarios) to attenuate arsenic below the GWPS (0.091 mg/L). Groundwater arsenic concentrations up to 10 mg/L are predicted to attenuate below the GWPS for the average soil capacity scenario. Similarly, cobalt concentrations in groundwater could increase up to approximately 0.02 mg/L before exceeding the capacity of soils (95th percentile of scenarios) to attenuate cobalt below the GWPS (0.01 mg/L). Under the average soil capacity scenario, the aquifer has the capacity to reduce cobalt concentrations as high as 0.1 mg/L to below the GWPS.

  For boron and molybdenum, modeling suggests that adsorption can reduce a portion of the dissolved load, but that there is not sufficient adsorption capacity alone to reduce the concentrations observed in porewater below the health-based standard. However, current molybdenum concentrations observed in downgradient

and Assessment Monitoring wells indicate that the combined long-term attenuation from sorption, dilution, and dispersion is sufficient to reduce concentrations below health-based standards. In addition to iron oxyhydroxides, molybdenum and boron (as well as arsenic and cobalt) are known to adsorb to other metal (hydr)oxides (e.g., manganese, aluminum), clay minerals and particulate organic matter, providing additional sorption capacity in the soils.

- **Stability Modeling for Adsorbed Constituents:** Stability modeling indicates that for the conditions (i.e. pH, Eh, and TDS ranges) determined in groundwater at the Site, adsorbed species of arsenic, boron, cobalt, and molybdenum are relatively stable and remain attenuated. The modeling results further suggest that the adsorption of arsenic, cobalt, and molybdenum could be reversed with sufficiently large fluctuations in pH and Eh conditions at the Site, but there is no historical basis to expect such occurrences. Based on the mineralogical test results for Site soils, carbonate minerals are widely distributed downgradient of the CCR Unit. Groundwater that is in contact with carbonate minerals is typically buffered against large fluctuations in pH. Total alkalinity concentrations in groundwater at the Site (generally between 50 and 410 mg $CaCO_3$/L) support the notion that the groundwater has significant buffering capacity.

  Modeling results also indicate that increasing TDS concentrations could result in an increase in aqueous concentrations of arsenic, cobalt, and molybdenum due to competition for sorption sites. However, the impact is predicted to be relatively minor over the range of TDS concentrations observed at the site. The maximum TDS concentration measured in porewater was 3,830 mg/L and even at those levels, there is sufficient attenuation capacity from the soils to maintain arsenic, boron, cobalt, and molybdenum concentrations below GWPS

9.0 CONCLUSIONS

Golder performed a supplemental Assessment Monitoring followed by an attenuation evaluation, which serve as the Tier I, II, and III evaluation of MNA feasibility at RMSGS for arsenic, boron, cobalt, lithium, and molybdenum with respect to the CCR Unit. This evaluation has been completed in accordance with guidance and best practices promulgated by the USEPA (USEPA 2007a and 2007b) and the ITRC (ITRC 2010). Based on the results of this evaluation, Golder makes the following assessment for the individual parameters:

- Arsenic: Physical and chemical attenuation is occurring and co-precipitation is possible, levels are stable, and the aquifer has the capacity to attenuate arsenic. Arsenic is a candidate for MNA at the RMSGS Site.
- Boron: Physical attenuation of boron is occurring at the RMSGS based on substantial decreases of boron in assessment wells. However, the high levels of boron upgradient of the CCR impoundments make it difficult to determine if the evaluation of if MNA will be successful. An alternative or natural source of boron should be further investigated prior to making a MNA determination for boron based on current findings.
- Cobalt: Chemical and physical attenuation is occurring and co-precipitation is possible, levels are stable, and the aquifer has the capacity to attenuate arsenic. Cobalt is a candidate for MNA at the RMSGS Site.
- Lithium: Physical attenuation is occurring, levels are stable, and the aquifer has the capacity to attenuate arsenic. Lithium is a candidate for MNA at the RMSGS Site.
- Molybdenum: Physical and some chemical attenuation is occurring, levels are stable, and the aquifer has the capacity to attenuate arsenic. Molybdenum is a candidate for MNA at the RMSGS Site.

Therefore, it is recommended that a Tier IV evaluation be completed to design a long-term monitoring plan and contingent remedy for arsenic, boron, cobalt, lithium, and molybdenum.

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Tables

Table 4: Summary of Travel Time Simulations and Attenuation Estimates
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

	Shallow Flow Paths				Deep Flow Paths			
Starting Well	**GAMW-16**	**GAMW-18**	**GAMW-17B**	**GAMW-09B**	**GAMW-16B**	**GAMW-18B**	**GAMW-17B**	**GAMW-09B**
Ending Well	**GAMW-53**	**GAMW-55**	**GAMW-54B**	**GAMW-54B**	**GAMW-53B**	**GAMW-55B**	**GAMW-54B**	**GAMW-54B**
Distance (ft)	**1521**	**1964**	**1200**	**1714**	**1521**	**1964**	**1200**	**1714**
Effective Porosity = 16%								
Travel Time (years)	4.8	11.0	4.5	8.9	5.0	11.0	5.5	9.0
Velocity (ft/year)	317	179	267	193	304	179	218	190
Time to Davis Ditch (years)	5.5	-	-	-	6	-	-	-
Time to property boundry near GAMW46B (years)	-	27	49	41	-	28.5	45	41
Effective Porosity = 30%								
Travel Time (years)	8.5	19.8	8.0	16.0	8.9	20.0	10.0	16.5
Velocity (ft/year)	179	99	150	107	171	98	120	104
Time to Davis Ditch (years)	10	-	-	-	9.9	-	-	-
Time to property boundry near GAMW46B (years)	-	49.8	79	75	-	51.5	80	76
Effective Porosity = 46%								
Travel Time (years)	13.0	31.0	12.0	25.0	13.5	29.0	15.0	25.0
Velocity (ft/year)	117	63	100	69	113	68	80	69
Time to Davis Ditch (years)	15	-	-	-	15	-	-	-
Time to property boundry near GAMW46B (years)	-	76.8	122	117	-	77	130	120
Estimate of Dilution/Attenuation Along Flow Path								
Starting concentration (mg/L)	9.7	13	12	12	9.7	13	12	12
End concentration (mg/L)	3.1	8.2	6.4	6.4	3.1	8.2	6.4	6.4
End Concentration as % of starting concentration	32%	63%	53%	53%	32%	63%	53%	53%
Dilution/Attenuation along flow path	68%	37%	47%	47%	68%	37%	47%	47%

Notes:
ft = feet
mg/L = milligrams per liter

Prepared by: GOL
Checked by: PJN
Reviewed by: RWB

Table 5: Groundwater Geochemical Modeling Results
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Parameter	Units	GAPIEZ06 08-2018	GAPIEZ06 09-2018	GAPIEZ06 10-2018	DAPZ-02A 03-2020	DAPZ-02B 03-2020	GAMW04 10-2018	GAMW04 04-2019	GAMW04 11-2019	GAMW07 10-2018	GAMW07 05-2019	GAMW07 11-2019	GAMW07B 09-2018	GAMW07B 10-2018	GAMW07B 05-2019	GAMW07B 11-2019
Charge Balance	% error	-3.9	-1.3	-5.5	-7.8	-4.3	5.1	-1.3	-9.0	-3.7	-3.7	**-10.8**	**82.8**	-6.8	-7.0	**-10.1**
MINERAL PHASES - Saturation Indices [a]																
Otavite	$CdCO_3$	-2.3	-2.3	-1.1	-3.2	-2.6	-2.9	-3.1	-2.4	-3.8	-2.3	-2.1	-1.5	-3.2	-2.4	-2.8
Ferrihydrite	$Fe(OH)_3$	**2.1**	**2.1**	**3.1**	**0.5**	**2.2**	**2.9**	**1.4**	**0.5**	-6.6	**1.9**	**0.4**	**3.6**	-1.6	**4.2**	**-0.2**
Siderite	$FeCO_3$	**-0.1**	**-0.1**	-0.8	**-0.4**	-0.7	-2.1	**0.5**	-1.7	-3.3	-3.6	-1.4	**1.1**	-0.5	-0.7	**-0.3**
Melanterite	$FeSO_4$ $7H_2O$	-4.9	-5.0	-7.2	-4.5	-5.1	-6.1	-4.0	-6.5	-6.7	-8.3	-6.5	-6.8	-4.4	-5.3	-4.5
Anglesite	$PbSO_4$	-4.5	-4.5	-6.1	-4.2	-4.4	-4.0	-4.2	-4.5	-4.2	-4.5	-4.7	-7.4	-4.0	-4.3	-4.1
Gypsum	$CaSO_4$:$2H_2O$	-0.6	-0.6	-0.6	-0.7	-1.0	**0.0**	**-0.4**	-0.7	-0.6	-0.7	-0.7	-2.5	**-0.2**	**-0.2**	**-0.2**
Jarosite-H	$(H_3O)Fe_3(SO_4)_2(OH)_6$	-7.1	-6.9	-11.4	-7.6	-5.6	-3.6	-8.9	-10.7	-26.4	-6.7	-12.2	-10.2	-15.0	-0.7	-12.1
Jarosite-K	$KFe_3(SO_4)_2(OH)_6$	**-0.4**	**-0.3**	-3.0	-2.1	**1.3**	**4.5**	-1.3	-4.3	-21.4	**0.2**	-5.3	-2.2	-8.4	**6.8**	-5.1
Jarosite-Na	$NaFe_3(SO_4)_2(OH)_6$	-2.5	-2.4	-4.9	-5.0	-1.8	**1.6**	-3.0	-6.7	-24.5	-3.0	-8.6	-4.3	-10.6	**4.5**	-7.6
Calcite	$CaCO_3$	**0.3**	**0.2**	**1.8**	-0.6	**-0.4**	**0.0**	**0.1**	**0.1**	-1.2	**0.2**	**0.4**	**1.3**	**-0.3**	**0.4**	**0.0**
Magnesite	$MgCO_3$	-0.9	-1.0	**0.5**	-2.1	-1.7	-1.5	-1.4	-1.3	-2.6	-1.1	-0.9	**0.0**	-1.5	-0.8	-1.3
Barite	$BaSO_4$	**0.7**	**0.6**	**0.7**	**1.0**	**0.9**	**0.9**	**1.1**	**0.9**	**0.9**	**0.9**	**0.7**	-1.2	**1.2**	**1.1**	**1.0**
Witherite	$BaCO_3$	-3.8	-3.9	-2.3	-4.4	-3.9	-4.4	-3.7	-3.6	-5.1	-3.7	-3.5	-2.7	-4.3	-3.6	-4.1
Fluorite	CaF_2	-1.0	-0.8	-1.0	-2.0	-2.4	-2.3	-1.5	-2.1	-1.1	-0.8	-1.0	**0.8**	**-0.4**	-0.6	-0.6
CoCO3	$CoCO_3$	-4.2	-4.4	-2.9	-4.3	-4.2	-4.1	-4.2	-4.3	-4.3	-3.1	-3.0	-3.2	-5.0	-4.2	-4.6
Cerrusite	$PbCO_3$	-2.0	-2.1	-2.1	-2.6	-2.0	-2.2	-2.0	-2.1	-3.2	-2.0	-2.0	-1.9	-2.5	-2.0	-2.2
Carbon Dioxide	$pCO_2(g)$ [b]	-2.3	-2.2	-4.5	-1.0	-1.8	-2.4	-2.4	-1.7	**-0.3**	-1.8	-2.1	-3.2	-1.6	-2.4	-2.0

Notes:
Charge balances errrors highlighted in **red** are greater than +/-10%
Non-detect values assumed equal to 1/2 analytical detection limit
Redox converted from field ORP to Eh by +200 mV
[a] Saturation indices greater than -0.5 are identified by bold type and grey shading
[b] pCO2(g) values presented at 10^^value atm

Table 5: Groundwater Geochemical Modeling Re
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Parameter	Units	GAMW08 10-2018	GAMW08 05-2019	GAMW08 11-2019	GAMW08B 09-2018	GAMW08B 10-2018	GAMW08B 05-2019	GAMW08B 11-2019	GAMW09 10-2018	GAMW09 05-2019	GAMW09 11-2019	GAMW09B 09-2018	GAMW09B 10-2018	GAMW09B 05-2019	GAMW09B 11-2019
Charge Balance	% error	-2.9	-3.7	-6.6	-9.7	**-12.2**	-8.3	**-11.7**	-5.0	-5.0	-6.0	-5.7	-6.7	-3.0	-6.5
MINERAL PHASES - Saturation Indices [(a)]															
Otavite	$CdCO_3$	-2.5	-2.1	-2.0	-2.3	-2.5	-2.5	-2.2	-3.0	-2.8	-2.8	-2.4	-2.3	-2.2	-2.2
Ferrihydrite	$Fe(OH)_3$	**1.7**	**2.3**	**2.4**	**1.8**	**3.1**	**4.1**	**3.6**	**0.2**	**1.3**	**0.7**	**2.0**	**2.5**	**3.7**	**2.2**
Siderite	$FeCO_3$	-1.8	-2.2	-2.1	**0.2**	**0.1**	**-0.4**	**0.1**	-2.3	-3.1	-2.5	**-0.2**	**-0.1**	**-0.2**	**0.1**
Melanterite	$FeSO_4\ 7H_2O$	-6.7	-7.3	-7.2	-4.5	-4.4	-4.9	-4.6	-6.7	-7.3	-7.0	-5.1	-5.1	-5.2	-5.0
Anglesite	$PbSO_4$	-4.6	-4.8	-4.8	-4.4	-4.2	-4.2	-4.4	-4.3	-4.2	-4.3	-4.5	-4.6	-4.7	-4.7
Gypsum	$CaSO_4{:}2H_2O$	-0.7	-0.6	-0.5	**-0.2**	**-0.2**	**-0.2**	**-0.2**	-0.7	-0.6	-0.8	-0.8	-0.7	-0.8	-0.9
Jarosite-H	$(H_3O)Fe_3(SO_4)_2(OH)_6$	-6.6	-6.5	-6.5	-8.4	-3.5	-0.9	-3.6	-10.6	-8.2	-10.1	-6.8	-6.1	-2.6	-7.3
Jarosite-K	$KFe_3(SO_4)_2(OH)_6$	**0.0**	**0.9**	**1.0**	-1.3	**3.4**	**6.2**	**4.0**	-4.3	-1.3	-3.7	**-0.3**	**0.5**	**4.2**	-0.7
Jarosite-Na	$NaFe_3(SO_4)_2(OH)_6$	-2.9	-2.1	-1.9	-3.1	**1.4**	**4.3**	**2.0**	-7.1	-4.2	-6.5	-2.2	-1.5	**2.1**	-2.9
Calcite	$CaCO_3$	**0.2**	**0.5**	**0.7**	**0.6**	**0.3**	**0.3**	**0.6**	**-0.3**	**-0.3**	**-0.4**	**0.0**	**0.3**	**0.2**	**0.2**
Magnesite	$MgCO_3$	-1.2	-0.7	-0.6	-0.9	-1.1	-1.2	-0.8	-2.0	-1.8	-2.0	-1.0	-0.8	-0.8	-0.8
Barite	$BaSO_4$	**0.7**	**0.9**	**1.0**	**1.0**	**0.9**	**0.8**	**0.8**	**0.6**	**0.8**	**0.6**	**0.8**	**0.8**	**0.7**	**0.5**
Witherite	$BaCO_3$	-3.7	-3.3	-3.2	-3.6	-4.0	-4.0	-3.7	-4.3	-4.2	-4.3	-3.7	-3.6	-3.6	-3.7
Fluorite	CaF_2	**-0.4**	**-0.1**	**-0.2**	**-0.4**	**-0.5**	**-0.2**	**-0.3**	-1.9	-1.9	-1.9	-0.5	-0.6	-0.6	-0.6
CoCO3	$CoCO_3$	-2.9	-2.8	-2.5	-4.0	-4.4	-4.3	-4.0	-4.8	-4.7	-4.8	-4.1	-4.3	-4.4	-4.0
Cerrusite	$PbCO_3$	-2.2	-1.9	-1.9	-2.0	-2.1	-2.1	-1.9	-2.4	-2.2	-2.3	-2.1	-2.0	-2.0	-2.0
Carbon Dioxide	$pCO_2(g)$ [(b)]	-1.5	-1.8	-2.0	-2.6	-2.3	-2.5	-2.7	-1.7	-2.1	-2.0	-2.1	-2.2	-2.2	-2.4

Notes:

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[(a)] Saturation indices greater than -0.5 are identified by bold type and grey shading

[(b)] pCO2(g) values presented at $10^{\wedge value}$ atm

Table 5: Groundwater Geochemical Modeling Re
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Parameter	Units	GAMW15 10-2018	GAMW15 05-2019	GAMW15 11-2019	GAMW15B 09-2018	GAMW15B 10-2018	GAMW15B 05-2019	GAMW15B 11-2019	GAMW16 10-2018	GAMW16 05-2019	GAMW16 11-2019	GAMW16B 09-2018	GAMW16B 10-2018	GAMW16B 05-2019	GAMW16B 11-2019
Charge Balance	% error	0.4	-4.5	-7.1	-5.7	-3.8	-5.0	-5.3	-0.7	-7.5	8.2	-3.0	-2.7	-4.4	-8.7
MINERAL PHASES - Saturation Indices [a]															
Otavite	$CdCO_3$	-4.3	-2.6	-2.3	-2.0	-3.0	-2.5	-2.3	-2.3	-2.2	-4.1	-1.8	-2.7	-2.4	-2.1
Ferrihydrite	$Fe(OH)_3$	-6.2	**2.7**	**2.5**	**3.3**	-2.6	**3.8**	**1.1**	**0.0**	**3.3**	**4.1**	**4.1**	**0.5**	**4.2**	**3.8**
Siderite	$FeCO_3$	-1.6	**0.1**	**0.2**	**0.0**	-0.9	-0.8	**0.0**	**-0.3**	-0.7	-3.0	**0.6**	**-0.1**	**-0.1**	**0.5**
Melanterite	$FeSO_4\ 7H_2O$	-4.7	-4.4	-4.9	-5.1	-5.0	-5.2	-4.8	-5.3	-5.6	-6.2	-4.8	-4.6	-4.8	-4.5
Anglesite	$PbSO_4$	-4.3	-4.4	-4.7	-4.7	-4.1	-4.2	-4.5	-4.6	-4.5	-4.1	-4.9	-4.3	-4.4	-4.6
Gypsum	$CaSO_4{:}2H_2O$	-1.1	-0.9	-1.1	-0.6	-0.6	**-0.3**	**-0.4**	-0.9	-0.6	-0.6	**-0.4**	**-0.4**	**-0.3**	**-0.3**
Jarosite-H	$(H_3O)Fe_3(SO_4)_2(OH)_6$	-23.5	-4.2	-5.9	-4.8	-18.1	-1.4	-10.2	-13.0	-3.6	-2.5	-2.9	-9.9	-0.7	-3.0
Jarosite-K	$KFe_3(SO_4)_2(OH)_6$	-19.4	**2.5**	**0.5**	**2.3**	-12.0	**5.9**	-3.2	-6.6	**3.4**	**4.5**	**4.3**	-3.7	**6.4**	**4.3**
Jarosite-Na	$NaFe_3(SO_4)_2(OH)_6$	-21.9	**-0.1**	-2.0	**0.3**	-13.9	**3.9**	-5.3	-9.1	**0.8**	**1.9**	**2.1**	-5.9	**4.1**	**2.6**
Calcite	$CaCO_3$	-2.1	**-0.3**	**-0.1**	**0.6**	**-0.4**	**0.2**	**0.4**	**0.1**	**0.3**	-1.5	**0.9**	**0.1**	**0.4**	**0.7**
Magnesite	$MgCO_3$	-3.4	-1.4	-1.3	-0.8	-1.8	-0.9	-1.0	-1.4	-1.1	-3.0	**-0.5**	-1.4	-0.9	-0.7
Barite	$BaSO_4$	**0.5**	**0.8**	**0.5**	**1.1**	**1.0**	**1.4**	**1.0**	**0.5**	**0.7**	**0.6**	**1.0**	**1.0**	**1.2**	**1.1**
Witherite	$BaCO_3$	-5.8	-4.0	-3.8	-3.1	-4.2	-3.5	-3.5	-3.9	-3.7	-5.6	-3.0	-3.9	-3.4	-3.2
Fluorite	CaF_2	-1.3	-1.5	-1.3	-1.4	-1.3	-1.0	-0.9	-0.8	-0.8	-0.8	-1.0	-1.1	-1.0	-0.9
CoCO3	$CoCO_3$	-5.5	-3.6	-3.6	-4.0	-4.8	-4.3	-4.1	-4.1	-4.0	-5.8	-3.6	-4.5	-4.2	-3.9
Cerrusite	$PbCO_3$	-3.7	-2.1	-2.1	-1.9	-2.4	-2.0	-2.0	-2.1	-2.0	-3.4	-1.9	-2.3	-2.0	-2.0
Carbon Dioxide	$pCO_2(g)$ [b]	**0.1**	-1.9	-2.1	-2.6	-1.5	-2.2	-2.4	-2.0	-2.2	-4.8	-2.7	-1.7	-2.3	-2.6

Notes:

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at $10^{\wedge value}$ atm

Table 5: Groundwater Geochemical Modeling Re
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Parameter	Units	GAMW17 10-2018	GAMW17 05-2019	GAMW17 11-2019	GAMW17B 09-2018	GAMW17B 10-2018	GAMW17B 05-2019	GAMW17B 11-2019	GAMW18 10-2018	GAMW18 04-2019	GAMW18 11-2019	GAMW18B 09-2018	GAMW18B 10-2018	GAMW18B 04-2019	GAMW18B 11-2019
Charge Balance	% error	0.8	-0.5	-6.6	-3.6	1.1	0.6	-4.3	**-10.9**	-6.4	-9.2	-3.2	**-10.4**	**-48.7**	**-10.9**
MINERAL PHASES - Saturation Indices [a]															
Otavite	$CdCO_3$	-2.8	-2.2	-1.9	-2.0	-2.2	-2.3	-2.0	-3.0	-3.0	-2.5	-2.0	-2.9	-4.7	-2.1
Ferrihydrite	$Fe(OH)_3$	-2.9	**2.5**	**2.9**	**3.3**	**0.1**	**3.6**	**4.3**	-0.7	**1.7**	**0.9**	**2.8**	**0.6**	**2.1**	**2.2**
Siderite	$FeCO_3$	-2.1	-2.6	-2.6	**0.4**	**0.3**	**0.1**	**-0.1**	-2.5	-2.9	-1.8	**0.6**	-0.5	-5.1	**0.1**
Melanterite	$FeSO_4\ 7H_2O$	-6.8	-7.7	-8.1	-5.0	-4.9	-5.0	-5.5	-6.7	-6.8	-6.4	-4.5	-4.7	-7.3	-4.9
Anglesite	$PbSO_4$	-4.5	-4.8	-5.0	-4.9	-4.8	-4.8	-4.9	-4.3	-4.1	-4.3	-4.6	-4.1	-3.7	-4.6
Gypsum	$CaSO_4{:}2H_2O$	-0.8	-1.0	-1.1	-0.9	-0.9	-1.0	-0.9	-0.6	**-0.4**	**-0.3**	**-0.4**	**-0.5**	**-0.4**	-0.6
Jarosite-H	$(H_3O)Fe_3(SO_4)_2(OH)_6$	-19.9	-6.7	-6.3	-4.5	-13.3	-2.1	-1.6	-12.0	-5.3	-9.3	-5.6	-8.8	-5.3	-7.6
Jarosite-K	$KFe_3(SO_4)_2(OH)_6$	-14.0	**0.2**	**0.6**	**2.5**	-6.5	**4.7**	**5.5**	-6.4	**0.8**	-2.8	**1.6**	-2.6	**1.1**	-0.5
Jarosite-Na	$NaFe_3(SO_4)_2(OH)_6$	-16.7	-2.4	-2.1	**0.2**	-8.8	**1.8**	**2.9**	-9.0	-1.7	-5.3	**-0.3**	-4.4	-2.5	-2.4
Calcite	$CaCO_3$	**-0.2**	**0.1**	**0.4**	**0.5**	**0.3**	**0.2**	**0.4**	**-0.4**	**-0.4**	**0.3**	**0.6**	**-0.3**	-2.1	**0.4**
Magnesite	$MgCO_3$	-1.4	-0.8	-0.7	-0.9	-1.0	-0.9	-0.7	-2.2	-2.1	-1.5	-0.6	-1.5	-4.6	-0.7
Barite	$BaSO_4$	**0.8**	**0.6**	**0.6**	**0.7**	**0.8**	**0.9**	**0.8**	**0.7**	**0.9**	**1.0**	**1.0**	**0.9**	**1.0**	**0.6**
Witherite	$BaCO_3$	-4.0	-3.6	-3.3	-3.2	-3.4	-3.3	-3.2	-4.5	-4.5	-3.8	-3.3	-4.3	-6.0	-3.7
Fluorite	CaF_2	**-0.5**	-0.6	-0.6	-1.1	-1.3	-1.3	-1.3	-3.3	-2.9	-2.3	-1.2	-1.3	-0.9	-1.0
CoCO3	$CoCO_3$	-4.6	-4.0	-3.8	-4.0	-4.0	-4.2	-3.8	-4.8	-5.2	-4.3	-4.1	-5.0	-6.8	-4.3
Cerrusite	$PbCO_3$	-2.4	-2.0	-2.0	-2.0	-2.0	-2.1	-2.0	-2.5	-2.4	-2.1	-2.0	-2.3	-3.8	-2.0
Carbon Dioxide	$pCO_2(g)$ [b]	-1.6	-2.4	-2.6	-2.3	-2.1	-1.7	-2.4	-1.2	-1.5	-1.8	-2.4	-1.5	-3.9	-2.4

Notes:

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at $10^{\wedge value}$ atm

Table 5: Groundwater Geochemical Modeling Re
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Parameter	Units	GAMW52 09-2018	GAMW52 10-2018	GAMW52 05-2019	GAMW52 11-2019	GAMW52B 09-2018	GAMW52B 10-2018	GAMW52B 05-2019	GAMW52B 11-2019	GAMW53 09-2018	GAMW53 10-2018	GAMW53 04-2019	GAMW53 11-2019	GAMW53B 09-2018	GAMW53B 10-2018
Charge Balance	% error	-2.9	3.4	4.0	-1.3	-7.2	1.1	-1.7	-6.4	3.9	2.9	-1.5	1.3	-0.7	-1.6
MINERAL PHASES - Saturation Indices [a]															
Otavite	$CdCO_3$	-1.9	-2.7	-2.3	-1.9	-1.6	-2.9	-2.3	-2.4	-3.5	-3.0	-4.0	-3.5	-2.2	-2.2
Ferrihydrite	$Fe(OH)_3$	**2.9**	**2.2**	**2.3**	**2.3**	**3.4**	**1.5**	**3.8**	**2.0**	**-0.1**	-1.9	-0.8	-1.1	**1.1**	**1.3**
Siderite	$FeCO_3$	-1.0	-2.7	-3.1	-1.3	**1.2**	**-0.1**	**-0.4**	**-0.1**	-1.4	-1.1	-2.9	-2.3	**0.1**	**0.1**
Melanterite	$FeSO_4\ 7H_2O$	-6.9	-8.4	-8.9	-7.3	-5.2	-5.3	-5.7	-5.3	-5.9	-6.0	-6.7	-6.7	-5.1	-5.1
Anglesite	$PbSO_4$	-5.4	-5.3	-5.5	-5.5	-5.9	-4.9	-5.0	-4.8	-4.4	-4.6	-4.5	-4.7	-4.8	-4.7
Gypsum	$CaSO_4{:}2H_2O$	-1.6	-2.0	-2.3	-1.7	-1.2	-1.2	-1.3	-1.1	-2.0	-1.9	-2.4	-2.3	-0.8	-0.7
Jarosite-H	$(H_3O)Fe_3(SO_4)_2(OH)_6$	-6.2	-7.4	-7.9	-8.7	-7.5	-8.4	-2.7	-7.4	-9.6	-16.9	-11.6	-13.6	-9.8	-9.2
Jarosite-K	$KFe_3(SO_4)_2(OH)_6$	**0.3**	-1.3	-1.7	-2.0	**0.1**	-1.9	**4.2**	-0.7	-5.0	-11.7	-6.6	-8.6	-3.6	-2.8
Jarosite-Na	$NaFe_3(SO_4)_2(OH)_6$	-2.4	-4.1	-4.5	-4.7	-1.8	-3.8	**2.2**	-2.6	-7.9	-14.6	-9.6	-11.7	-5.6	-4.8
Calcite	$CaCO_3$	**0.2**	**-0.4**	**-0.4**	**0.2**	**1.1**	**0.0**	**0.1**	**0.1**	-1.7	-1.1	-2.6	-2.0	**0.3**	**0.3**
Magnesite	$MgCO_3$	-1.1	-1.6	-1.5	-1.0	**-0.2**	-1.3	-1.1	-1.2	-2.9	-2.4	-3.5	-3.0	-1.3	-1.3
Barite	$BaSO_4$	**0.0**	-0.6	-0.8	**-0.3**	**1.1**	**1.1**	**1.1**	**1.3**	**-0.3**	**-0.3**	**-0.3**	**-0.3**	**0.6**	**0.7**
Witherite	$BaCO_3$	-3.5	-4.3	-4.3	-3.7	-1.9	-3.1	-2.8	-2.9	-5.3	-4.8	-5.9	-5.3	-3.5	-3.5
Fluorite	CaF_2	-2.0	-2.2	-2.4	-2.1	**0.4**	-2.4	-2.4	-2.3	-2.8	-2.7	-4.8	-4.7	-1.5	-1.6
CoCO3	$CoCO_3$	-3.7	-4.4	-4.2	-3.8	-3.2	-4.5	-4.0	-4.1	-5.1	-4.6	-5.9	-5.4	-4.0	-4.0
Cerrusite	$PbCO_3$	-2.0	-2.1	-2.0	-2.0	-2.0	-2.2	-2.0	-2.1	-2.6	-2.3	-3.1	-2.8	-2.1	-2.1
Carbon Dioxide	$pCO_2(g)$ [b]	-2.1	-1.8	-1.9	-2.3	-3.0	-1.8	-2.1	-2.1	-0.9	-1.3	-1.2	-1.3	-1.9	-2.0

Notes:

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at $10^{\wedge value}$ atm

Table 5: Groundwater Geochemical Modeling Re
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Parameter	Units	GAMW53B 04-2019	GAMW53B 11-2019	GAMW54 09-2018	GAMW54 10-2018	GAMW54 04-2019	GAMW54 11-2019	GAMW54B 09-2018	GAMW54B 10-2018	GAMW54B 05-2019	GAMW54B 11-2019	GAMW55 09-2018	GAMW55 10-2018	GAMW55B 09-2018	GAMW55B 10-2018
Charge Balance	% error	-2.8	-2.7	-1.7	2.0	-3.0	-3.0	-1.5	1.8	-6.0	-3.8	-1.3	0.7	-6.0	-2.6
MINERAL PHASES - Saturation Indices [a]															
Otavite	$CdCO_3$	-2.1	-2.1	-3.3	-1.7	-2.8	-2.3	-2.7	-1.2	-2.4	-2.4	-2.8	-2.5	-2.6	-2.5
Ferrihydrite	$Fe(OH)_3$	**4.1**	**3.3**	**1.5**	**-0.3**	**1.4**	**1.0**	**1.0**	**2.9**	**3.4**	**2.8**	**2.1**	**0.9**	**1.2**	**1.7**
Siderite	$FeCO_3$	**-0.4**	**0.1**	-2.5	-0.6	-2.1	-1.1	**-0.1**	**1.5**	**0.1**	**0.1**	-1.2	-1.4	**-0.1**	**0.0**
Melanterite	$FeSO_4\ 7H_2O$	-5.8	-5.3	-6.7	-6.6	-6.6	-6.5	-4.7	-4.7	-4.8	-4.7	-5.8	-6.1	-4.7	-4.7
Anglesite	$PbSO_4$	-4.9	-4.9	-4.5	-5.4	-4.5	-5.1	-4.3	-5.8	-4.5	-4.5	-4.4	-4.5	-4.4	-4.4
Gypsum	$CaSO_4{:}2H_2O$	-0.9	-1.0	-1.3	-1.4	-1.2	-1.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.5	-0.5	**-0.5**
Jarosite-H	$(H_3O)Fe_3(SO_4)_2(OH)_6$	-1.4	-4.2	-4.8	-17.1	-7.5	-10.3	-8.3	-9.7	-2.4	-3.8	-4.3	-9.0	-7.9	-6.8
Jarosite-K	$KFe_3(SO_4)_2(OH)_6$	**5.2**	**2.4**	**0.0**	-10.5	-1.7	-4.4	-2.1	-1.6	**4.2**	**2.7**	**1.7**	-2.6	-1.7	**-0.4**
Jarosite-Na	$NaFe_3(SO_4)_2(OH)_6$	**3.0**	**0.2**	-2.4	-12.9	-4.1	-7.0	-4.0	-3.6	**2.2**	**0.7**	-0.9	-5.2	-3.6	-2.3
Calcite	$CaCO_3$	**0.4**	**0.3**	-1.1	**0.5**	-0.7	**-0.2**	**-0.1**	**1.6**	**0.2**	**0.2**	**-0.1**	**0.1**	**0.1**	**0.2**
Magnesite	$MgCO_3$	-1.1	-1.2	-2.5	-0.8	-1.8	-1.5	-1.5	**0.2**	-1.1	-1.1	-1.7	-1.4	-1.4	-1.2
Barite	$BaSO_4$	**0.5**	**0.7**	**0.4**	**0.3**	**0.4**	**-0.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.0**	**0.9**	**1.3**	**1.2**
Witherite	$BaCO_3$	-3.5	-3.3	-4.8	-3.2	-4.4	-4.0	-3.7	-2.1	-3.5	-3.5	-3.8	-3.7	-3.5	-3.4
Fluorite	CaF_2	-1.5	-1.3	-2.6	-2.6	-2.7	-2.2	-1.7	-1.5	-1.4	-1.3	-1.4	-1.5	-2.0	-2.1
CoCO3	$CoCO_3$	-3.9	-3.9	-5.1	-3.5	-4.6	-4.2	-4.5	-3.0	-4.2	-4.2	-3.5	-3.4	-4.6	-4.3
Cerrusite	$PbCO_3$	-2.0	-2.1	-2.8	-2.0	-2.2	-2.1	-2.3	-2.0	-2.1	-2.1	-2.4	-2.2	-2.3	-2.2
Carbon Dioxide	$pCO_2(g)$ [b]	-2.0	-2.2	-1.0	-2.7	-1.6	-1.7	-1.6	-3.5	-1.9	-1.8	-1.4	-1.7	-1.7	-1.9

Notes:

Charge balances errrors highlighted in **red** are greater than +/-10%

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Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at $10^{\wedge value}$ atm

Table 5: Groundwater Geochemical Modeling Re
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Parameter	Units	GAMW55B 05-2019	GAMW55B 11-2019	GAMW55R 11-2019	GAMW56 09-2018	GAMW56 10-2018	GAMW56 04-2019	GAMW56 11-2019	GAMW56B 09-2018	GAMW56B 10-2018	GAMW56B 04-2019	GAMW56B 11-2019
Charge Balance	% error	-5.4	-6.2	-5.5	4.4	-1.6	**61.8**	3.5	0.7	2.6	**-13.1**	-4.8
MINERAL PHASES - Saturation Indices [a]												
Otavite	$CdCO_3$	-2.4	-2.2	-2.3	-2.4	-2.0	-2.7	-2.2	-2.3	-2.3	-2.3	-2.3
Ferrihydrite	$Fe(OH)_3$	**3.0**	**2.0**	**1.4**	**1.5**	**2.5**	**2.9**	**1.7**	**1.2**	**2.0**	**3.7**	**1.7**
Siderite	$FeCO_3$	**0.0**	**0.2**	-1.9	**0.5**	**0.8**	-0.7	**0.1**	**0.2**	**0.1**	**0.2**	**0.1**
Melanterite	$FeSO_4\ 7H_2O$	-4.8	-4.8	-6.9	-5.1	-5.1	-5.9	-5.6	-5.0	-5.2	-4.8	-4.9
Anglesite	$PbSO_4$	-4.5	-4.6	-4.6	-5.4	-5.5	-5.1	-5.4	-5.0	-5.1	-4.7	-4.7
Gypsum	$CaSO_4{:}2H_2O$	-0.6	-0.6	-0.8	-1.7	-1.7	-1.9	-1.7	-1.2	-1.3	-1.0	-0.9
Jarosite-H	$(H_3O)Fe_3(SO_4)_2(OH)_6$	-3.6	-7.1	-8.6	-8.3	-6.6	-4.3	-8.7	-8.8	-6.6	-1.5	-7.8
Jarosite-K	$KFe_3(SO_4)_2(OH)_6$	**2.9**	**-0.5**	-1.9	-2.5	**-0.4**	**2.4**	-2.6	-2.6	**-0.4**	**4.6**	-1.2
Jarosite-Na	$NaFe_3(SO_4)_2(OH)_6$	**1.0**	-2.4	-4.4	-5.4	-3.2	**0.4**	-5.7	-5.0	-2.7	**1.7**	-3.5
Calcite	$CaCO_3$	**0.2**	**0.4**	**0.2**	**-0.1**	**0.2**	-0.6	**0.1**	**0.0**	**0.0**	**0.0**	**0.1**
Magnesite	$MgCO_3$	-1.1	-1.0	-1.2	-1.5	-1.1	-1.2	-1.2	-1.2	-1.1	-1.3	-1.1
Barite	$BaSO_4$	**1.0**	**1.0**	**0.6**	**0.0**	**0.0**	**-0.1**	**-0.1**	**0.6**	**0.4**	**0.8**	**0.9**
Witherite	$BaCO_3$	-3.5	-3.4	-3.8	-3.7	-3.5	-4.2	-3.7	-3.6	-3.6	-3.5	-3.5
Fluorite	CaF_2	-2.0	-2.0	-1.3	-0.8	-1.0	-1.7	-1.2	-1.7	-1.9	-1.7	-1.7
CoCO3	$CoCO_3$	-4.2	-4.0	-4.1	-3.8	-2.9	-3.4	-2.9	-4.2	-4.2	-4.2	-4.2
Cerrusite	$PbCO_3$	-2.1	-2.1	-2.1	-2.2	-2.0	-2.2	-2.1	-2.1	-2.1	-2.0	-2.0
Carbon Dioxide	$pCO_2(g)$ [b]	-2.0	-2.1	-2.0	-1.2	-1.6	-1.6	-1.6	-1.4	-1.3	-1.6	-1.8

Notes:

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at 10^value atm

Prepared by: GOL
Checked by: PJN
Reviewed by: RV

Table 6: Average Point Decay Rates in Background and Downgradient Wells
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Constituent	Units	Point Decay Constants (first-order decay)	
		Background Wells	All Downgradient Wells (including Assessment Wells)
Arsenic	yr^{-1}	-0.33	**0.11**
Boron	yr^{-1}	0.04	**-0.04**
Cobalt	yr^{-1}	0.36	**-0.05**
Lithium	yr^{-1}	0.20	**-0.06**
Molybdenum	yr^{-1}	0.28	**-0.03**

Notes:
yr^{-1} = rate per year

Prepared by: GOL
Checked by: PJN
Reviewed by: RV

Table 7: Summary of Rietveld Quantitative Analysis X-Ray Diffraction Results
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Mineral	Mineral Formula	OW-9 18-20' (wt %)	OW-9 10-12' (wt %)	SB-52B-35'-37' (wt %)	SB-54B-30'-32' (wt %)	SB-56B-30'-32' (wt %)
Quartz	SiO_2	69	60	53	61	72
Pyrite	FeS_2	-	-	0.39	0.10	0.12
Marcasite	FeS_2	-	-	0.22	-	-
Muscovite	$KAl_2(AlSi_3O_{10})(OH)_2$	3.6	3.5	7.8	1.7	1.3
Biotite	$K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$	-	-	1.1	0.57	0.16
Chlorite	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$	-	-	2.6	1.0	1.1
Microcline	$KAlSi_3O_8$	5.2	9.1	9.2	7.5	6.6
Orthoclase	$KAlSi_3O_8$	-	-	2.2	0.65	0.57
Hematite	Fe_2O_3	-	-	0.26	0.44	0.57
Dolomite	$CaMg(CO_3)_2$	6.5	9.8	7.9	9.6	5.3
Calcite	$CaCO_3$	4.8	3.6	4.7	5.8	3.9
Albite	$NaAlSi_3O_8$	8.3	11	7.3	9.1	6.4
Epidote	$Ca_2(Al,Fe)Al_2O(SiO_4)(Si_2O_7)(OH)$	1.6	1.5	2.8	2.1	1.9
Anatase	TiO_2	-	-	-	-	-
Cancrinite	$Na_6Ca(CO_3)(AlSiO_4)_6{\cdot}2H_2O$	0.87	1.7	-	-	-
TOTAL		100	100	100	100	100

Notes:

wt % = percent by weight of each mineral

Non-detect minerals within a sample are represented with "-"

Prepared by: GOL
Checked by: PJN
Reviewed by: RV

Table 8: Sequential Extraction Procedure and Total Metal Solids Results
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Sample Location		SB-07B	DA-14	OW-9	OW-9	SB-08B	SB-52B	SB-53B	SB-53B	SB-54B	SB-55B	SB-56B
Sample Start Depth (ft bgs)		35	4	10	18	30	35	25	30	30	30	30
Sample End Depth (ft bgs)		37	6	12	20	32	37	27	32	32	32	32
Well Type		Background	Drying Well	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte	SEP Step											
Aluminum	Total Metal Result	1900	3100 J+	2200 J+	1100	1300	3200	1500	1400	2000	2200	1600
Aluminum	SEP Step 1	52 U	48 U	47 U	47 U	51 U	44 U	48 U	44 U	49 U	48 U	49 U
Aluminum	SEP Step 2	15 J	63 J	16 J	35 UJ	38 UJ	8.8 J	11 J	33 UJ	12 J	36 UJ	5.9 J
Aluminum	SEP Step 3	44	540	60	15	31	33	75	30	34	23	29
Aluminum	SEP Step 4	300	1600	280	160	130	110	130	100	130	100	360
Aluminum	SEP Step 5	200 UJ	80 J	180 U	170 U	190 UJ	28 J	31 J	34 J	180 UJ	180 UJ	180 UJ
Aluminum	SEP Step 6	1000	1600	840	520	1100	1200	750	820	1400	1200	1300
Aluminum	SEP Step 7	22000	11000	23000	15000	23000	25000	16000	19000	23000	21000	25000
Aluminum	SEP SUM	23000	15000	24000	16000	24000	26000	17000	20000	24000	22000	27000
Aluminum	SEP TOTAL	25000	21000	29000	19000	23000	28000	18000	20000	29000	31000	23000
Antimony	Total Metal Result	7.7 U	18 U	17 U	17 U	7 U	6.3 UJ	6.9 UJ	6.6 UJ	7 U	7 U	7 U
Antimony	SEP Step 1	16 U	14 U	14 U	14 U	15 U	13 U	14 U	13 U	15 U	14 U	15 U
Antimony	SEP Step 2	12 U	11 U	11 U	10 U	12 U	10 U	11 U	10 U	11 U	11 U	11 U
Antimony	SEP Step 3	3.9 U	3.6 U	3.5 U	3.5 U	3.8 U	3.3 U	3.6 U	3.3 U	3.7 U	3.6 U	3.6 U
Antimony	SEP Step 4	3.9 U	3.6 U	3.5 U	3.5 U	3.8 U	3.3 U	3.6 U	3.3 U	3.7 U	3.6 U	3.6 U
Antimony	SEP Step 5	59 U	54 U	53 U	52 U	58 U	50 U	53 U	50 U	55 U	54 U	55 U
Antimony	SEP Step 6	3.9 U	3.6 U	3.5 U	3.5 U	3.8 U	3.3 U	3.6 U	3.3 U	3.7 U	3.6 U	3.6 U
Antimony	SEP Step 7	0.45 J	3.6 U	3.5 U	3.5 U	0.54 J	3.3 U	3.6 U	0.16 J	0.29 J	3.6 U	0.3 J
Antimony	SEP SUM	0.45 J	3 U	3 U	3 U	0.54 J	3 U	3 U	0.16 J	0.29 J	3 U	0.3 J
Antimony	SEP TOTAL	0.53 J	3.6 U	3.5 U	3.5 U	0.27 J	3.3 U	3.6 J	3.3 U	0.33 J	3.6 U	0.29 J
Arsenic	Total Metal Result	1.7 J	0.62 J	1.7 J	0.69 J	1.9 J	5.4 J	5	1.3 J	2.3	2 J	5
Arsenic	SEP Step 1	2.6 U	2.4 U	2.3 U	2.3 U	2.6 U	2.2 U	2.4 U	2.2 U	2.4 U	2.4 U	2.4 U
Arsenic	SEP Step 2	2 U	1.8 UJ	1.8 U	1.7 U	1.9 U	0.46 J	1.8 U	1.7 U	1.8 UJ	1.8 UJ	1.8 UJ
Arsenic	SEP Step 3	0.37 J	0.45 J	0.43 J	0.17 J	0.27 J	0.83	0.83	0.44 J	0.45 J	0.37 J	1.9
Arsenic	SEP Step 4	0.69	0.6 U	0.94	0.73	0.66	0.71 J+	0.59 U	0.56 U	0.68	0.5 J	1.1
Arsenic	SEP Step 5	9.8 U	9 U	8.8 U	8.7 U	9.6 U	8.3 UJ	8.9 UJ	8.3 UJ	9.1 U	9 U	9.1 U
Arsenic	SEP Step 6	1.2	0.3 J	0.56 J	0.54 J	1.7	2.2	1.6	0.89	1.8	1.4	3.8
Arsenic	SEP Step 7	1.3 U	0.7	0.39 J	0.34 J	1.3 U	1.2	1	0.88	1.2 U	0.6 U	1.2 U
Arsenic	SEP SUM	2.2	1.4	2.3	1.8	2.6	5.4	4	2.7	2.9	2.7	7.3
Arsenic	SEP TOTAL	2.1	2.2	1.9	3	3.1	5.4 J	5.6	2.5	4.7	3.9	6.2

Table 8: Sequential Extraction Procedure and Total Metal Solids Results
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Sample Location		SB-07B	DA-14	OW-9	OW-9	SB-08B	SB-52B	SB-53B	SB-53B	SB-54B	SB-55B	SB-56B
Sample Start Depth (ft bgs)		35	4	10	18	30	35	25	30	30	30	30
Sample End Depth (ft bgs)		37	6	12	20	32	37	27	32	32	32	32
Well Type		Background	Drying Well	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte	SEP Step											
Barium	Total Metal Result	6.9 J+	7.3 J+	13	4.1	4.3 J+	8.4 J+	4.6 J+	4.3 J+	6.2	6.1	6.1
Barium	SEP Step 1	13 U	1.1 J	0.58 J	12 U	13 U	11 U	12 U	11 U	12 U	12 U	12 U
Barium	SEP Step 2	0.5 J	1.7 J	0.62 J	8.7 UJ	0.46 J	0.52 J	0.54 J	0.54 J	0.56 J	0.44 J	0.96 J
Barium	SEP Step 3	3.3 U	3.6	2.9 U	2.9 U	3.2 U	2.8 U	3 U	2.8 U	3 U	3 U	3 U
Barium	SEP Step 4	2.2 J	2.6 J	5.3	1.6 J	1.4 J	2.4 J	0.97 J	1.1 J	2.2 J	1.9 J	2.2 J
Barium	SEP Step 5	49 UJ	45 UJ	44 UJ	44 UJ	48 UJ	42 UJ	45 UJ	42 UJ	46 UJ	45 UJ	46 UJ
Barium	SEP Step 6	2.3 J	2.2 J	2.2 J	1.2 J	1.9 J	2 J	1.6 J	1.5 J+	2.3 J	2 J	2.4 J
Barium	SEP Step 7	250	230	350	220	220	250 J	190	220	230	190	260
Barium	SEP SUM	250	240	360	220	230	250	190	220	240	190	260
Barium	SEP TOTAL	270	300	390	210	190	200	170	200	220	200	230
Beryllium	Total Metal Result	1.3 U	0.053 J	0.12 J	0.064 J	1.2 U	0.19 J	1.1 U	1.1 U	1.2 U	1.2 U	1.2 U
Beryllium	SEP Step 1	1.3 U	1.2 U	1.2 U	1.2 U	1.3 U	1.1 U	1.2 U	1.1 U	1.2 U	1.2 U	1.2 U
Beryllium	SEP Step 2	0.98 UJ	0.9 UJ	0.88 UJ	0.87 UJ	0.96 UJ	0.83 UJ	0.89 UJ	0.83 UJ	0.91 UJ	0.9 UJ	0.91 UJ
Beryllium	SEP Step 3	0.33 U	0.026 J	0.021	0.29 U	0.32 U	0.28 U	0.3 U	0.28 U	0.3 U	0.3 U	0.3 U
Beryllium	SEP Step 4	0.33 U	0.026 J	0.024 J	0.02 J	0.32 U	0.28 U	0.3 U	0.28 U	0.3 U	0.3 U	0.03 J
Beryllium	SEP Step 5	4.9 UJ	4.5 UJ	4.4 UJ	4.4 UJ	4.8 UJ	4.2 UJ	4.5 UJ	4.2 UJ	4.6 UJ	4.5 UJ	4.6 UJ
Beryllium	SEP Step 6	0.045 J	0.024 J	0.036 J	0.027 J	0.039 J	0.042 J	0.026 J	0.027 J	0.045 J	0.037 J	0.067 J
Beryllium	SEP Step 7	0.29 J	0.21 J	0.39	0.24 J	0.31 J	0.35	0.23 J	0.28	0.3	0.25 J	0.46
Beryllium	SEP SUM	0.34	0.29	0.47	0.28	0.35	0.39	0.25	0.31	0.34	0.29	0.56
Beryllium	SEP TOTAL	0.37	0.3	0.41	0.28 J	0.26 J	0.35	0.25 J	0.27 J	0.33	0.27 J	0.33
Boron	Total Metal Result	26 U	5.5	7.4	3.6	23 U	21 U	23 U	22 U	23 U	23 U	23 U
Cadmium	Total Metal Result	0.64 U	0.24 U	0.11 J	0.072 J	0.59 U	0.53 U	0.57 U	0.55 U	0.58 U	0.58 U	0.3 J
Cadmium	SEP Step 1	1.3 U	1.2 U	1.2 U	1.2 U	1.3 U	1.1 U	1.2 U	1.1 U	1.2 U	1.2 U	1.2 U
Cadmium	SEP Step 2	0.98 U	0.9 U	0.88 U	0.87 U	0.96 U	0.83 U	0.89 U	0.83 U	0.91 U	0.9 U	0.91 U
Cadmium	SEP Step 3	0.33 U	0.3 UJ	0.29 UJ	0.29 UJ	0.32 U	0.28 UJ	0.3 UJ	0.28 UJ	0.3 UJ	0.3 UJ	0.3 UJ
Cadmium	SEP Step 4	0.077 J	0.059 J	0.09 J	0.083 J	0.076 J	0.086 J	0.08 J	0.076 J	0.069 J	0.065 J	0.059 J
Cadmium	SEP Step 5	4.9 U	4.5 U	4.4 U	4.4 U	4.8 U	4.2 U	4.5 U	4.2 U	4.6 U	4.5 U	4.6 U
Cadmium	SEP Step 6	0.33 U	0.3 U	0.29 U	0.29 U	0.32 U	0.28 U	0.3 U	0.28 U	0.026 J	0.013 J	0.3 U
Cadmium	SEP Step 7	0.33 U	0.3 U	0.29 U	0.29 U	0.32 U	0.28 U	0.3 U	0.28 U	0.3 U	0.3 U	0.3 U
Cadmium	SEP SUM	0.077 J	0.11 J	0.09 J	0.083 J	0.076 J	0.086 J	0.08 J	0.076 J	0.095 J	0.077 J	0.059 J
Cadmium	SEP TOTAL	0.015 J	0.3 U	0.29 U	0.29 U	0.065 J	0.28 U	0.3 U	0.28 U	0.18 J	0.12 J	0.058 J

Table 8: Sequential Extraction Procedure and Total Metal Solids Results
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Sample Location		SB-07B	DA-14	OW-9	OW-9	SB-08B	SB-52B	SB-53B	SB-53B	SB-54B	SB-55B	SB-56B
Sample Start Depth (ft bgs)		35	4	10	18	30	35	25	30	30	30	30
Sample End Depth (ft bgs)		37	6	12	20	32	37	27	32	32	32	32
Well Type		Background	Drying Well	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte	SEP Step											
Chromium	Total Metal Result	4.3	2.9	4.4	2.5	2.8	8.2 J	5.1	3.4	5	6	3.2
Chromium	SEP Step 1	2.6 U	2.4 U	2.3 U	2.3 U	2.6 U	2.2 U	2.4 U	2.2 U	2.4 U	2.4 U	2.4 U
Chromium	SEP Step 2	2 UJ	1.8 U	0.28 J	1.7 U	1.9 UJ	0.37 J	0.37 J	1.7 U	0.31 J	1.8 U	1.8 U
Chromium	SEP Step 3	0.29 J	0.37 J	0.52 J	0.16 J	0.17 J	1.1	0.97	0.27 J	1.1	0.14 J	0.19 J
Chromium	SEP Step 4	1.2	1.1	0.94	0.57 J	0.55 J	0.68	0.58 J	0.51 J	0.73	0.6	1
Chromium	SEP Step 5	9.8 U	9 UJ	1.5 J	1.3 J	9.6 U	8.3 U	8.9 U	8.3 U	9.1 U	9 U	9.1 U
Chromium	SEP Step 6	2.5	0.99	2.1	1.7	3.1	3.5	2.2	2.2	3.7	3.3	3
Chromium	SEP Step 7	5.5	3.7	7.3	5.2	7.2	9	5	7.3	8.5	6.7	13
Chromium	SEP SUM	9.4	8.1	13	8.8	11	15	9.1	10	14	11	17
Chromium	SEP TOTAL	9.5	6.9	11	8.3	8.8	16 J	10	8.7	17	13	9.2
Cobalt	Total Metal Result	3.5 J	1.1	1.8	2.2	2.9 J	5.2 J	5.7	2.6 J	5.7 J	3.9 J	3 J
Cobalt	SEP Step 1	13 U	12 U	12 U	12 U	13 U	11 U	12 U	11 U	12 U	12 U	12 U
Cobalt	SEP Step 2	0.54 J	9 U	8.8 U	8.7 U	0.35 J	0.44 J	0.63 J	0.38 J	0.62 J	0.41 J	0.26 J
Cobalt	SEP Step 3	0.55 J	0.1 J	0.27 J	0.19 J	0.37 J	0.45 J	1.2 J	0.53 J	0.47 J	0.39 J	0.37 J
Cobalt	SEP Step 4	0.83 J	0.29 J	0.87 J	1.2 J	0.97 J	0.71 J	1.1 J	0.66 J	1.6 J	0.91 J	0.76 J
Cobalt	SEP Step 5	49 UJ	45 UJ	44 UJ	44 UJ	48 UJ	42 UJ	45 UJ	42 UJ	46 UJ	45 UJ	46 UJ
Cobalt	SEP Step 6	1.3 J	0.3 J	0.66 J	0.68 J	1.8 J	2.1 J	1.5 J	0.97 J	2.5 J	1.5 J	2.9 J
Cobalt	SEP Step 7	0.8 J	3 U	0.69 J	0.69 J	1.1 J	0.82 J	0.44 J	0.43 J	1.5 J	0.8 J	0.81 J
Cobalt	SEP SUM	4	0.69 J	2.5	2.8	4.6	4.5	4.8	3	6.7	4	5.1
Cobalt	SEP TOTAL	4.2 J	0.87 J	2.5 J	3.2	4.8 J	4.7 J	5.2 J	3.2	6.1	4.3	4.5 J
Iron	Total Metal Result	4900	1500	4400	2600	3400	6800	7900	3700	5800	5900	5600
Iron	SEP Step 1	26 U	24 U	23 U	23 U	26 U	22 U	24 U	22 U	24 U	24 U	24 U
Iron	SEP Step 2	260 J	31 J	61 J	29 J	190 J	130 J	200 J	99 J	280 J	160 J	140 J
Iron	SEP Step 3	950	280	710	150	600	590	2600	470	740	700	1200
Iron	SEP Step 4	1100	770	1700	1100	1000	1200	1100	830	1400	1500	1400
Iron	SEP Step 5	98 UJ	90 UJ	88 UJ	87 UJ	96 UJ	83 UJ	89 UJ	83 UJ	91 UJ	90 UJ	91 UJ
Iron	SEP Step 6	2600	870	2100	1500	2800	3300	2600	2000	3800	3300	4600
Iron	SEP Step 7	1800	1300	2400	2000	2900	2500	2000	2100	3700	2400	3100
Iron	SEP SUM	6700	3200	7100	4700	7600	7700	8500	5500	9900	8100	10000
Iron	SEP TOTAL	6300	3400	7500	5500	7000	8400	8700	5700	9900	8600	6800

Table 8: Sequential Extraction Procedure and Total Metal Solids Results
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Sample Location		SB-07B	DA-14	OW-9	OW-9	SB-08B	SB-52B	SB-53B	SB-53B	SB-54B	SB-55B	SB-56B
Sample Start Depth (ft bgs)		35	4	10	18	30	35	25	30	30	30	30
Sample End Depth (ft bgs)		37	6	12	20	32	37	27	32	32	32	32
Well Type		Background	Drying Well	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte	SEP Step											
Lead	Total Metal Result	4.4	1.4	3.1	1.8	2.9	6.6 J	3.2	2.4	4.2	3.7	3.5
Lead	SEP Step 1	2.6 U	2.4 U	2.3 U	2.3 U	2.6 U	2.2 U	2.4 U	2.2 U	2.4 U	2.4 U	2.4 U
Lead	SEP Step 2	1.9 J	1.8 U	1.8 U	1.7 U	0.92 J	0.85 J	1.8 U	0.66 J	0.86 J	0.82 J	0.75 J
Lead	SEP Step 3	0.66 UJ	0.61 J	0.59 UJ	0.58 UJ	0.64 UJ	0.55 UJ	0.59 UJ	0.56 UJ	0.61 UJ	0.6 UJ	0.61 UJ
Lead	SEP Step 4	1.2	0.65	1.7	1.2	1.4	2.3	1.8	1.5	2.3	1.8	2
Lead	SEP Step 5	9.8 UJ	9 UJ	8.8 UJ	8.7 UJ	9.6 UJ	8.3 UJ	8.9 UJ	8.3 UJ	9.1 UJ	9 UJ	9.1 UJ
Lead	SEP Step 6	1.1	0.67	0.67	0.35 J	0.78	1.8	1.1	0.72	1.6	1.3	3.4
Lead	SEP Step 7	3.2	3.1	5.3	3.2	3.5	3.3	2.5	2.6	2.8	4.7	2.9
Lead	SEP SUM	7.4	5	7.7	4.8	6.6	8.2	5.3	5.5	7.5	8.6	9.1
Lead	SEP TOTAL	7	5.7	7.4	5.6	5	7.5 J	4.9	5.1	6.7	5.6	6.2
Lithium	Total Metal Result	4.6 J	1.4 J	3.6 J	2.2 J	3.3 J	6.6 J+	3.1 J+	3.4 J+	5.4 J	5.2 J	3.5 J
Lithium	SEP Step 1	13 U	12 U	12 U	12 U	13 U	11 U	12 U	11 U	12 U	12 U	12 U
Lithium	SEP Step 2	9.8 U	9 U	8.8 U	8.7 U	9.6 U	8.3 U	8.9 U	8.3 U	0.71 J	0.72 J	9.1 U
Lithium	SEP Step 3	3.3 U	3 U	2.9 U	2.9 U	3.2 U	2.8 U	3 U	2.8 U	3 U	3 U	3 U
Lithium	SEP Step 4	0.78 J	0.5 J	0.81 J	0.55 J	0.62 J	1 J	0.64 J	0.71 J	1.1 J	1 J	1.3 J
Lithium	SEP Step 5	49 U	45 U	44 U	44 U	48 U	42 U	45 U	42 U	46 U	45 U	46 U
Lithium	SEP Step 6	2.3 J	1.1 J	1.8 J	1.2 J	2.2 J	3	1.7 J	1.9 J	3.5	2.9 J	2.8 J
Lithium	SEP Step 7	4.4	2.5 J	3.4	2.1 J	3.8	6.1	2.6 J	3.1	5.6	4.2	7.1
Lithium	SEP SUM	12	4.1	6	3.8	11	14	7.8	5.7	19	18	19
Lithium	SEP TOTAL	8	4.2	6.8	5.4	7.5	10	6	7.5	11	10	7.2
Molybdenum	Total Metal Result	5.1 U	6.3	1.1 U	1.1 U	4.7 U	3.8 J	4 J	4.4 U	0.88 J	4.7 U	2.1 J
Molybdenum	SEP Step 1	10 U	13	9.4 U	9.3 U	10 U	8.9 U	9.5 U	8.9 U	9.8 U	9.6 U	9.7 U
Molybdenum	SEP Step 2	7.9 U	0.51 J	7 U	7 U	7.7 U	6.7 U	7.1 U	6.7 U	7.3 U	7.2 U	7.3 U
Molybdenum	SEP Step 3	2.6 U	1.2 J	2.3 U	2.3 U	2.6 U	0.51 J	2.2 J	0.27 J	0.59 J	2.4 U	0.5 J
Molybdenum	SEP Step 4	2.6 U	1.3 J	2.3 U	2.3 U	2.6 U	0.39 J	0.63 J	0.24 J	0.53 J	2.4 U	0.36 J
Molybdenum	SEP Step 5	39 U	36 U	35 U	35 U	38 U	33 U	36 U	33 U	37 U	36 U	1.7 J
Molybdenum	SEP Step 6	2.6 U	0.13 J	2.3 U	2.3 U	2.6 U	0.21 J	0.13 J	2.2 U	0.18 J	0.2 J	1.5 J
Molybdenum	SEP Step 7	2.6 U	2.4 U	2.3 U	2.3 U	2.6 U	2.2 U	2.4 U	2.2 U	2.4 U	2.4 U	0.16 J
Molybdenum	SEP SUM	2 U	16	2 U	2 U	2 U	1.1 J	3	0.51 J	1.3 J	0.2 J	4.3
Molybdenum	SEP TOTAL	0.94 J	15	0.22 J	0.15 J	0.54 J	2.4	3.8	0.67 J	2.4	0.48 J	2.4

Table 8: Sequential Extraction Procedure and Total Metal Solids Results
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Sample Location		SB-07B	DA-14	OW-9	OW-9	SB-08B	SB-52B	SB-53B	SB-53B	SB-54B	SB-55B	SB-56B
Sample Start Depth (ft bgs)		35	4	10	18	30	35	25	30	30	30	30
Sample End Depth (ft bgs)		37	6	12	20	32	37	27	32	32	32	32
Well Type		Background	Drying Well	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte	SEP Step											
Selenium	Total Metal Result	1.9 U	4.8 U	4.6 U	4.6 U	0.53 J	1.6 U	0.51 J	0.74 J	0.68 J	0.65 J	1.8 U
Selenium	SEP Step 1	2.6 U	2.4 U	2.3 U	2.3 U	2.6 U	2.2 U	2.4 U	2.2 U	2.4 U	2.4 U	2.4 U
Selenium	SEP Step 2	2 U	1.8 U	1.8 U	1.7 U	1.9 U	1.7 U	1.8 U	1.7 U	1.8 UJ	1.8 UJ	1.8 UJ
Selenium	SEP Step 3	0.66 U	0.6 U	0.22 J	0.58 U	0.64 U	0.55 U	0.59 U	0.56 U	0.61 U	0.6 U	0.61 U
Selenium	SEP Step 4	1.1 J	0.6 UJ	0.6 J+	0.75 J+	1.3 J	0.64 J	0.59 UJ	0.56 UJ	0.71 J	0.6 UJ	0.59 J
Selenium	SEP Step 5	9.8 U	9 U	8.8 U	8.7 U	9.6 U	8.3 U	3.3 J	8.3 U	9.1 U	9 U	9.1 U
Selenium	SEP Step 6	0.66 U	0.6 U	0.59 U	0.58 U	0.64 U	0.55 U	0.59 U	0.56 U	0.61 U	0.6 U	0.61 U
Selenium	SEP Step 7	1.3 U	0.6 U	0.59 U	0.58 U	1.3 U	1.1 U	0.59 U	0.56 U	0.74 J	0.6 U	1.2 U
Selenium	SEP SUM	2.7	0.5 U	0.82	0.75	2.5	0.64	3.3	0.5 U	1.5	0.5 U	0.59
Selenium	SEP TOTAL	1.3 U	1.2 U	0.59 U	0.58 U	1.3 U	1.1 U	1.2 U	0.56 U	0.61 U	0.24 J	1.2 U
Thallium	Total Metal Result	4.5 U	7.2 U	6.9 U	6.8 U	4.1 U	3.7 u	4 U	3.9 U	4.1 U	4.1 U	4.1 U
Thallium	SEP Step 1	9.2 U	8.4 U	8.2 U	8.2 U	8.9 U	7.8 U	8.3 U	7.8 U	8.5 U	8.4 U	8.5 U
Thallium	SEP Step 2	6.9 U	6.3 U	6.2 U	6.1 U	6.7 U	5.8 U	6.2 U	5.8 U	6.4 U	6.3 U	6.4 U
Thallium	SEP Step 3	2.3 U	2.1 U	2.1 U	2 U	2.2 U	1.9 U	2.1 U	1.9 U	2.1 U	2.1 U	2.1 U
Thallium	SEP Step 4	2.3 U	2.1 U	2.1 UJ	2 UJ	2.2 U	1.9 U	2.1 U	1.9 U	2.1 U	2.1 U	2.1 U
Thallium	SEP Step 5	34 UJ	31 UJ	31 UJ	31 UJ	34 UJ	29 UJ	31 UJ	29 UJ	32 UJ	32 UJ	32 UJ
Thallium	SEP Step 6	2.3 U	2.1 U	2.1 U	2 U	2.2 U	1.9 U	2.1 U	1.9 U	2.1 U	2.1 U	2.1 U
Thallium	SEP Step 7	0.48 J	2.1 U	0.62 J	0.56 J	1.1 J	3.9 U	2.1 U	1.9 U	0.97 J	0.74 J	1.3 J
Thallium	SEP SUM	0.48 J	1.8 U	0.62 J	0.56 J	1.4 J	1.8 U	1.8 U	1.8 U	0.97 J	0.74 J	1.3 J
Thallium	SEP TOTAL	0.87 J	4.2 U	0.58 J	0.47 J	0.9 J	3.9 U	4.2 U	1.9 U	0.88 J	0.85 J	1.3 J

Notes:
All results displayed in milligram per kilogram (mg/kg).
ft bgs = feet below ground surface
SEP: Sequential Extraction Procedure
Step 1 - Exchangeable Phase: This extraction includes trace elements that are reversibly adsorbed to soil minerals, amorphous solids, and organic material by electrostatic forces.
Step 2 - Carbonate Phase: This extraction targets trace elements that are adsorbed or otherwise bound to carbonate minerals.
Step 3 - Non-Crystalline Materials Phase: This extraction targets trace elements that are complexed by amorphous minerals (e.g. iron).
Step 4 - Metal Hydroxide Phase: This extraction targets trace elements bound to hydroxides of iron, manganese, and/or aluminum.
Step 5 - Organic Phase: This extraction targets trace elements strongly bound via chemisorption to organic material.
Step 6 - Acid/Sulfide Fraction: The extraction is used to identify trace elements precipitated as sulfide minerals.
Step 7 - Residual Fraction: Trace elements remaining in the soil after the previous extractions will be distributed between silicates, phosphates, and refractory oxides.
U= The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
UJ= The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit, the quantitation limit is considered estimated.
J= The analyte was positively identified. The associated numerical value is the approximate concentration.
J+= The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample and biased high.
Total Metal Results are the results of the 6010C analysis

Prepared by: DFSC
Checked by: KMC
Reviewed by: MAH

Table 9: Predicted Range of COI Concentrations in Assessment Wells Assuming Only Dilution and Dispersion
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Constituent	Units	Site-Specific Groundwater Protection Standard[2]	Health-Based Standard	Maximimum concentration observed in Porewater	Maximimum concentration at side-gradient Assessment Wells:				Concentration at Assessment Wells assuming 32%[3] dilution of porewater with maximum concentration measured at:				Concentration at Assessment Wells assuming 63%[4] dilution of porewater with maximum concentration measured at:			
					GAMW-52	GAMW-52B	GAMW-56	GAMW-56B	GAMW-52	GAMW-52B	GAMW-56	GAMW-56B	GAMW-52	GAMW-52B	GAMW-56	GAMW-56B
Arsenic	mg/L	0.091	0.010	0.012	0.0025	0.0016	0.022	0.0025	0.0090	0.0087	0.015	0.0090	0.0060	0.0054	0.018	0.0060
Boron[1]	mg/L	-	4.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Cobalt	mg/L	0.010	0.0060	0.0022	0.00058	0.00050	0.0084	0.00050	0.0017	0.0017	0.0042	0.0017	0.0012	0.0011	0.0061	0.0011
Lithium	mg/L	0.040	0.040	0.016	0.0062	0.0071	0.0053	0.0062	0.013	0.013	0.013	0.013	0.0098	0.010	0.0093	0.0098
Molybdenum	mg/L	0.10	0.10	0.81	0.0064	0.015	0.013	0.0064	0.55	0.56	0.55	0.55	0.30	0.31	0.31	0.30
Arsenic	Percentage relative to Groundwater Protection Standard	100%	-	13%	3%	2%	24%	3%	10%	10%	17%	10%	7%	6%	20%	7%
Boron		100%	-	345%	80%	33%	7%	80%	260%	245%	237%	260%	178%	148%	132%	178%
Cobalt		100%	-	22%	6%	5%	84%	5%	17%	17%	42%	17%	12%	11%	61%	11%
Lithium		100%	-	40%	16%	18%	13%	16%	32%	33%	31%	32%	25%	26%	23%	25%
Molybdenum		100%	-	810%	6%	15%	13%	6%	553%	556%	555%	553%	304%	309%	308%	304%

Notes:
(1) Boron does not have a groundwater protection standard, results are compated to the health-based standard
(2) The groundwater protection standard is equal to the higher of the background tolerance limit and the relevant health-based standard
(3) 32% dilution was minimum dilution predicted in Table 8
(4) 63% dilution was maximum dilution predicted in Table 8
ft = feet
mg/L = milligrams per liter

Prepared by: GOL
Checked by: PJN
Reviewed by: RV

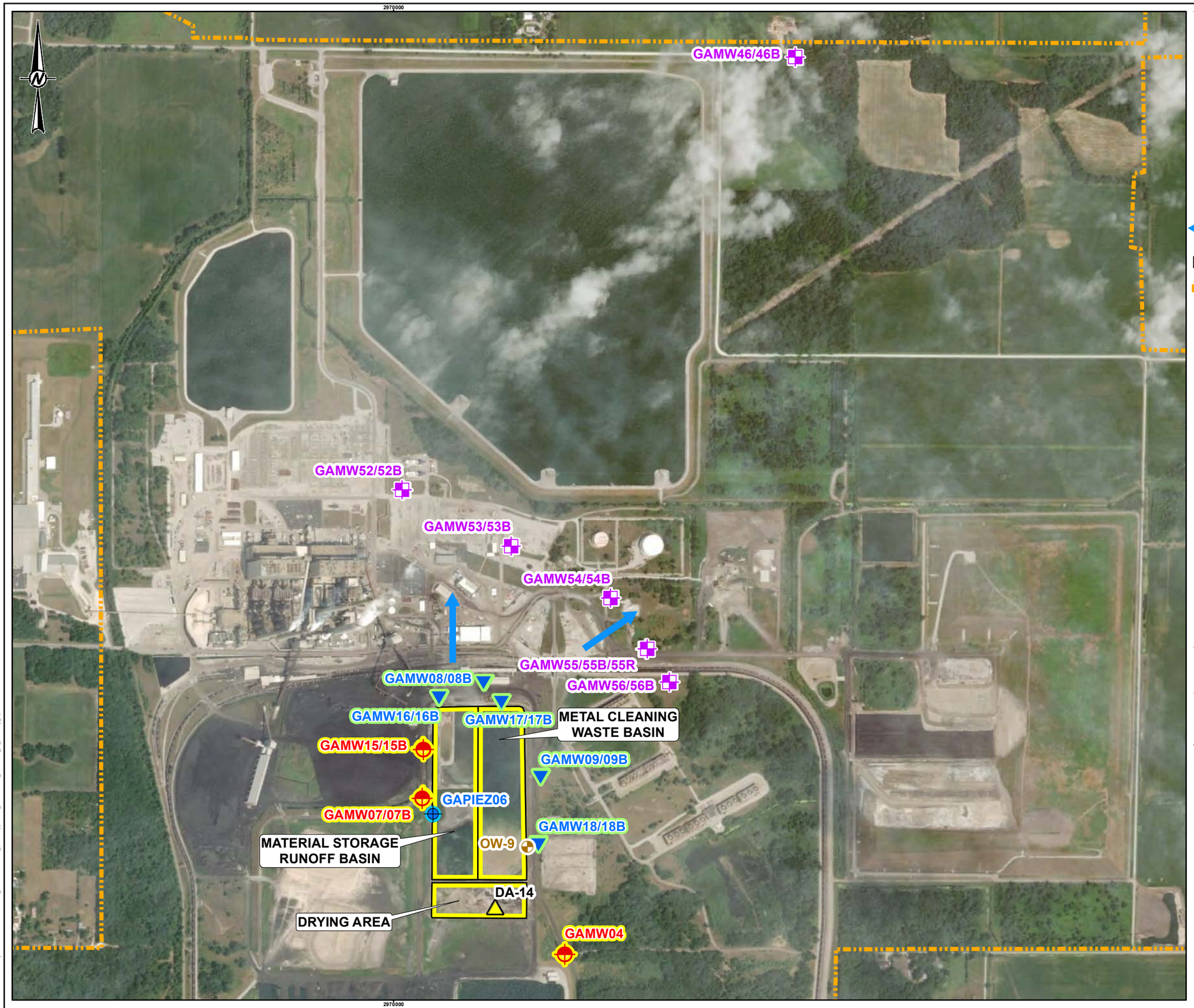
Table 10: Sorption Site and Surface Area Calculations
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

	Units	Minimum	Mean	Maximum
Ferrihydrite				
Amorphous Iron (Step 3 SEP) + Metal Hydroxide Iron (Step 4 SEP)	Sample Name	SB-18B-32/34	Mean of all samples	SB-53B-25-27
	ppm of Fe	1278	2006	3787
	millimoles of Fe	22.9	35.9	67.8
	moles of Fe	0.0229	0.0359	0.0678
Specific Surface Area	m^2/g	600		
Surface Site Concentration	moles weak sites/ mole of Fe	0.2		
Surface Sites	moles of weak sites	0.00458	0.00719	0.01356
Mass of Ferrihydrite	g	2.03	3.19	6.03
Gibbsite				
Amorphous Aluminum (Step 3 SEP) + Metal Hydroxide Aluminum (Step 4 SEP)	Sample Name	SB-53B-30-32	Mean of all samples	OW-9-10-12
	ppm of Al	130	221	408
	millimoles of Al	4.8	8.2	15.1
	moles of Al	0.0048	0.0082	0.0151
Specific Surface Area	m^2/g	32		
Surface Site Concentration	moles weak sites/ mole of Al	0.41		
Surface Sites	moles of weak sites	0.00198	0.00335	0.00619
Mass of Gibbsite	g	0.38	0.64	1.18

Notes:
ppm = parts per million
m^2/g = meters squared per gram
g = grams

Prepared by: GOL
Checked by: PJN
Reviewed by: RV

Figures



LEGEND

- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- Downgradient Boring Location
- Porewater Sample Location
- CCR Source Material Sample Location
- Generalized Groundwater Flow Direction
- CCR Units
- Approximate Property Line

0 850 1,700

1 " = 850 feet Feet

NOTE(S)

1. THIS FIGURE DEPICTS THE GENERALIZED GROUNDWATER FLOW DIRECTION WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER.

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

MONITORED NATURAL ATTENUATION EVALUATION
MSRB, MCWB, AND DRYING AREA
NIPSCO LLC R. M. SCHAHFER GENERATING STATION

TITLE

SAMPLE LOCATION MAP

CONSULTANT

GOLDER

YYYY-MM-DD	6/16/2020
DESIGNED	DFS
PREPARED	SHL
REVIEWED	JSP
APPROVED	MAH

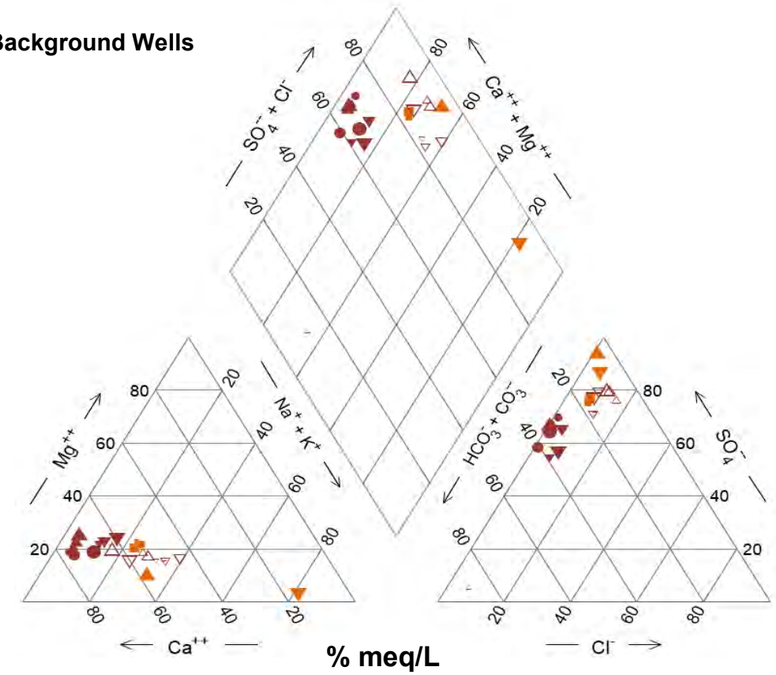
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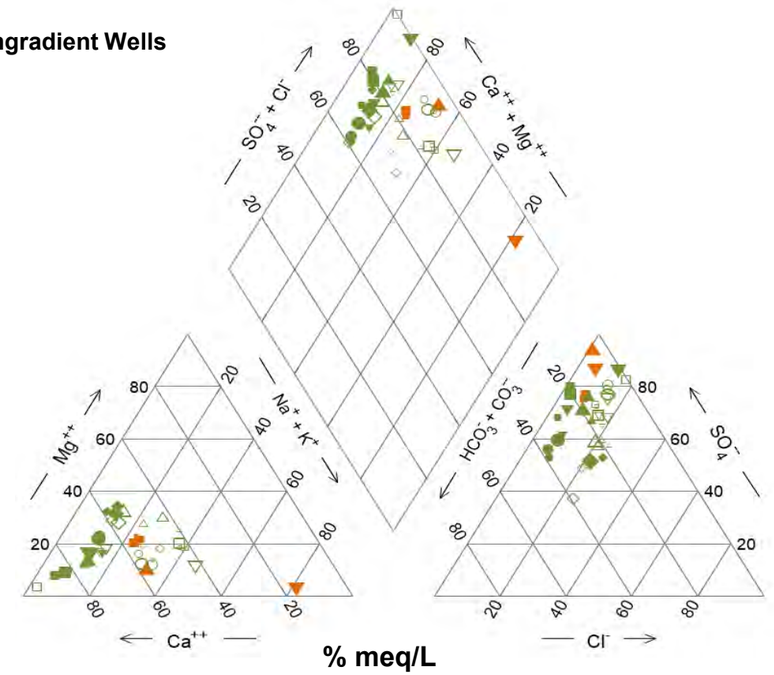
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1 in
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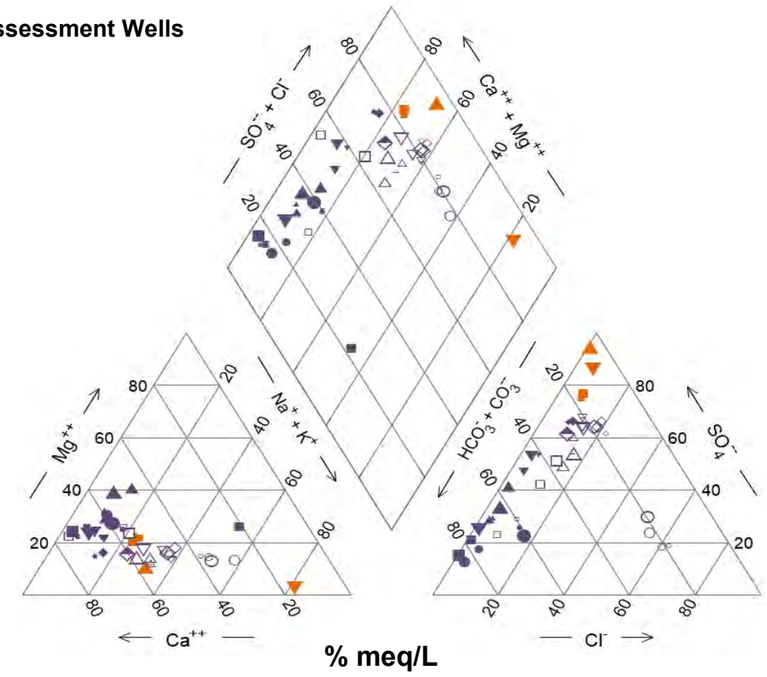
(a) **Background Wells**



(b) **Downgradient Wells**



(c) **Assessment Wells**



Porewater
- GAPIEZ–06
- DAPZ–02A
- DAPZ–02B

Upgradient Wells
- GAMW–04
- GAMW–07
- GAMW–07B
- GAMW–15
- GAMW–15B

Downgradient Wells
- GAMW–08
- GAMW–08B
- GAMW–09
- GAMW–09B
- GAMW–16
- GAMW–16B
- GAMW–17
- GAMW–17B
- GAMW–18
- GAMW–18B

Assessment Wells
- GAMW–52
- GAMW–52B
- GAMW–53
- GAMW–53B
- GAMW–54
- GAMW–54B
- GAMW–55
- GAMW–55R
- GAMW–55B
- GAMW–56
- GAMW–56B

Sample Collection Date

Least Recent → Most Recent

CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

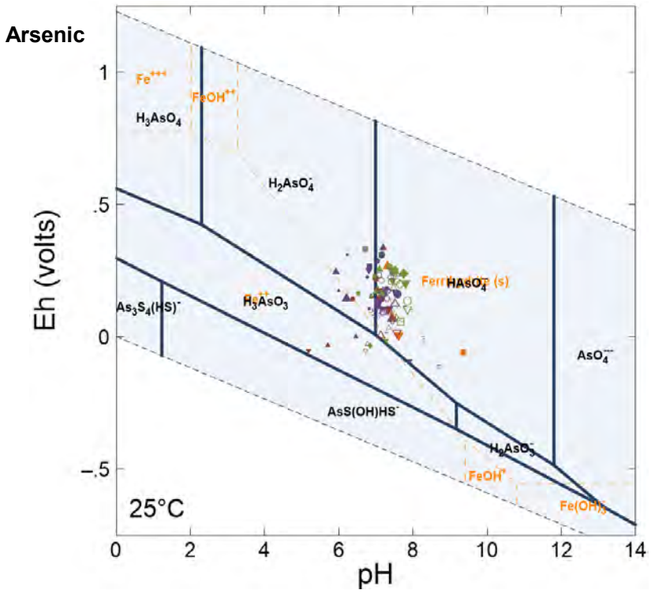
PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Piper Diagrams - Groundwater Characterization of Background, Monitoring, and Assessment Wells

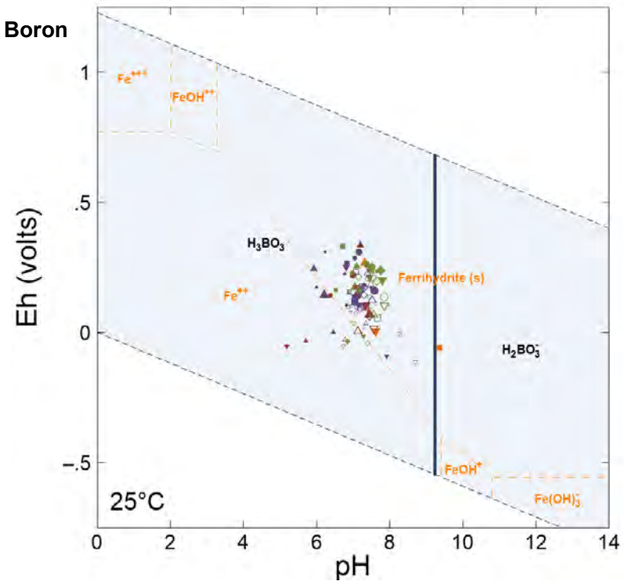
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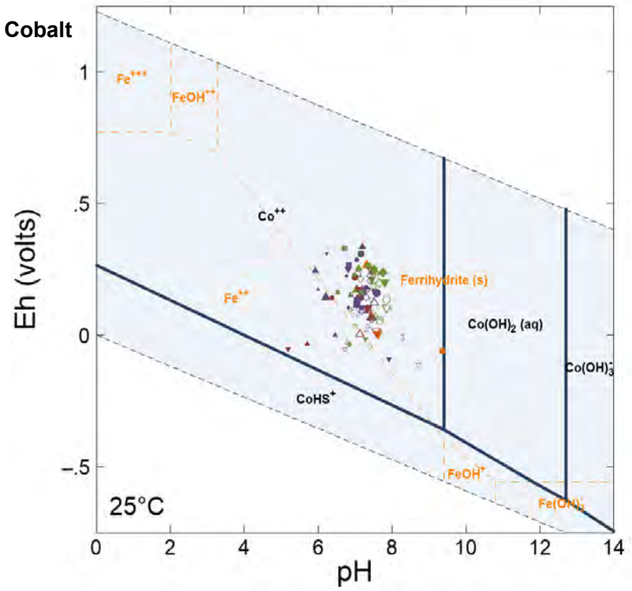
(a) Arsenic



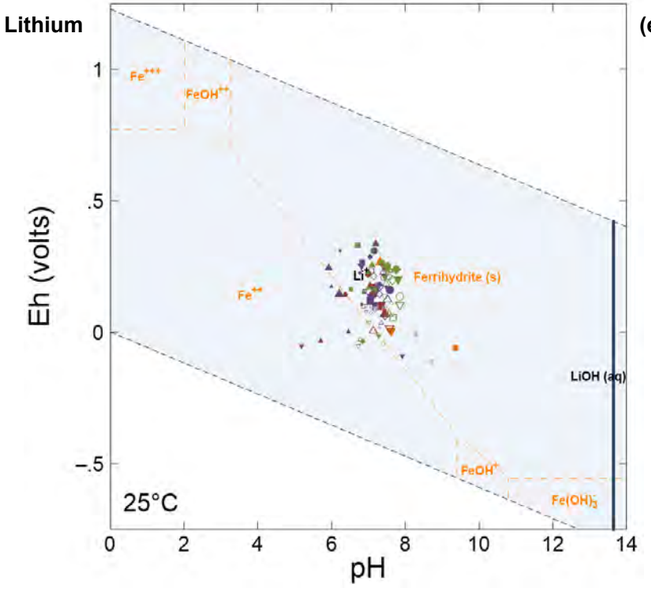
(b) Boron



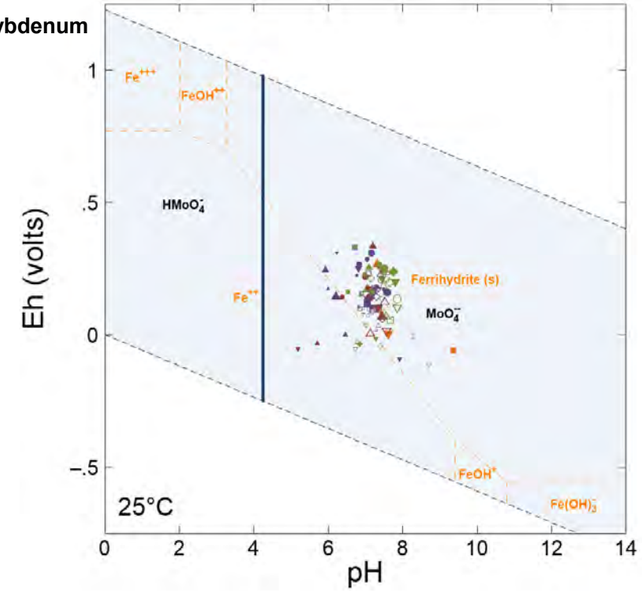
(c) Cobalt



(d) Lithium



(e) Molybdenum



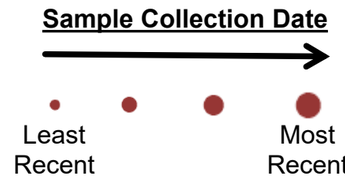
Porewater
- GAPIEZ–06
- DAPZ–02A
- DAPZ–02B

Upgradient Wells
- GAMW–04
- GAMW–07
- GAMW–07B
- GAMW–15
- GAMW–15B

Downgradient Wells
- GAMW–08
- GAMW–08B
- GAMW–09
- GAMW–09B
- GAMW–16
- GAMW–16B
- GAMW–17
- GAMW–17B
- GAMW–18
- GAMW–18B

Assessment Wells
- GAMW–52
- GAMW–52B
- GAMW–53
- GAMW–53B
- GAMW–54
- GAMW–54B
- GAMW–55
- GAMW–55R
- GAMW–55B
- GAMW–56
- GAMW–56B

Sample Collection Date



CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

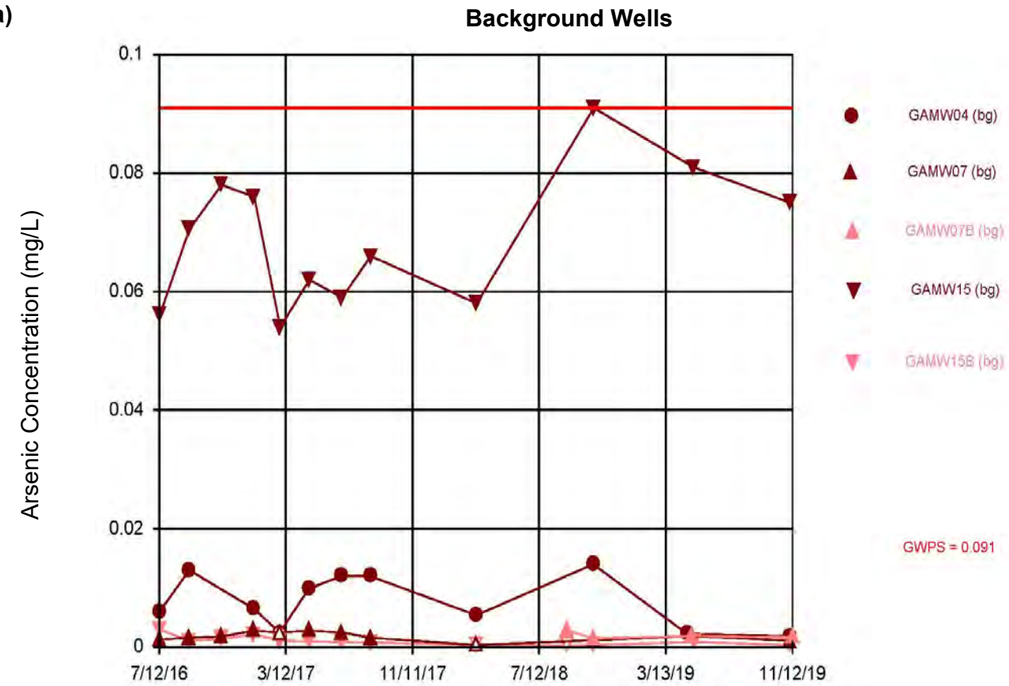
PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Pourbaix Diagrams For Arsenic, Boron, Cobalt, Lithium, and Molybdenum

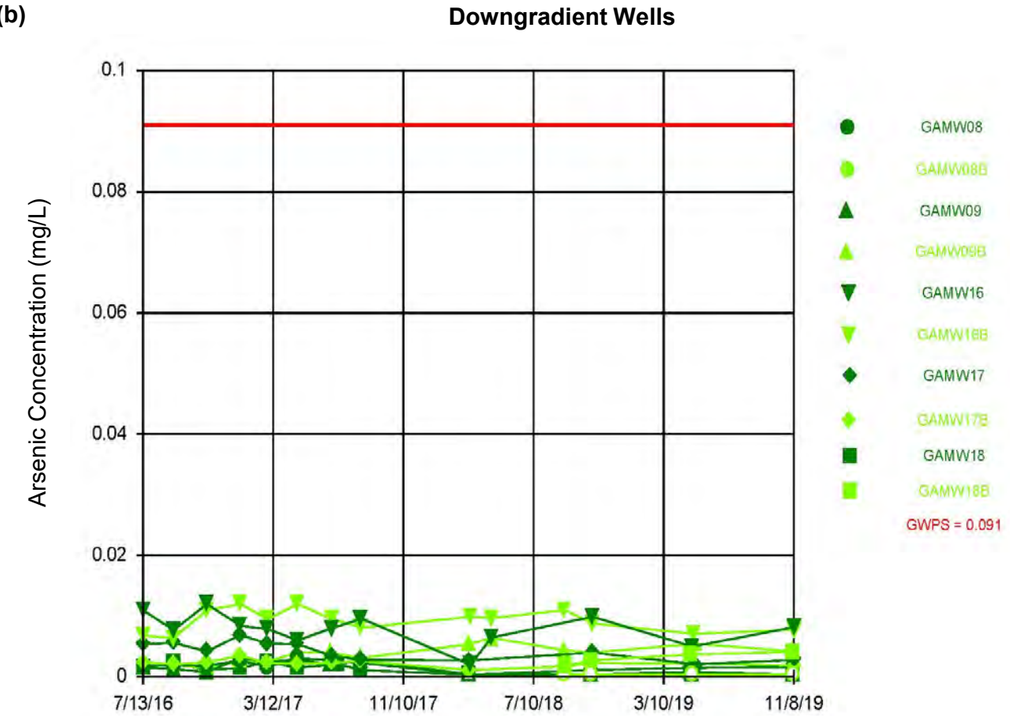
PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	3a-e

PATH: https://golderassociates.sharepoint.com/sites/nipscocrgwmonitoring/Shared Documents/RMSGS/Reports/MNA Report | FILE NAME: 2020_11_MNA_RMSGS_Figures.xlsx

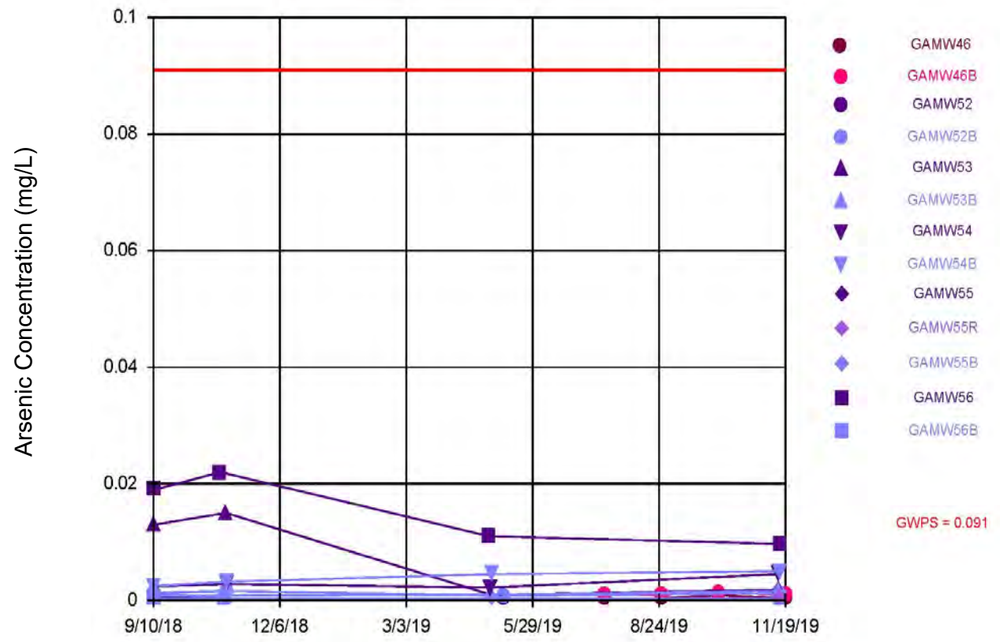
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit.

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PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

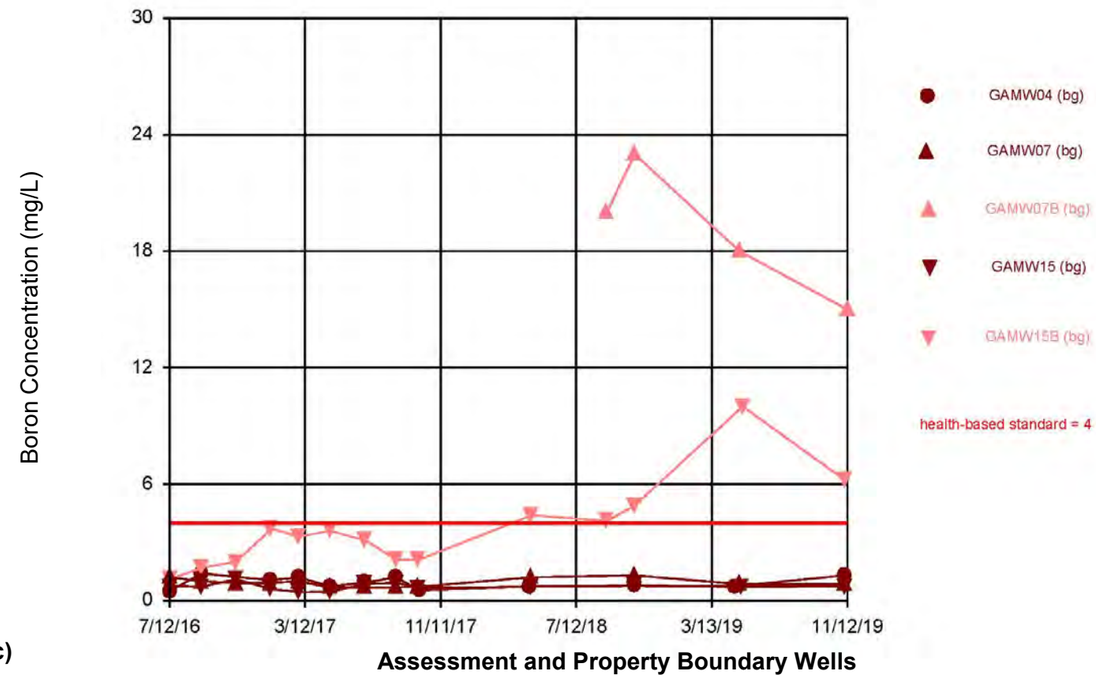
TITLE
Arsenic Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	4a-c

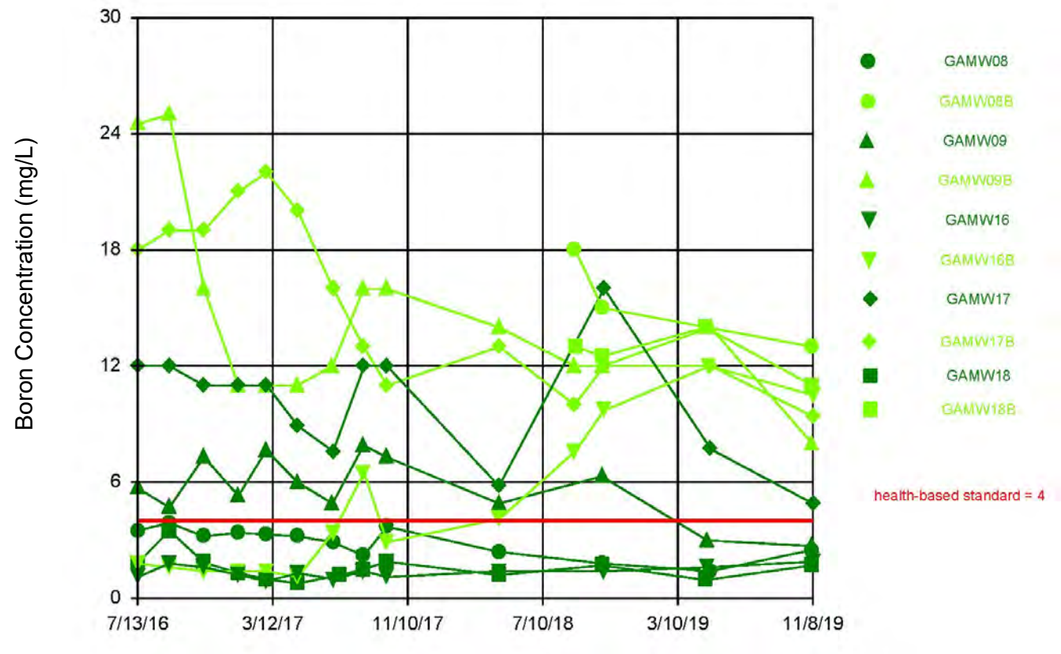
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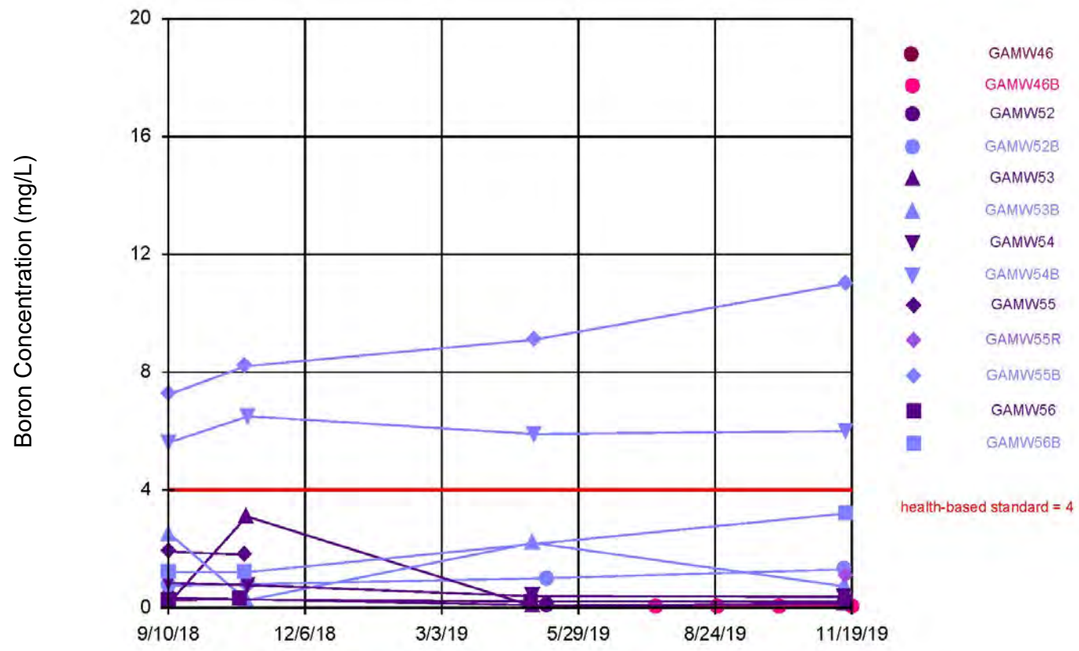
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit

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PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

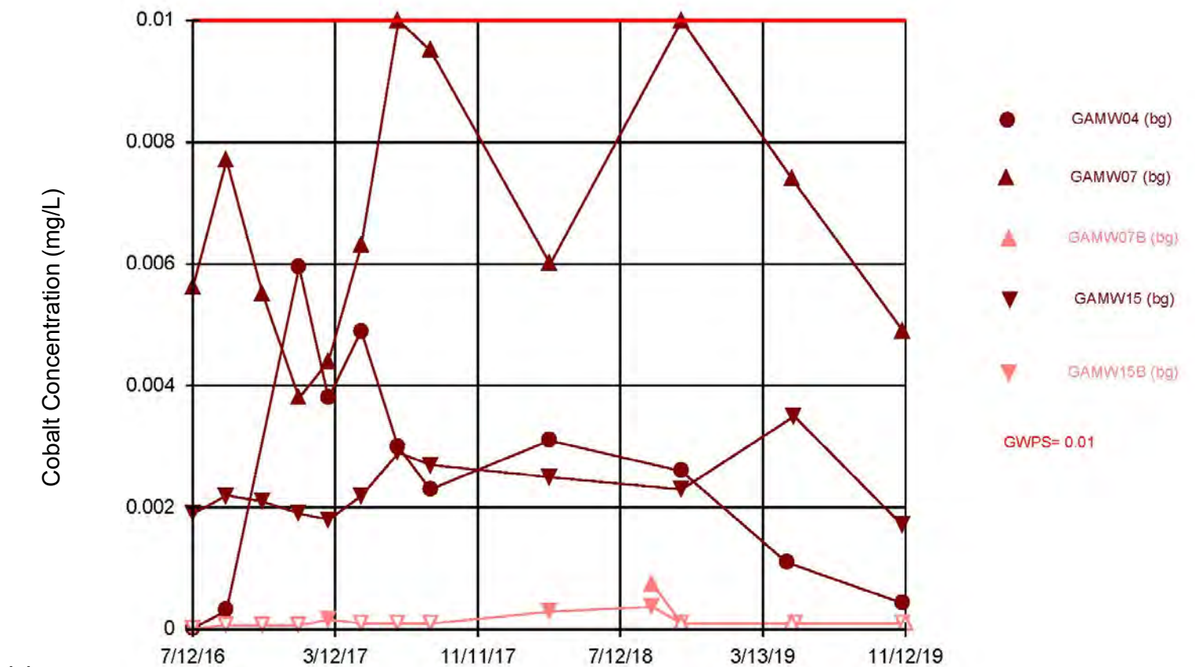
TITLE
Boron Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
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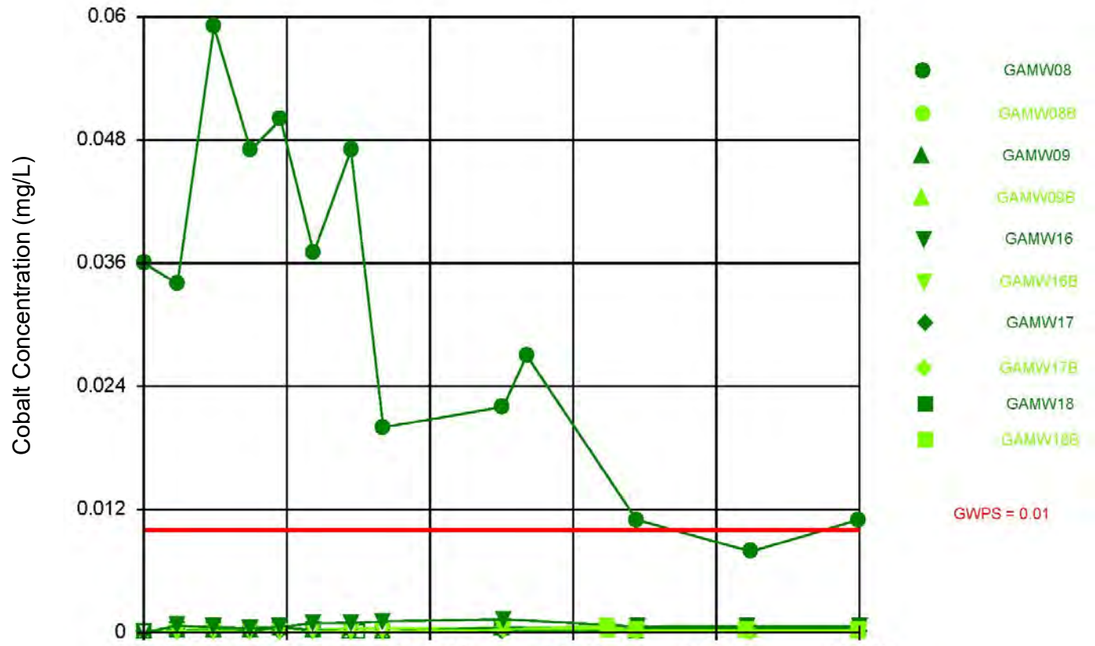
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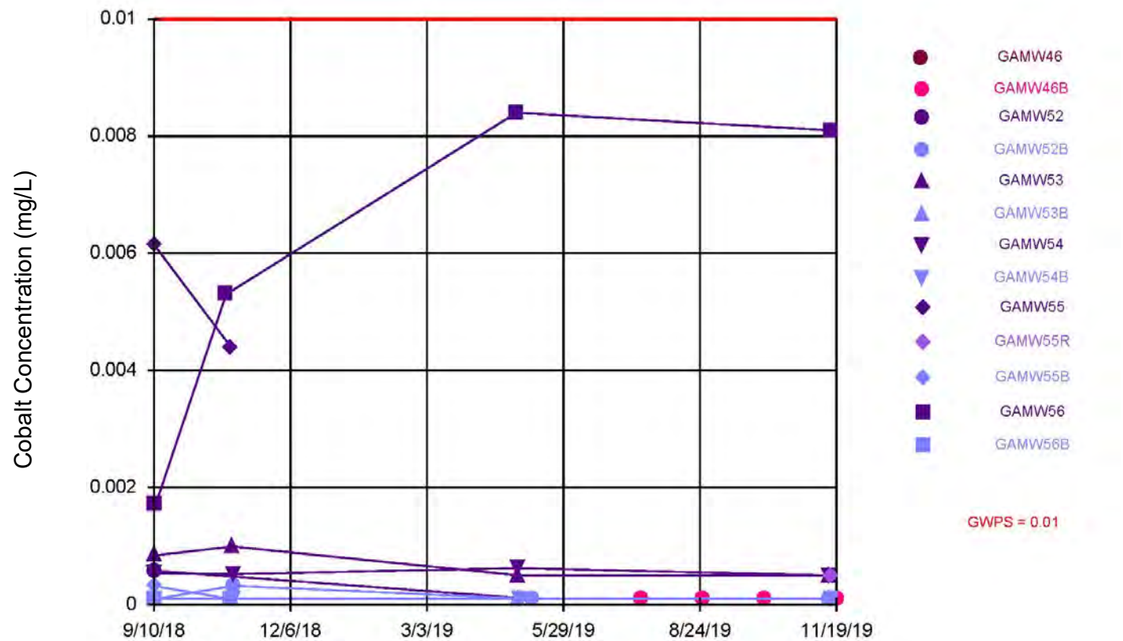
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit

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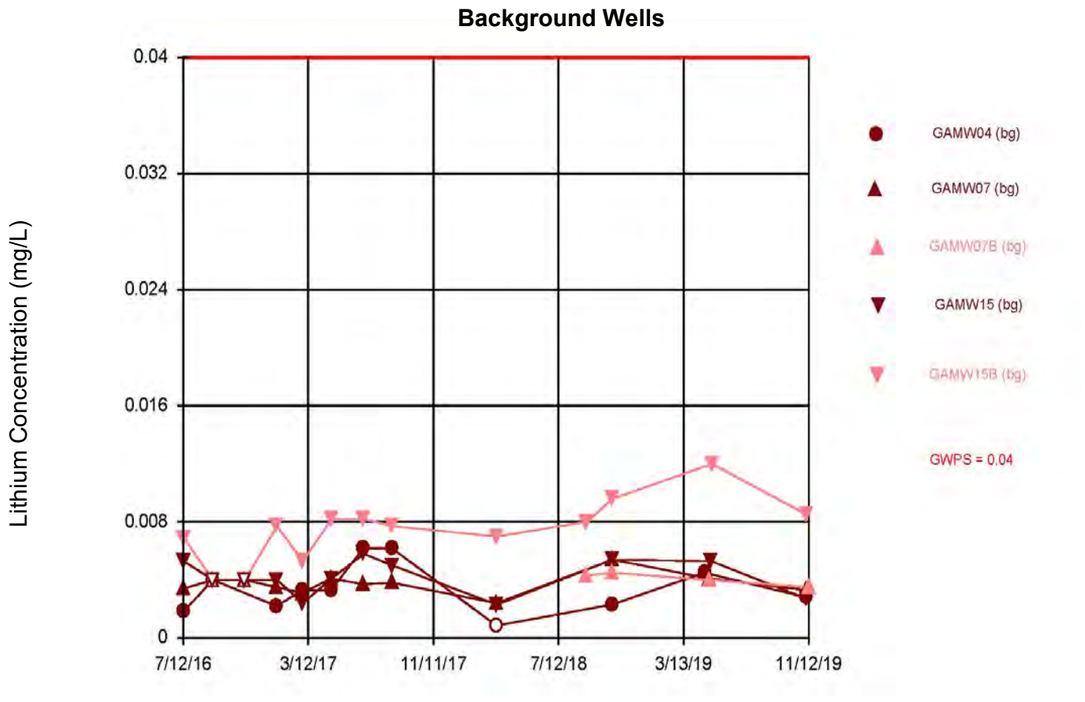
TITLE
Cobalt Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	6a-c

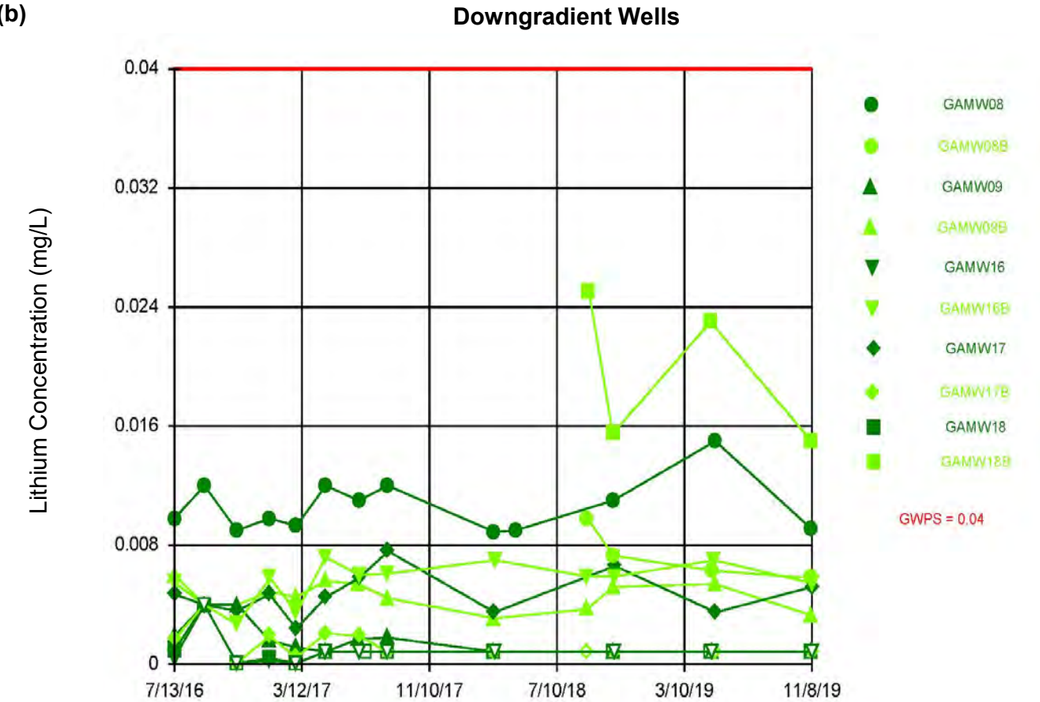
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PATH: https://golderassociates.sharepoint.com/sites/nipscocorgwmonitoring/Shared Documents/RMSGS/Reports/MNA Report | FILE NAME: 2020_11_MNA_RMSGS_Figures.xlsx

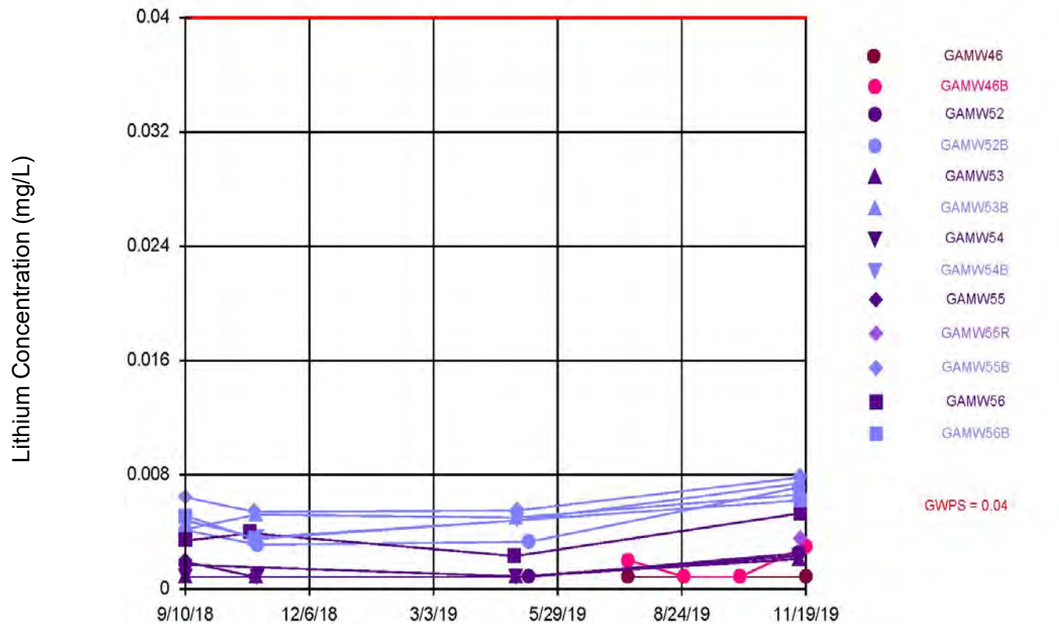
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit

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PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

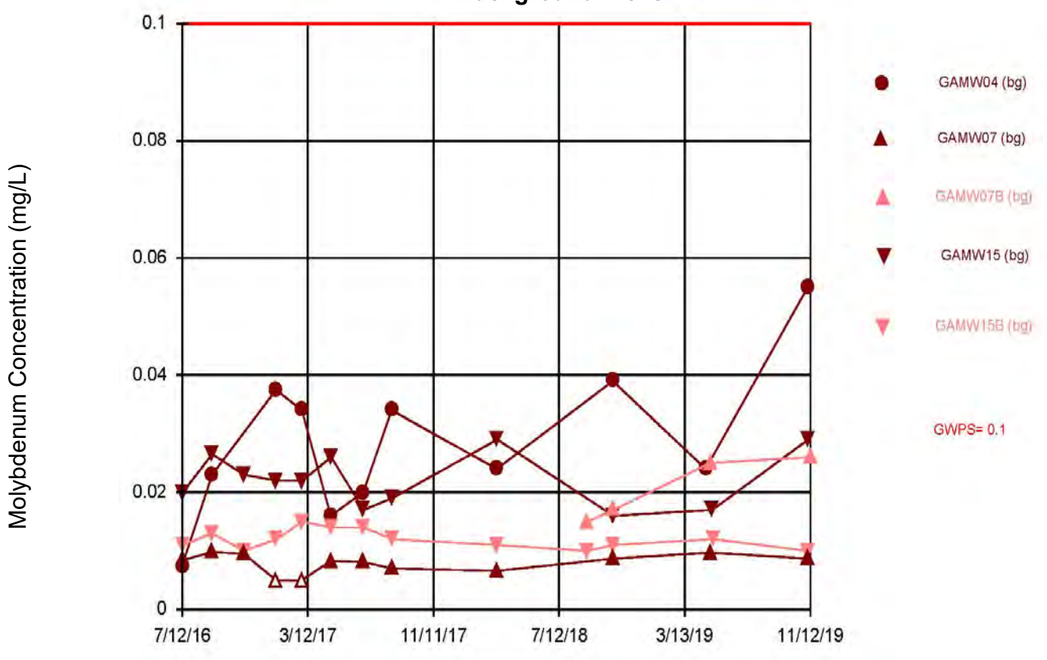
TITLE
Lithium Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	7a-c

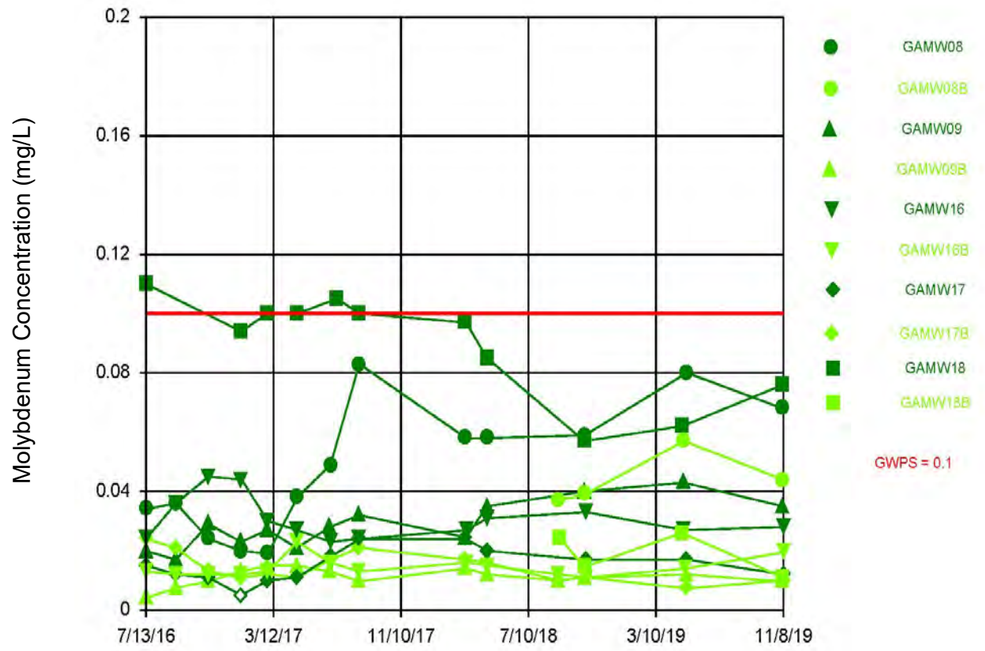
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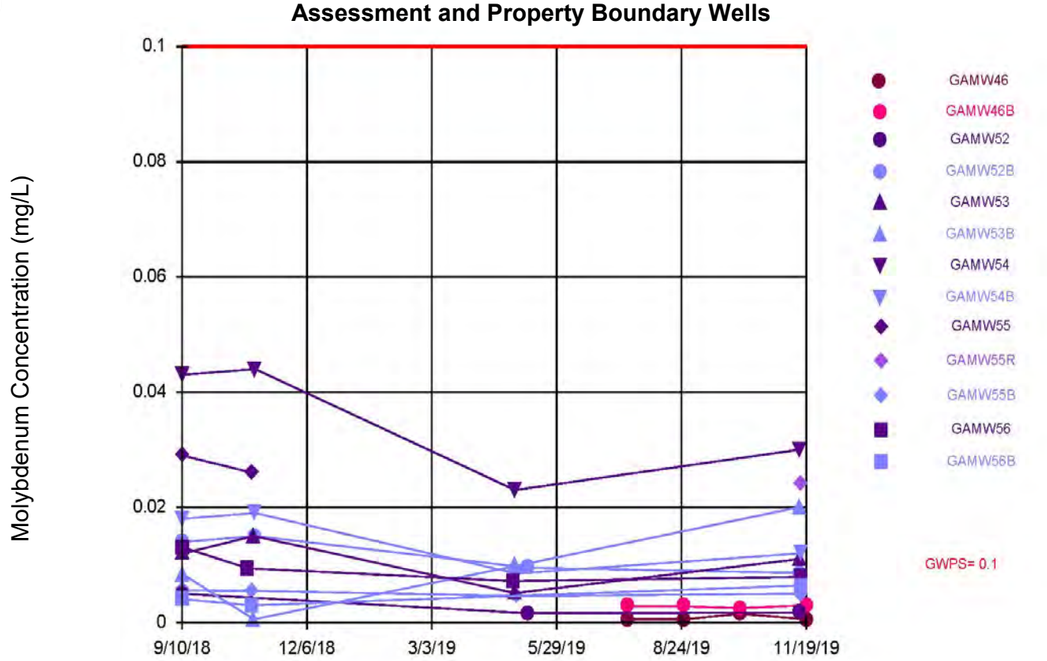
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit

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PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

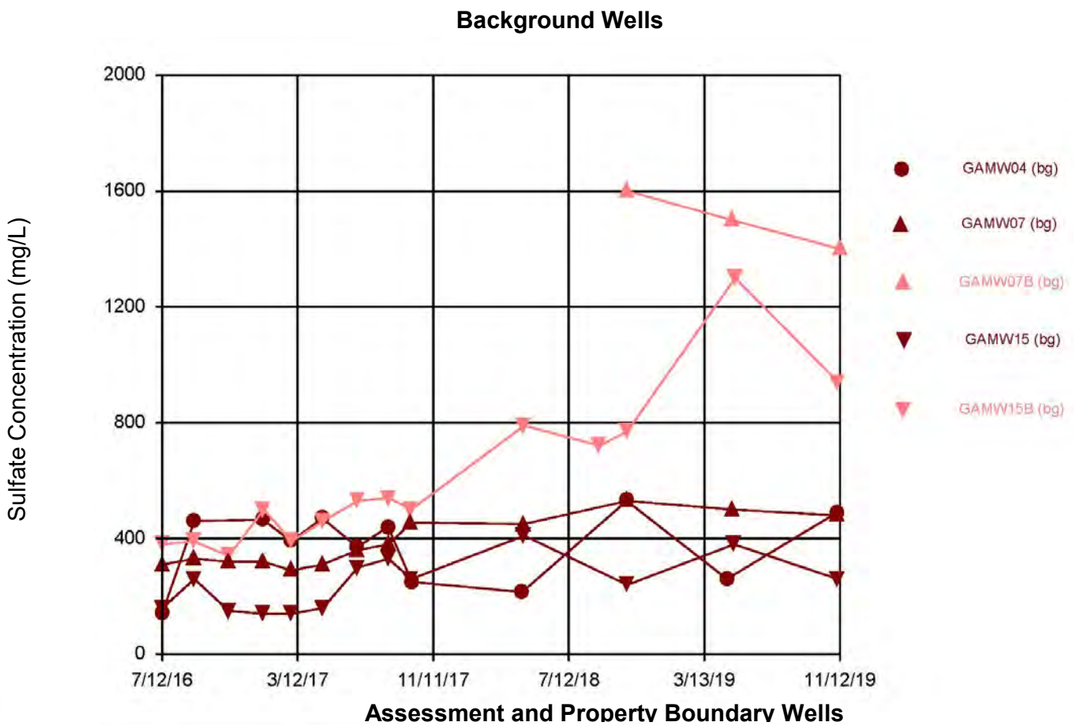
TITLE
Molybdenum Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	8a-c

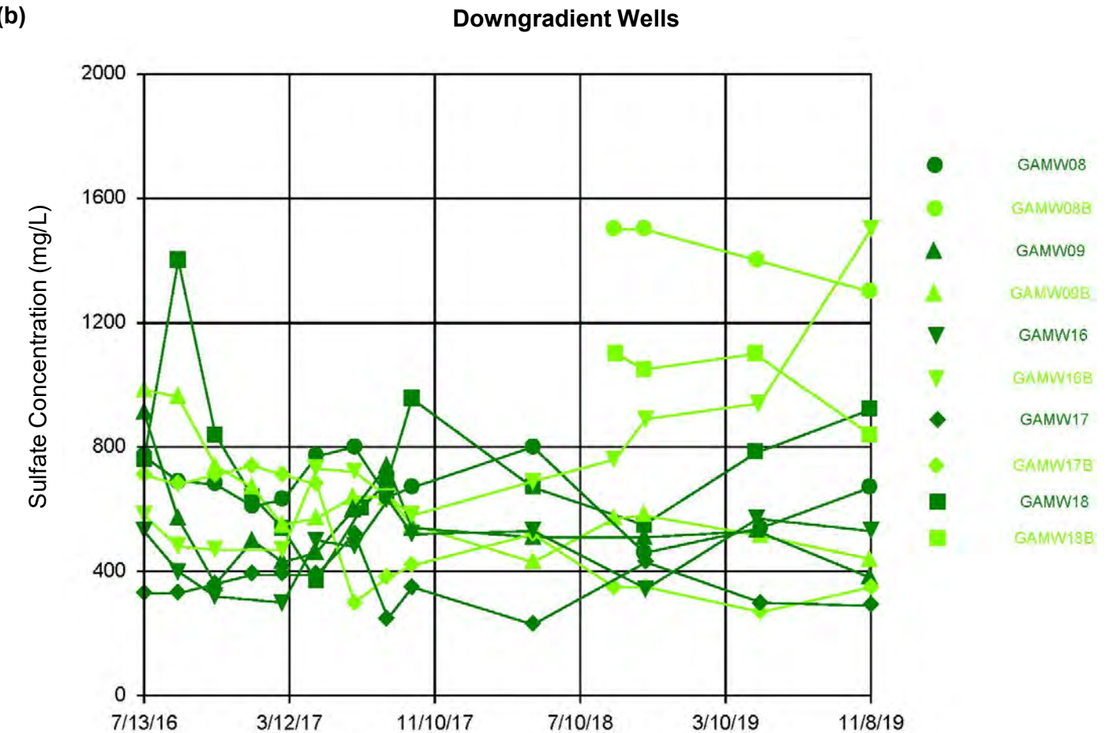
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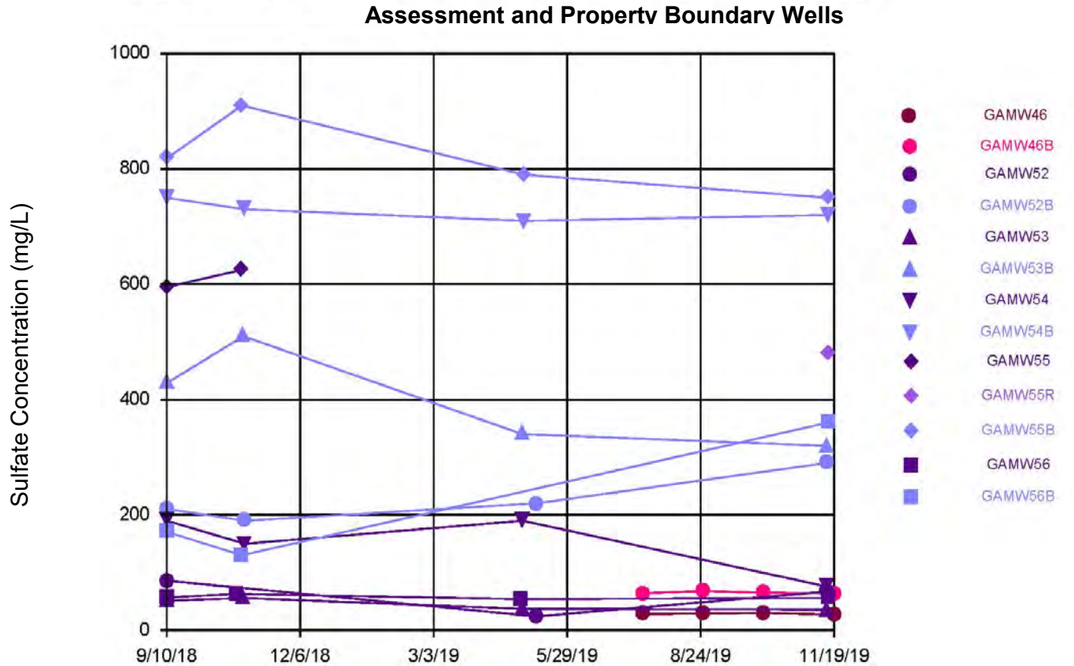
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit

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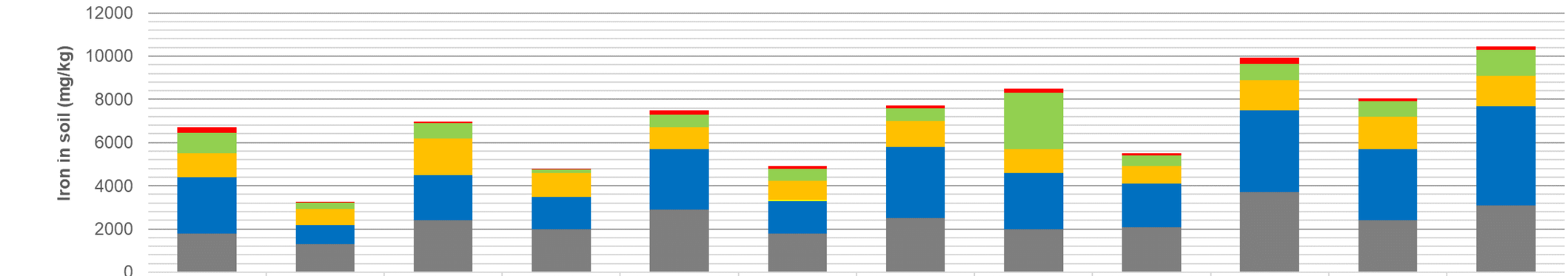
PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Sulfate Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	9a-c

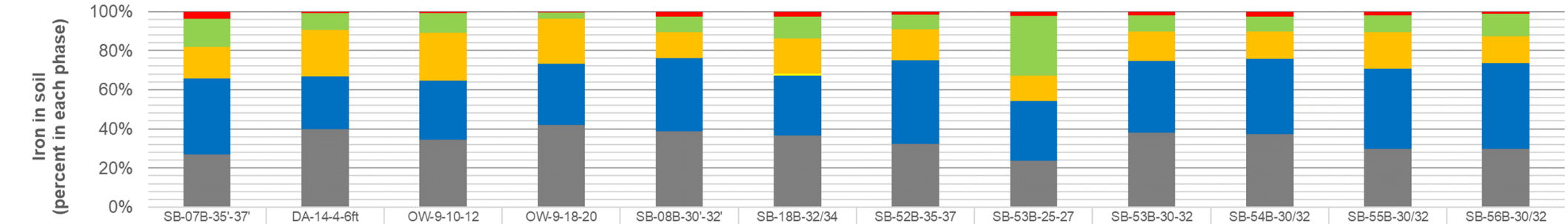
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PATH: https://golderassociates.sharepoint.com/sites/nipscocrgwmonitoring/Shared Documents/RMSGS/Reports/MNA Report | FILE NAME: 2020_11_MNA_RMSGS_Figures.xlsx



	SB-07B-35'-37'	DA-14-4-6ft	OW-9-10-12	OW-9-18-20	SB-08B-30'-32'	SB-18B-32/34	SB-52B-35-37	SB-53B-25-27	SB-53B-30-32	SB-54B-30/32	SB-55B-30/32	SB-56B-30/32
Exchangeable Phase	0	0	0	0	0	0	0	0	0	0	0	0
Carbonate Phase	260	31	61	29	190	130	130	200	99	280	160	140
Amorphous Phase	950	280	710	150	600	550	590	2600	470	740	700	1200
Metal Hydroxide Phase	1100	770	1700	1100	1000	880	1200	1100	830	1400	1500	1400
Organic Phase	0	0	0	0	0	63	0	0	0	0	0	0
Acid/Sulfide Fraction	2600	870	2100	1500	2800	1500	3300	2600	2000	3800	3300	4600
Residual Fraction	1800	1300	2400	2000	2900	1800	2500	2000	2100	3700	2400	3100

Borehole and depth below ground surface (Iron in mg/kg soil)



	SB-07B-35'-37'	DA-14-4-6ft	OW-9-10-12	OW-9-18-20	SB-08B-30'-32'	SB-18B-32/34	SB-52B-35-37	SB-53B-25-27	SB-53B-30-32	SB-54B-30/32	SB-55B-30/32	SB-56B-30/32
Exchangeable Phase	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Carbonate Phase	3.87%	0.95%	0.88%	0.61%	2.54%	2.64%	1.68%	2.35%	1.80%	2.82%	1.99%	1.34%
Amorphous Phase	14.16%	8.61%	10.19%	3.14%	8.01%	11.17%	7.64%	30.59%	8.55%	7.46%	8.68%	11.49%
Metal Hydroxide Phase	16.39%	23.69%	24.39%	23.02%	13.35%	17.88%	15.54%	12.94%	15.09%	14.11%	18.61%	13.41%
Organic Phase	0.00%	0.00%	0.00%	0.00%	0.00%	1.28%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Acid/Sulfide Fraction	38.75%	26.76%	30.12%	31.39%	37.38%	30.47%	42.75%	30.59%	36.37%	38.31%	40.94%	44.06%
Residual Fraction	26.83%	39.99%	34.43%	41.85%	38.72%	36.56%	32.38%	23.53%	38.19%	37.30%	29.78%	29.69%

Borehole and depth below ground surface (Iron in percent of total)

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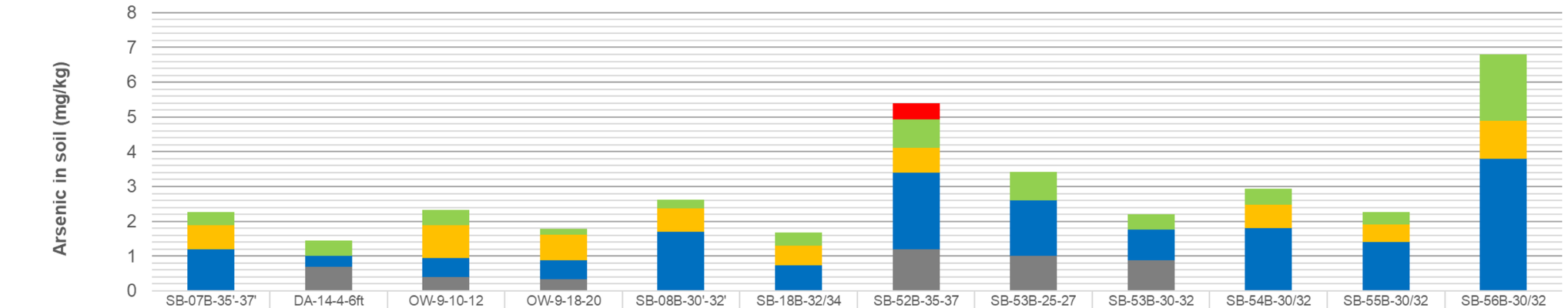
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Iron Sequential Extraction Results

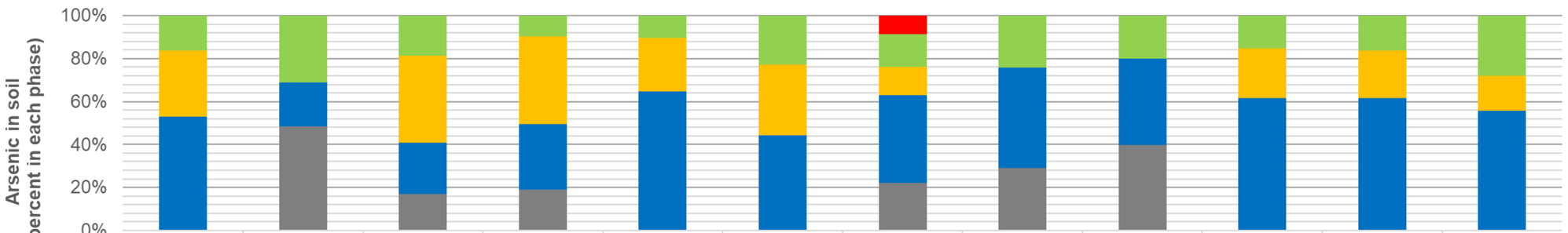
PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	10

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	SB-07B-35'-37'	DA-14-4-6ft	OW-9-10-12	OW-9-18-20	SB-08B-30'-32'	SB-18B-32/34	SB-52B-35-37	SB-53B-25-27	SB-53B-30-32	SB-54B-30/32	SB-55B-30/32	SB-56B-30/32
Exchangeable Phase	0	0	0	0	0	0	0	0	0	0	0	0
Carbonate Phase	0	0	0	0	0	0	0.46	0	0	0	0	0
Amorphous Phase	0.37	0.45	0.43	0.17	0.27	0.38	0.83	0.83	0.44	0.45	0.37	1.9
Metal Hydroxide Phase	0.69	0	0.94	0.73	0.66	0.55	0.71	0	0	0.68	0.5	1.1
Organic Phase	0	0	0	0	0	0	0	0	0	0	0	0
Acid/Sulfide Fraction	1.2	0.3	0.56	0.54	1.7	0.74	2.2	1.6	0.89	1.8	1.4	3.8
Residual Fraction	0	0.7	0.39	0.34	0	0	1.2	1	0.88	0	0	0

Borehole and depth below ground surface (Arsenic in mg/kg soil)



	SB-07B-35'-37'	DA-14-4-6ft	OW-9-10-12	OW-9-18-20	SB-08B-30'-32'	SB-18B-32/34	SB-52B-35-37	SB-53B-25-27	SB-53B-30-32	SB-54B-30/32	SB-55B-30/32	SB-56B-30/32
Exchangeable Phase	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Carbonate Phase	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	8.52%	0.00%	0.00%	0.00%	0.00%	0.00%
Amorphous Phase	16.37%	31.03%	18.53%	9.55%	10.27%	22.75%	15.37%	24.20%	19.91%	15.36%	16.30%	27.94%
Metal Hydroxide Phase	30.53%	0.00%	40.52%	41.01%	25.10%	32.93%	13.15%	0.00%	0.00%	23.21%	22.03%	16.18%
Organic Phase	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Acid/Sulfide Fraction	53.10%	20.69%	24.14%	30.34%	64.64%	44.31%	40.74%	46.65%	40.27%	61.43%	61.67%	55.88%
Residual Fraction	0.00%	48.28%	16.81%	19.10%	0.00%	0.00%	22.22%	29.15%	39.82%	0.00%	0.00%	0.00%

Borehole and depth below ground surface (Arsenic in percent of total)

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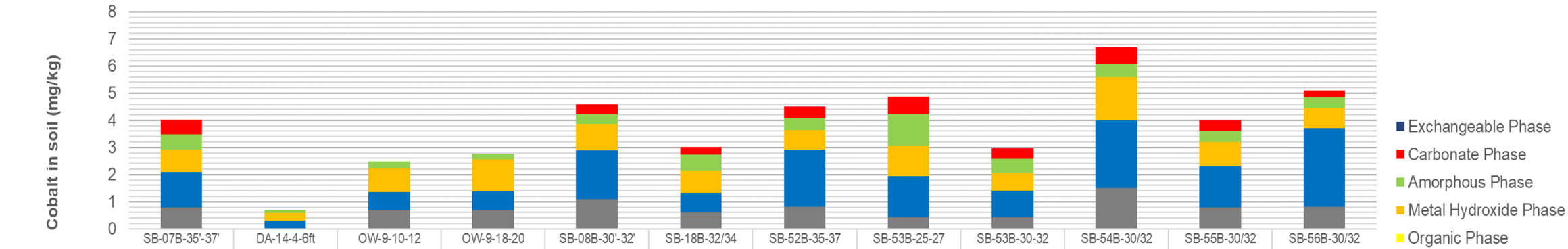
PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Arsenic Sequential Extraction Results

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	11

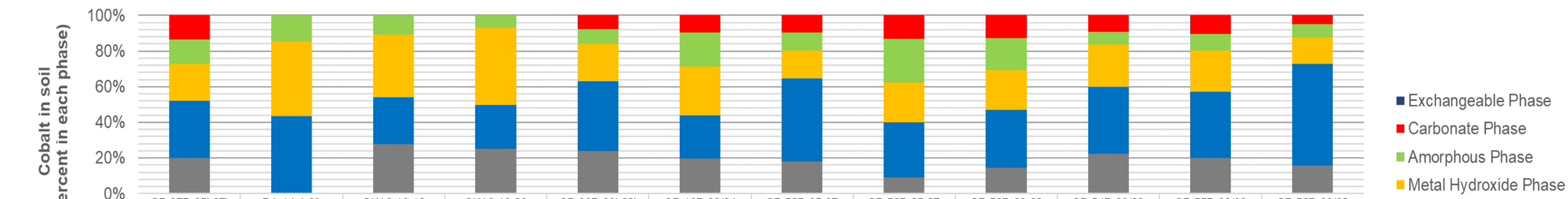
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PATH: https://golderassociates.sharepoint.com/sites/nipscocrgwmonitoring/Shared Documents/RMSGS/Reports/MNA Report | FILE NAME: 2020_11_MNA_RMSGS_Figures.xlsx



	SB-07B-35'-37'	DA-14-4-6ft	OW-9-10-12	OW-9-18-20	SB-08B-30'-32'	SB-18B-32/34	SB-52B-35-37	SB-53B-25-27	SB-53B-30-32	SB-54B-30/32	SB-55B-30/32	SB-56B-30/32
Exchangeable Phase	0	0	0	0	0	0	0	0	0	0	0	0
Carbonate Phase	0.54	0	0	0	0.35	0.29	0.44	0.63	0.38	0.62	0.41	0.26
Amorphous Phase	0.55	0.1	0.27	0.19	0.37	0.58	0.45	1.2	0.53	0.47	0.39	0.37
Metal Hydroxide Phase	0.83	0.29	0.87	1.2	0.97	0.83	0.71	1.1	0.66	1.6	0.91	0.76
Organic Phase	0	0	0	0	0	0	0	0	0	0	0	0
Acid/Sulfide Fraction	1.3	0.3	0.66	0.68	1.8	0.73	2.1	1.5	0.97	2.5	1.5	2.9
Residual Fraction	0.8	0	0.69	0.69	1.1	0.6	0.82	0.44	0.43	1.5	0.8	0.81

Borehole and depth below ground surface (Cobalt in mg/kg soil)



	SB-07B-35'-37'	DA-14-4-6ft	OW-9-10-12	OW-9-18-20	SB-08B-30'-32'	SB-18B-32/34	SB-52B-35-37	SB-53B-25-27	SB-53B-30-32	SB-54B-30/32	SB-55B-30/32	SB-56B-30/32
Exchangeable Phase	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Carbonate Phase	13.43%	0.00%	0.00%	0.00%	7.63%	9.57%	9.73%	12.94%	12.79%	9.27%	10.22%	5.10%
Amorphous Phase	13.68%	14.49%	10.84%	6.88%	8.06%	19.14%	9.96%	24.64%	17.85%	7.03%	9.73%	7.25%
Metal Hydroxide Phase	20.65%	42.03%	34.94%	43.48%	21.13%	27.39%	15.71%	22.59%	22.22%	23.92%	22.69%	14.90%
Organic Phase	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Acid/Sulfide Fraction	32.34%	43.48%	26.51%	24.64%	39.22%	24.09%	46.46%	30.80%	32.66%	37.37%	37.41%	56.86%
Residual Fraction	19.90%	0.00%	27.71%	25.00%	23.97%	19.80%	18.14%	9.03%	14.48%	22.42%	19.95%	15.88%

Borehole and depth below ground surface (Cobalt in percent of total)

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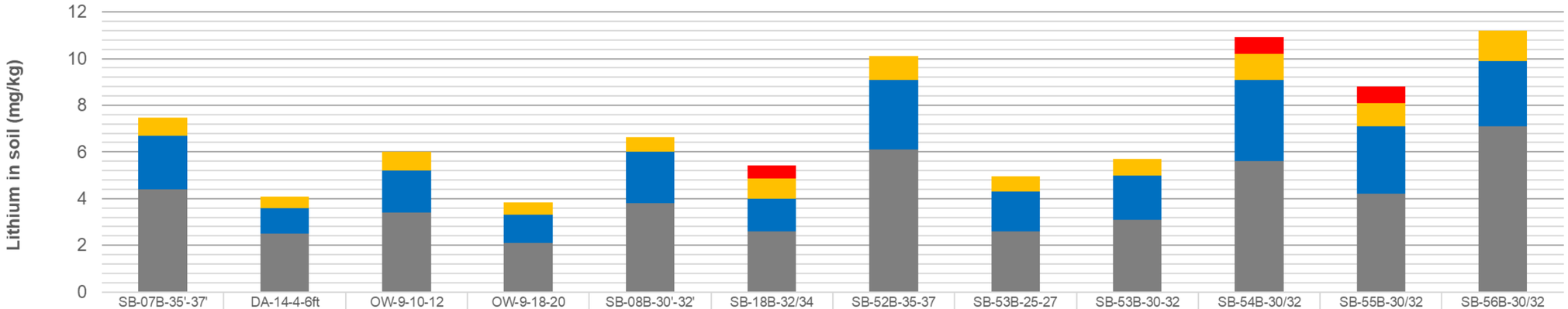
PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Cobalt Sequential Extraction Results

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	12

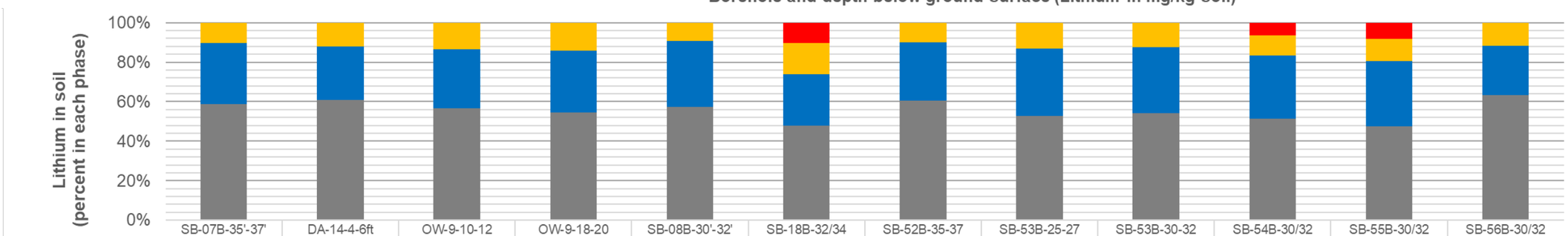
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	SB-07B-35'-37'	DA-14-4-6ft	OW-9-10-12	OW-9-18-20	SB-08B-30'-32'	SB-18B-32/34	SB-52B-35-37	SB-53B-25-27	SB-53B-30-32	SB-54B-30/32	SB-55B-30/32	SB-56B-30/32
Exchangeable Phase	0	0	0	0	0	0	0	0	0	0	0	0
Carbonate Phase	0	0	0	0	0	0.56	0	0	0	0.71	0.72	0
Amorphous Phase	0	0	0	0	0	0	0	0	0	0	0	0
Metal Hydroxide Phase	0.78	0.5	0.81	0.55	0.62	0.86	1	0.64	0.71	1.1	1	1.3
Organic Phase	0	0	0	0	0	0	0	0	0	0	0	0
Acid/Sulfide Fraction	2.3	1.1	1.8	1.2	2.2	1.4	3	1.7	1.9	3.5	2.9	2.8
Residual Fraction	4.4	2.5	3.4	2.1	3.8	2.6	6.1	2.6	3.1	5.6	4.2	7.1

Borehole and depth below ground surface (Lithium in mg/kg soil)



	SB-07B-35'-37'	DA-14-4-6ft	OW-9-10-12	OW-9-18-20	SB-08B-30'-32'	SB-18B-32/34	SB-52B-35-37	SB-53B-25-27	SB-53B-30-32	SB-54B-30/32	SB-55B-30/32	SB-56B-30/32
Exchangeable Phase	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Carbonate Phase	0.00%	0.00%	0.00%	0.00%	0.00%	10.33%	0.00%	0.00%	0.00%	6.51%	8.16%	0.00%
Amorphous Phase	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Metal Hydroxide Phase	10.43%	12.20%	13.48%	14.29%	9.37%	15.87%	9.90%	12.96%	12.43%	10.08%	11.34%	11.61%
Organic Phase	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Acid/Sulfide Fraction	30.75%	26.83%	29.95%	31.17%	33.23%	25.83%	29.70%	34.41%	33.27%	32.08%	32.88%	25.00%
Residual Fraction	58.82%	60.98%	56.57%	54.55%	57.40%	47.97%	60.40%	52.63%	54.29%	51.33%	47.62%	63.39%

Borehole and depth below ground surface (Lithium in percent of total)

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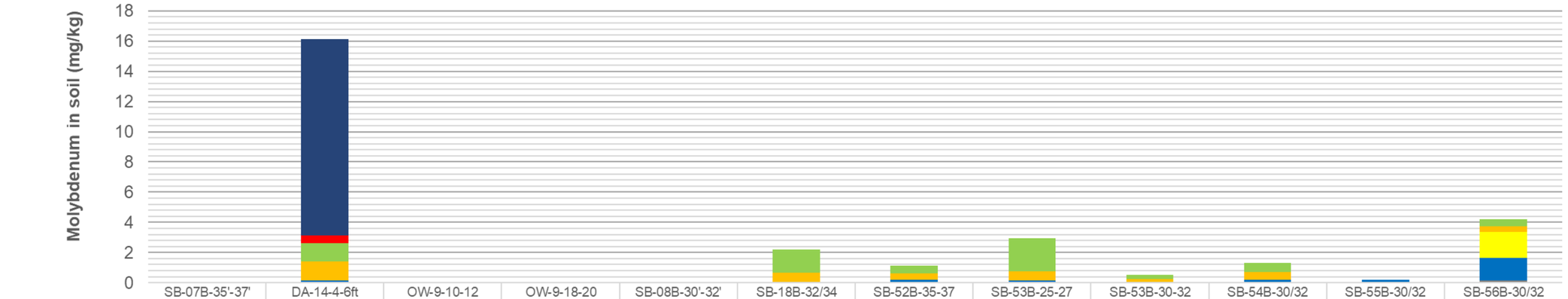
PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Lithium Sequential Extraction Results

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	13

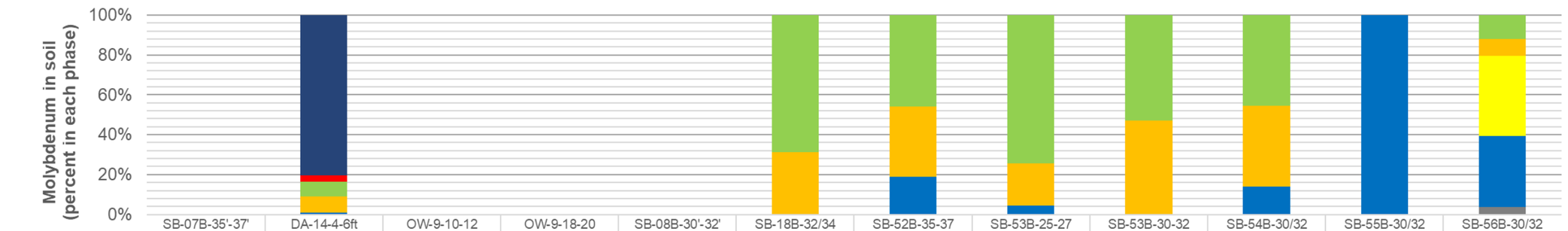
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	SB-07B-35'-37'	DA-14-4-6ft	OW-9-10-12	OW-9-18-20	SB-08B-30'-32'	SB-18B-32/34	SB-52B-35-37	SB-53B-25-27	SB-53B-30-32	SB-54B-30/32	SB-55B-30/32	SB-56B-30/32
Exchangeable Phase	0	13	0	0	0	0	0	0	0	0	0	0
Carbonate Phase	0	0.51	0	0	0	0	0	0	0	0	0	0
Amorphous Phase	0	1.2	0	0	0	1.5	0.51	2.2	0.27	0.59	0	0.5
Metal Hydroxide Phase	0	1.3	0	0	0	0.68	0.39	0.63	0.24	0.53	0	0.36
Organic Phase	0	0	0	0	0	0	0	0	0	0	0	1.7
Acid/Sulfide Fraction	0	0.13	0	0	0	0	0.21	0.13	0	0.18	0.2	1.5
Residual Fraction	0	0	0	0	0	0	0	0	0	0	0	0.16

Borehole and depth below ground surface (Molybdenum in mg/kg soil)



	SB-07B-35'-37'	DA-14-4-6ft	OW-9-10-12	OW-9-18-20	SB-08B-30'-32'	SB-18B-32/34	SB-52B-35-37	SB-53B-25-27	SB-53B-30-32	SB-54B-30/32	SB-55B-30/32	SB-56B-30/32
Exchangeable Phase	0.00%	80.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Carbonate Phase	0.00%	3.16%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Amorphous Phase	0.00%	7.43%	0.00%	0.00%	0.00%	68.81%	45.95%	74.32%	52.94%	45.38%	0.00%	11.85%
Metal Hydroxide Phase	0.00%	8.05%	0.00%	0.00%	0.00%	31.19%	35.14%	21.28%	47.06%	40.77%	0.00%	8.53%
Organic Phase	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	40.28%
Acid/Sulfide Fraction	0.00%	0.81%	0.00%	0.00%	0.00%	0.00%	18.92%	4.39%	0.00%	13.85%	100.00%	35.55%
Residual Fraction	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.79%

Borehole and depth below ground surface (Molybdenum in percent of total)

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PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

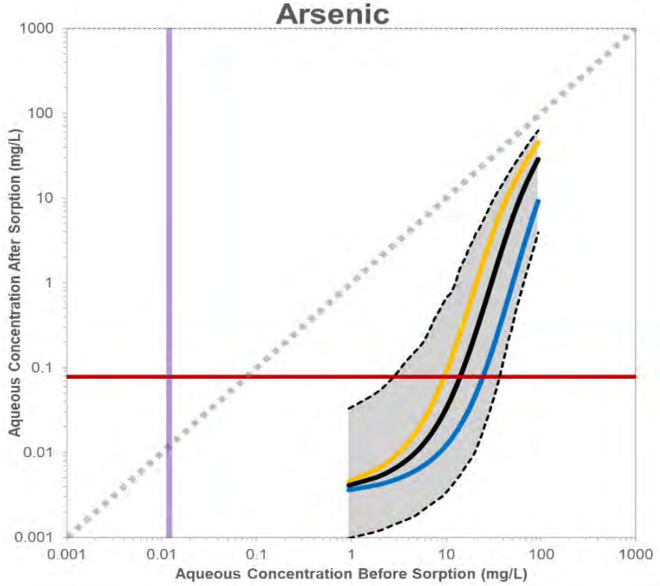
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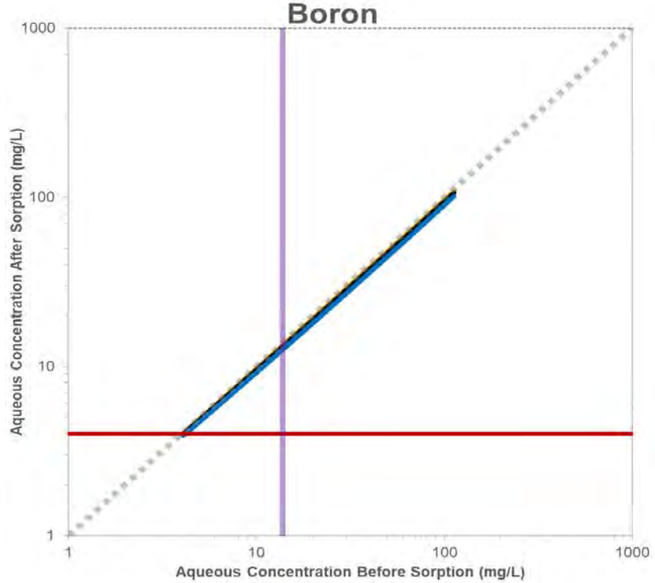
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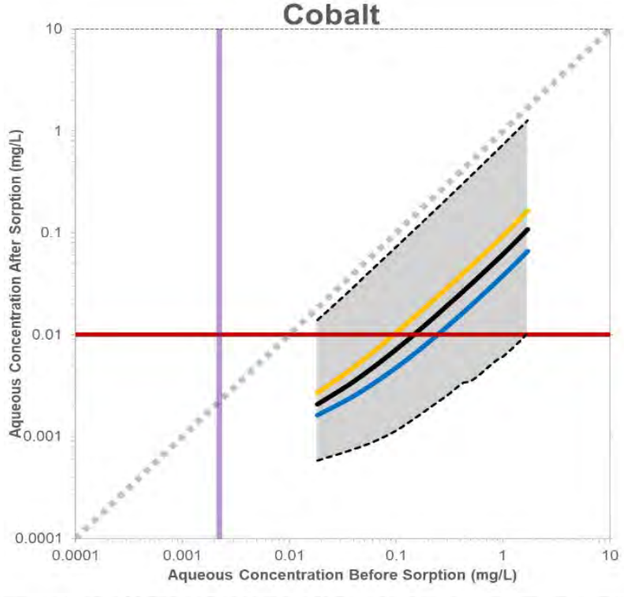
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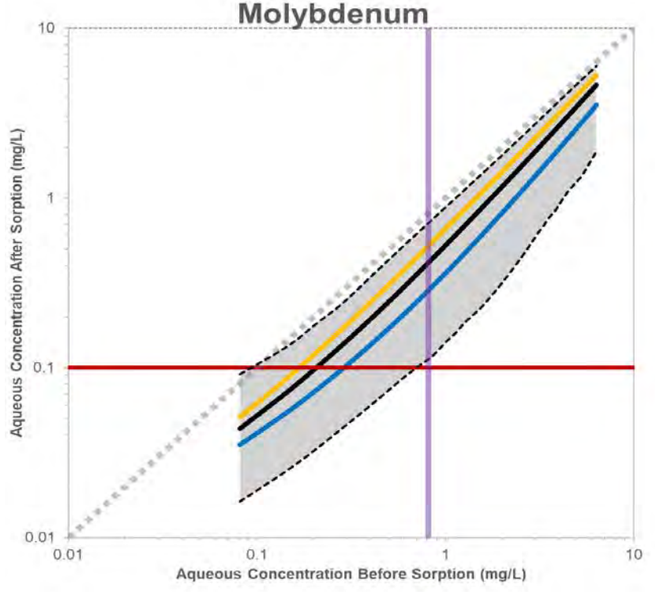
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(d)



- Minimum Hfo and Hao Contents (Geometric mean of all simulations)
- Mean Hfo and Hao Contents (Geometric mean of all simulations)
- Maximum Hfo and Hao Contents (Geometric mean of all simulations)
- 5th to 95th Precentile of Min, Mean, and Max Simulations
- Groundwater Protection Standard
- Porewater
- 1:1 Line

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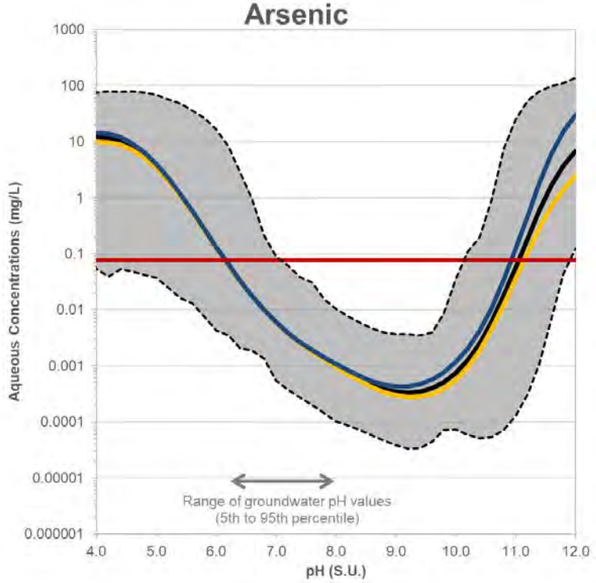
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Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Capacity of Soils to Adsorb Constituents: Aqueous Concentrations Prior to Equilibrating with Hfo and Hao versus Aqueous Concentrations After Equilibrating

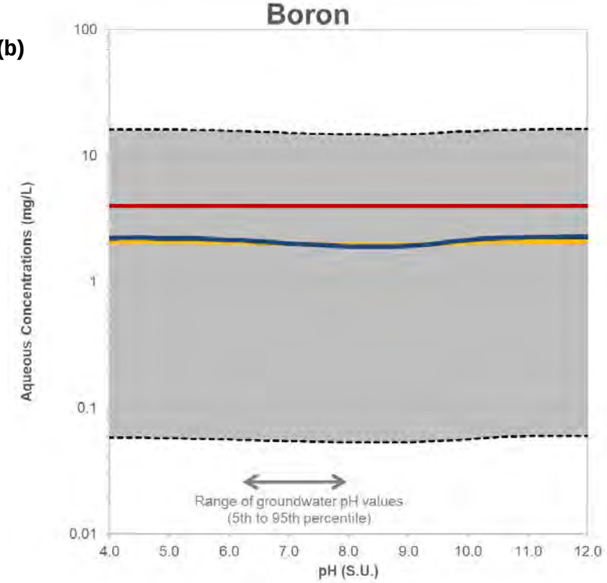
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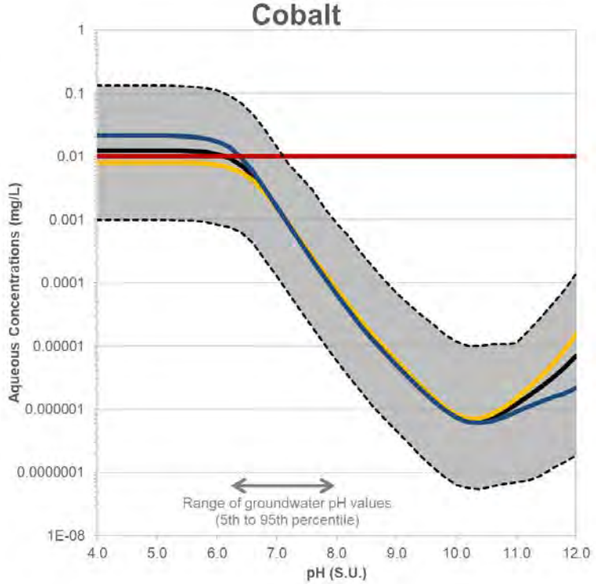
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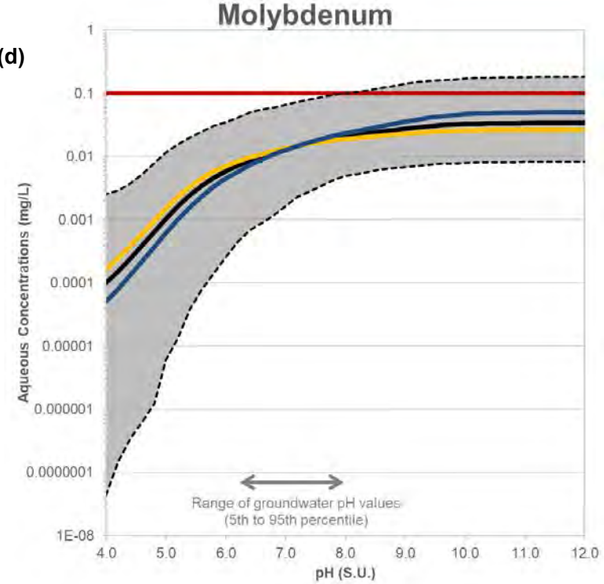
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(d)



Minimum Hfo and Hao Contents (Geometric mean of all simulations)
Mean Hfo and Hao Contents (Geometric mean of all simulations)
Maximum Hfo and Hao Contents (Geometric mean of all simulations)
5th to 95th Precentile of Min, Mean, and Max Simulations
Groundwater Protection Standard

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Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

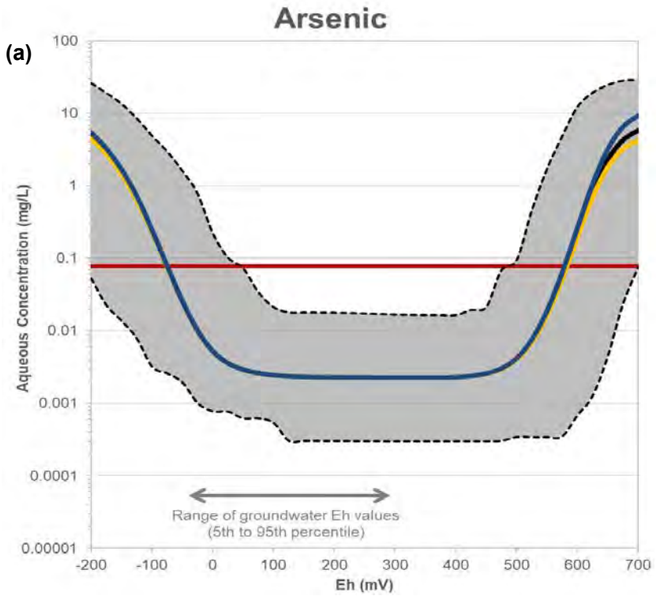
TITLE
Stability of Adsorbed Constituents Versus pH

PROJECT NO.	PHASE	REV.	FIGURE
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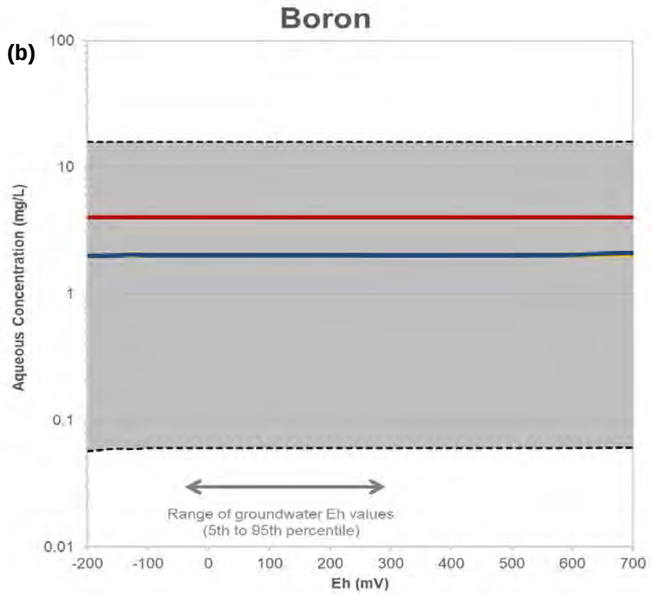
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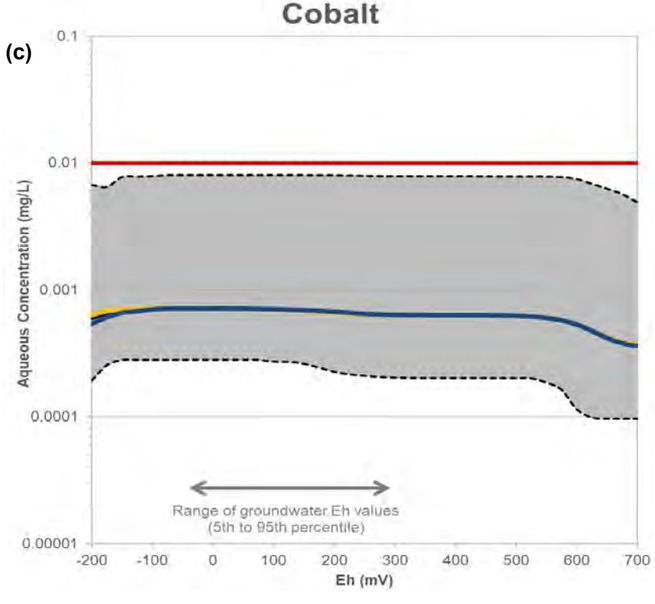
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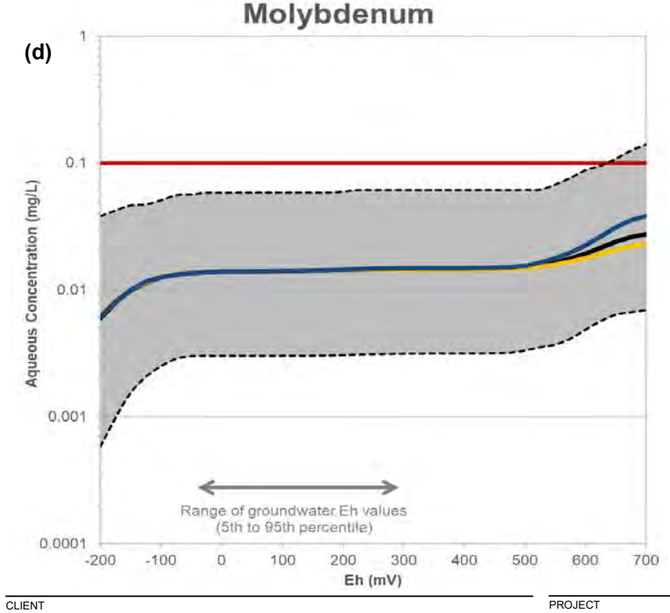
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(c)



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Minimum Hfo and Hao Contents (Geometric mean of all simulations)
Mean Hfo and Hao Contents (Geometric mean of all simulations)
Maximum Hfo and Hao Contents (Geometric mean of all simulations)
5th to 95th Precentile of Min, Mean, and Max Simulations
Groundwater Protection Standard

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MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

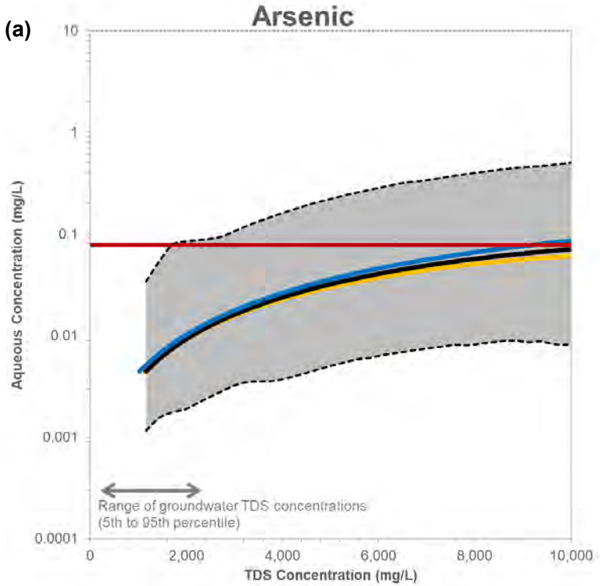
TITLE
Stability of Adsorbed Constituents Versus Eh

PROJECT NO.	PHASE	REV.	FIGURE
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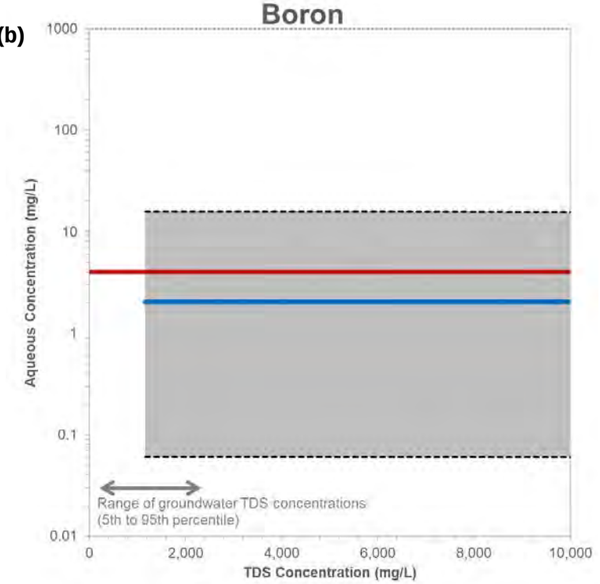
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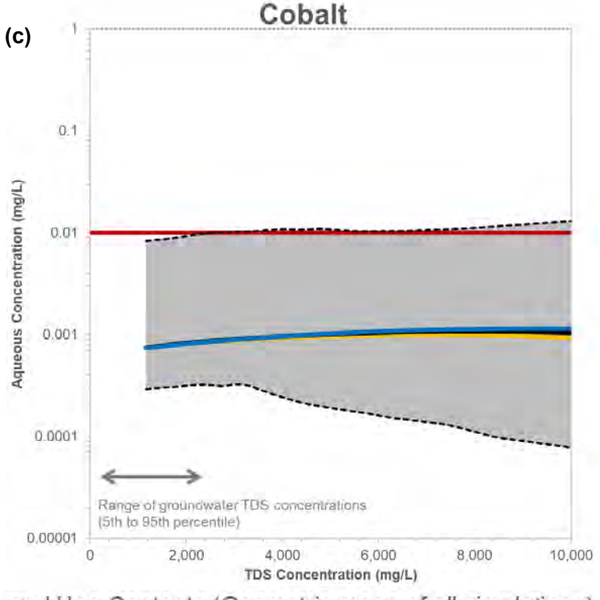
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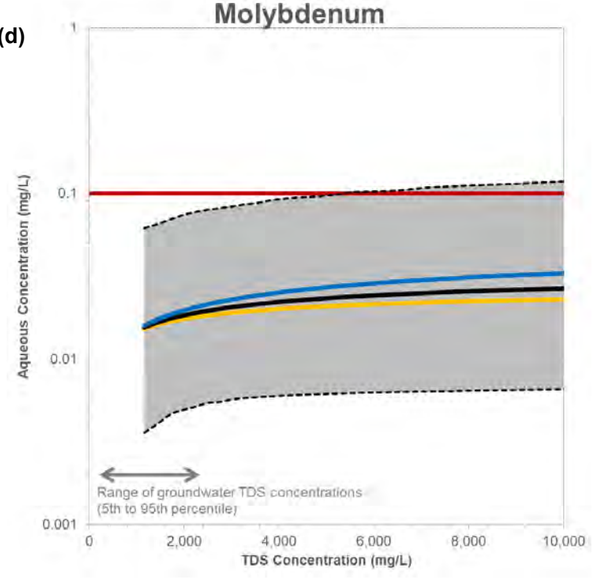
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Minimum Hfo and Hao Contents (Geometric mean of all simulations)
Mean Hfo and Hao Contents (Geometric mean of all simulations)
Maximum Hfo and Hao Contents (Geometric mean of all simulations)
5th to 95th Precentile of Min, Mean, and Max Simulations
Groundwater Protection Standard

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PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Stability of Adsorbed Constituents Versus TDS

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	18

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APPENDIX A

Groundwater and Porewater Monitoring Data

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW04																
	Sample Date	2016-07-12	2016-09-08	2016-11-09	2017-01-10		2017-03-01	2017-04-26	2017-06-28	2017-08-22	2017-10-04	2018-03-13		2018-04-20		2018-10-25	2019-04-23	2019-11-07
	Sample Type	N	N	N	FD	N	N	N	N	N	N	FD	N	FD	N	N	N	N
Chemical Name	Unit																	
CCR Appendix III																		
Boron	mg/L	0.48	1.4	2.4	1.1	1	1.2	0.74	0.92	1.2	0.54			0.74	0.72	0.78	0.74	1.3
Calcium	mg/L	110	230	300	270	240	230	220	200	200	140			140	140	210	130	190
Chloride	mg/L	2.2	27	69	13	14	13	5.4	12	13	4.5			3.7 J	4.4	10	3.7	9.5
Fluoride	mg/L	0.92 J+	0.2 J	10 U	0.19 J	0.17 J	5 U	5 U	0.19 J	0.21 J	0.24 J	0.15 J	5 U	5 U	0.17 J-	0.26	0.16 J+	0.23
pH	SU	7.22	6.83	6.75		6.93	7.01	6.76	6.88	7.21	7.28		6.95		7.2	6.39	7	7.14
Sulfate	mg/L	140 J-	460	480	460	470	390	470	370	440	250			220	210	530	260	490
Total Dissolved Solids	mg/L	420	990	1400	1000	1000	890	870	880	920	610			580 J	580	980	600	900
CCR Appendix IV																		
Antimony	mg/L	0.002 U	0.002 U	0.00027 J	0.002 U	0.00057 J	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U	0.002 U			0.002 U	0.00065 J	0.00092 J
Arsenic	mg/L	0.0059	0.013	0.0052	0.0058	0.0072	0.005 U	0.0099	0.012	0.012		0.004 J	0.0054			0.014	0.0023 J	0.0018 J
Barium	mg/L	0.041	0.077	0.11	0.095	0.079	0.089	0.069	0.084	0.09		0.11	0.077			0.074	0.068	0.066
Beryllium	mg/L	0.00027 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.00048 J	0.00053 J	0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.00036 J	0.00036 J	0.0052 J	0.002 U	0.002 U	0.002 U	0.002 U		0.0011 J	0.0012 J			0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.00031 J	0.00064 J	0.0061	0.0058	0.0038	0.0049	0.003	0.0023		0.0028	0.0031			0.0026	0.0011	0.00043 J
Fluoride	mg/L	0.92 J+	0.2 J	10 U	0.19 J	0.17 J	5 U	5 U	0.19 J	0.21 J	0.24 J	0.15 J	5 U	5 U	0.17 J-	0.26	0.16 J+	0.23
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.0018 J	0.008 U	0.008 U	0.0021 J	0.0023 J	0.0033 J	0.0033 J	0.0062 J	0.0062 J		0.008 U	0.008 U			0.0023 J	0.0045 J	0.0028 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U	0.0002 U			0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.0075 J	0.023	0.073	0.037	0.038	0.034	0.016	0.02	0.034		0.0048 J	0.024			0.039	0.024	0.055
Radium, Total	pci/L	5 U	0.583	0.697	0.804	0.515 U	0.362 U	0.379 U	0.364 U	0.352 U		1.35 J+	0.778 J+			0.473	0.591	
Radium-226	pci/L	1 U	0.138 U	0.346 U	0.301 U	0.242 U	0.121 U	0.117 U	0.119 J+	0.118		0.177	0.0881			0.306	0.311 U	
Radium-228	pci/L	1 U	0.498 U	0.495 U	0.677 J+	0.515 U	0.362 U	0.379 U	0.364 U	0.352 U		1.17 J+	0.69 J+			0.462 U	0.405	
Selenium	mg/L	0.005 U	0.005 U	0.00064 J	0.0017 J	0.0021 J	0.005 U	0.005 U	0.005 U	0.005 U		0.001 J	0.001 J			0.005 U	0.0013 J	0.0052
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U
Supplemental Parameters																		
Alkalinity, Bicarbonate (HCO3)	mg/L																	
Alkalinity, Carbonate (CO3)	mg/L																	
Alkalinity, Hydroxide (OH)	mg/L																	
Alkalinity, Total	mg/L															230	190	270
Ferric Iron	mg/L															6.9		
Ferrous Iron	mg/L															3.1 J		
Iron	mg/L																2.3	0.083 J
Magnesium	mg/L															31	18	31
Manganese	mg/L																0.012 J-	0.0078 J
Nitrate as N	mg/L																0.1 U	0.1 U
Nitrite as N	mg/L																	
Nitrogen, Nitrate-Nitrite	mg/L															0.39		
Phosphorus (as phosphate)	mg/L															0.9	0.31 U	0.31 UJ
Potassium	mg/L															3.3 J	3.1 J	3.2 J
Sodium	mg/L															13	12	36
Sample Parameters																		
Dissolved Oxygen	mg/L	0.09	0.58	0.37		1.82	1.47	0.12	0.3	0.52	0.09		0.66		2.3	0.15	7.08	2.55
Oxidation Reduction Potential	mV	59.6	-24	-6.9		-31.7	14	-57.8	-45	-27	-105.8		-181.8		-81.2	-58.1	19	-60.7
Eh	mV	259.6	176.0	193.1		168.3	214.0	142.2	155.0	173.0	94.2		18.2		118.8	141.9	219.0	139.3
pH	SU	7.22	6.83	6.75		6.93	7.01	6.76	6.88	7.21	7.28		6.95		7.2	6.39	7	7.14
Specific Conductance	uS/cm	595	1345	1681		1109	910	1137	911	1153	813		562		770	1311	549	866
Temperature	deg C	13	17.3	16.3		10.5	8.05	10.2	13.1	15.9	16.1		7.55		3.5	15.5	4.2	13.2
Turbidity	NTU	4.04	1.48	2.21		2.28	4.26	4.04	4.88	1.65	0.51		4.92		3.12	1.92	4.48	1.38

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW07															GAMW07B			
	Sample Date	2016-07-12	2016-09-08	2016-11-09	2017-01-10	2017-03-01	2017-04-26	2017-06-29	2017-08-23	2017-10-03		2018-03-15	2018-04-23	2018-10-26	2019-05-02	2019-11-08	2018-09-06	2018-10-26	2019-05-02	2019-11-12
	Sample Type	N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N	N	N	N
Chemical Name	Unit																			
CCR Appendix III																				
Boron	mg/L	1.2	1	0.91	0.91	1	0.68	0.67	0.68	0.71	0.72		1.2	1.3	0.85	0.85	20	23	18	15
Calcium	mg/L	170	190	200	170	170	190	220	190	220	220		210	230	220	180	370	430	380	400
Chloride	mg/L	7.8	6.6	5.3	6	7.6	2.8	3 J	3.2 J	3 J	3.6 J		4.7 J	6.3	6.5	4.8	10 U	250	170	150
Fluoride	mg/L	0.72 J+	0.91 J	0.8 J	0.85 J	0.66 J	0.76 J	0.79 J	0.66 J	1.1 J	0.93 J	0.58 J	0.57 J	0.73	0.97	0.88	10 U	1.5	1.3	1.2
pH	SU	7.03	7.27	7.04	7.15	7.2	7.17	6.57	7.2		7.1	7.28	7.35	5.71	7.2	7.44	8.29	6.78	7.58	7.13
Sulfate	mg/L	310 J-	330	320	320	290	310	360	380	460	450		450	530	500	480	10 U	1600	1500	1400
Total Dissolved Solids	mg/L	770	830	840	750	710	810	970	910	970	1000		900	970	1100	940	2700	2600	920	2300
CCR Appendix IV																				
Antimony	mg/L	0.00035 J	0.00039 J	0.00035 J	0.00028 J	0.002 U	0.002 U	0.002 U	0.002 U			0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.0013 J	0.0016 J	0.0018 J	0.0028 J	0.005 U	0.0028 J	0.0025 J	0.0016 J			0.005 U		0.0012 J	0.0019 J	0.0011 J	0.0028 J	0.0015 J	0.0019 J	0.0017 J
Barium	mg/L	0.052	0.055	0.056	0.042	0.05	0.05	0.059	0.059			0.056		0.064	0.053	0.043	0.072	0.063	0.053	0.043
Beryllium	mg/L	0.00011 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0003 J	0.00022 J			0.001 U		0.00047 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.00047 J	0.00046 J	0.002 U	0.002 U	0.002 U	0.002 U			0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.0056	0.0077	0.0055	0.0038	0.0044	0.0063	0.01	0.0095			0.006		0.01	0.0074	0.0049	0.00074 J	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	0.72 J+	0.91 J	0.8 J	0.85 J	0.66 J	0.76 J	0.79 J	0.66 J	1.1 J	0.93 J	0.58 J	0.57 J	0.73	0.97	0.88	10 U	1.5	1.3	1.2
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0007 J			0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.0034 J	0.008 U	0.008 U	0.0035 J	0.0031 J	0.0041 J	0.0037 J	0.0038 J			0.0024 J		0.0054 J	0.0041 J	0.0033 J	0.0043 J	0.0045 J	0.004 J	0.0035 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ			0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.0084 J	0.0098 J	0.0095 J	0.01 U	0.01 U	0.0083 J	0.0081 J	0.007 J			0.0066 J		0.0087 J	0.0097 J	0.0087 J	0.015	0.017	0.025	0.026
Radium, Total	pci/L	1.59	0.696	0.548	0.412 U	0.42 U	0.371 U	0.45	0.588			0.749 J+		0.823 J+	0.37 U		2.63	2.6 J+	2.31	
Radium-226	pci/L	0.667 J+	0.289	0.374	0.237 U	0.186	0.155	0.232 J+	0.3			0.163		0.483 J+	0.305 U		1.16	1.56 J+	1.17	
Radium-228	pci/L	0.923	0.406	0.462 U	0.412 U	0.42 U	0.371 U	0.262 U	0.413 U			0.585 J+		0.365 U	0.37 U		1.47	1.04	1.14	
Selenium	mg/L	0.005 U	0.005 U	0.003 J	0.003 J	0.005 U	0.008	0.0054	0.005			0.0028 J		0.0016 J	0.0045 J	0.0019 J	0.0012 J	0.005 U	0.005 U	0.005 U
Thallium	mg/L	0.00011 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.00024 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Supplemental Parameters																				
Alkalinity, Bicarbonate (HCO3)	mg/L																180			
Alkalinity, Carbonate (CO3)	mg/L																5 U			
Alkalinity, Hydroxide (OH)	mg/L																5 U			
Alkalinity, Total	mg/L													260	270	250	180	180	170	170
Ferric Iron	mg/L													0.035 J			6.7 J	6.8		
Ferrous Iron	mg/L													0.05 UJ			0.1 R	1.1 J		
Iron	mg/L														0.067 J	0.09 J			5.3	5.5
Magnesium	mg/L													39	41	38	72	87	73	72
Manganese	mg/L														0.46	0.61			0.46	0.49
Nitrate as N	mg/L														3.3	1.6	0.05 R		0.1 U	0.1 U
Nitrite as N	mg/L																0.05 R			
Nitrogen, Nitrate-Nitrite	mg/L													0.53				0.049 J		
Phosphorus (as phosphate)	mg/L													0.31 U	0.31 U	0.31 U	0.031 U	0.31 U	0.31 U	0.31 U
Potassium	mg/L													6.6	5.5	6.5	12	13	13	13
Sodium	mg/L													14	14	9.9	290	240	230	120
Sample Parameters																				
Dissolved Oxygen	mg/L	0.6	1.81	0.59	0.52	0.51	1.96	1.02	0.84		0.48	0.8	3.52	2.64	0.81	0.38	0.13	0.67	0.19	0.2
Oxidation Reduction Potential	mV	111.2	64.2	-6.4	71.3	65.3	76.9	291.1	8.5		95.4	-55	-98.7	-233.3	135.1	-131.8	-197.6	-230.2	34.9	-196.7
Eh	mV	311.2	264.2	193.6	271.3	265.3	276.9	491.1	208.5		295.4	145.0	101.3	-33.3	335.1	68.2	2.4	-30.2	234.9	3.3
pH	SU	7.03	7.27	7.04	7.15	7.2	7.17	6.57	7.2		7.1	7.28	7.35	5.71	7.2	7.44	8.29	6.78	7.58	7.13
Specific Conductance	uS/cm	966	1072	1106	928	832	1121	1151	1157		1273	760	1060	1240	975	828	5178	3237	2357	1686
Temperature	deg C	14.4	19.2	16.7	12.9	10.63	11.8	14.6	16.5		18	10	10	16.95	10.3	15.3	15.03	13.86	12.4	12.9
Turbidity	NTU	4.6	4.51	1.26	3.2	4.76	2.17	2.87	0.9		0.49	1.3	1.75	1.08	2.72	4.58	4.48	3.01	2.86	1.11

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
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"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW08														GAMW08B					
Sample Date		2016-07-13	2016-09-08	2016-11-09	2017-01-10	2017-03-02	2017-04-27	2017-06-29	2017-08-23	2017-10-04	2018-03-14	2018-04-23	2018-10-26	2019-05-08	2019-11-07	2018-09-07		2018-10-26		2019-05-03	2019-11-07
Sample Type		N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	FD	N	N	N
Chemical Name	Unit																				
CCR Appendix III																					
Boron	mg/L	3.5	3.9	3.2	3.4	3.3	3.2	2.9	2.2	3.7		2.4	1.8	1.4	2.5		18		15	14	13
Calcium	mg/L	310	310	300	260	270	310	340	270	290		360	230	250	280		380		370	350	340
Chloride	mg/L	88	71	89	99	110	86	83	39	87		64	56	49	66		240		180	160	180
Fluoride	mg/L	1 J+	1.2 J	0.73 J	0.87 J	0.94 J	0.92 J	1.3 J	2 J	0.68 J	1.2 J	1.3 J-	1.6	2.2	1.9		1.6 J		1.5	1.9	1.7
pH	SU	6.92	7.03	6.85	7.02	7.09	6.93	7	7.27	6.89	7.41	7.41	6.99	7.37	7.5		7.7		7.45	7.57	7.85
Sulfate	mg/L	770 J-	690	680	610	630	770	800	640	670		800	460	540	670		1500		1500	1400	1300
Total Dissolved Solids	mg/L	1600	1500	1600	1300	1400	1700	2000	1400	1500		1700	1100	1300	1300		1900 J+		2300	2300	2200
CCR Appendix IV																					
Antimony	mg/L	0.00073 J	0.00069 J	0.0014 J	0.00041 J	0.00043 J	0.002 U	0.00059 J	0.00075 J		0.002 U		0.00082 J	0.00076 J	0.00077 J		0.002 U		0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.0018 J	0.0019 J	0.0018 J	0.0027 J	0.0016 J	0.0031 J	0.0027 J	0.0023 J		0.005 U		0.0011 J	0.0015 J	0.0016 J		0.005 U		0.005 U	0.005 U	0.005 U
Barium	mg/L	0.068	0.065	0.065	0.05	0.055	0.064	0.074	0.077		0.066	0.069	0.053	0.058	0.066		0.042		0.03	0.025	0.023
Beryllium	mg/L	0.00017 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.0004 J	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U
Cadmium	mg/L	7.4E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.00037 J	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.00029 J	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.036	0.034	0.059	0.047	0.05	0.037	0.047	0.02		0.022	0.027	0.011	0.0079	0.011		0.00066 J		0.001 U	0.001 U	0.001 U
Fluoride	mg/L	1 J+	1.2 J	0.73 J	0.87 J	0.94 J	0.92 J	1.3 J	2 J	0.68 J	1.2 J	1.3 J-	1.6	2.2	1.9		1.6 J		1.5	1.9	1.7
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.0098	0.012	0.009	0.0098	0.0093	0.012	0.011	0.012		0.0089	0.009	0.011	0.015	0.0091		0.0098		0.0073 J	0.0063 J	0.0058 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U		0.0002 U		0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.034	0.036	0.024	0.02	0.019	0.038	0.049	0.083		0.058	0.058	0.059	0.08	0.068		0.037		0.039	0.057	0.044
Radium, Total	pci/L	1.07	1.08	1.09	0.581	0.777	0.632	1.11	0.762		1.13 J+	0.99	1 J+	0.473			1.67 J+		1.02 J+	0.704	
Radium-226	pci/L	0.501 J+	0.469	0.557	0.375	0.368	0.383	0.613 J+	0.591		0.267	0.437	0.582 J+	0.312 U			1.09 J+		0.596 J+	0.438	
Radium-228	pci/L	1 U	0.609	0.533	0.43 U	0.423 U	0.365 U	0.499	0.341 U		0.865 J+	0.552	0.423	0.456 U			0.579		0.454 U	0.518 U	
Selenium	mg/L	0.005 U	0.0065	0.0033 J	0.0014 J	0.0032 J	0.011	0.0088	0.0081		0.024	0.022	0.0021 J	0.016	0.0036 J		0.0014 J		0.005 U	0.005 U	0.005 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.00045 J	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U
Supplemental Parameters																					
Alkalinity, Bicarbonate (HCO3)	mg/L															160	160				
Alkalinity, Carbonate (CO3)	mg/L															5 U	5 U				
Alkalinity, Hydroxide (OH)	mg/L															5 U	5 U				
Alkalinity, Total	mg/L												350	380	380	160	160	160	160	130	160
Ferric Iron	mg/L												0.083 J			6.1 J	6.9 J	6.5	6.2		
Ferrous Iron	mg/L												0.05 UJ			0.1 R	0.1 R	0.79 J	0.98 J		
Iron	mg/L													0.2 U	0.2 U					5.6	5.1
Magnesium	mg/L												44	53	56	58	66	63	62	45	42
Manganese	mg/L													0.22	0.37					0.49	0.45
Nitrate as N	mg/L													7.7	0.25	0.05 R	0.05 R			0.075 J	0.43
Nitrite as N	mg/L															0.05 R	0.05 R				
Nitrogen, Nitrate-Nitrite	mg/L												0.06					0.05 U	0.05 U		
Phosphorus (as phosphate)	mg/L												0.31 U	0.15 J	0.11 J-	0.028 J	0.031 U	0.31 U	0.31 U	0.31 U	0.19 J-
Potassium	mg/L												12	13	12	5.6	6.4	5.5	5.5	5.6	5.3
Sodium	mg/L												45	45	51	260	300	200	200	240	200
Sample Parameters																					
Dissolved Oxygen	mg/L	1.9	0.38	1.62	1.27	0.96	0.63	1.96	0.93	0.21	0.97	5.09	0.21	0.44	4.2		0.42		0.12	0.13	2.61
Oxidation Reduction Potential	mV	159.7	64.6	-8	58.4	49.9	60.4	242.5	61.9	-15.9	110.1	-106.4	27.7	62.2	44.1		-185.5		-67	7.9	-67
Eh	mV	359.7	264.6	192.0	258.4	249.9	260.4	442.5	261.9	184.1	310.1	93.6	227.7	262.2	244.1		14.5	200.0	133.0	207.9	133.0
pH	SU	6.92	7.03	6.85	7.02	7.09	6.93	7	7.27	6.89	7.41	7.41	6.99	7.37	7.5		7.7		7.45	7.57	7.85
Specific Conductance	uS/cm	1925	1807	1664	1517	1494	2098	1834	1713	1840	1121	1732	1440	1102	1322		2538		2375	2190	1896
Temperature	deg C	15.5	18.78	17.75	12.2	10.06	11.1	15.8	18.5	18.3	9.6	10.2	17.2	11	10.84		14.6		14.5	12.8	8.05
Turbidity	NTU	2.3	3.22	0.58	1.26	1.56	1.1	2.41	0.68	4.38	1.11	1.54	1.4	1.81	0.31		3.4		1.63	1.72	2.89

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
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"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW09																
Sample Date		2016-07-13	2016-09-08	2016-11-09	2017-01-10	2017-03-01		2017-04-26		2017-06-28	2017-08-23	2017-10-03	2018-03-14	2018-04-23	2018-10-25	2019-05-02		2019-11-07
Sample Type		N	N	N	N	FD	N	FD	N	N	N	N	N	N	N	FD	N	N
Chemical Name	Unit																	
CCR Appendix III																		
Boron	mg/L	5.7	4.7	7.3	5.3	7.7	7.6	5.9	6.1	4.9	7.9	7.3		4.9	6.3	3	3	2.7
Calcium	mg/L	320	240	210	210	200	200	220	240	270	280	220		220	220	200	200	150
Chloride	mg/L	63	55	58	58	75	73	71	67	53	39	64		58	82	46	46	39
Fluoride	mg/L	0.15 J+	10 U	10 U	0.22 J	0.13 J	0.14 J	0.16 J	0.13 J	0.18 J	2 J	0.21 J	5 U	0.26 J-	0.28	0.27	0.27	0.33
pH	SU	7.27	7.25	7.12	6.68		7.44		7.15	7.25	7.31	7.3	7.28	6.87	6.88		7.1	7.06
Sulfate	mg/L	910 J-	570	360	500	440	420	460	460	600	740	540		510	510 J-	530	530	380
Total Dissolved Solids	mg/L	1500	1100	880	980	1000	990	1000	960	1300	1400	1100		930	1100	970	980	770
CCR Appendix IV																		
Antimony	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.0015 J	0.0013 J	0.00076 J	0.0031 J	0.005 U	0.005 U	0.0028 J	0.0029 J	0.002 J	0.0027 J		0.005 U		0.005 U	0.005 U	0.005 U	0.005 U
Barium	mg/L	0.059	0.043	0.036	0.039	0.035	0.037	0.039	0.042	0.047	0.054		0.041	0.039	0.039	0.041	0.041	0.036
Beryllium	mg/L	0.00012 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00036 J	0.001 U	0.001 U	0.001 U		0.001 U		0.00092 J	0.00058 J	0.00052 J	0.00049 J
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.00033 J	0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.0036	0.002 U	0.00062 J	0.0013 J	0.002 U	0.002 U	0.002 U	0.002 U	0.0011 J	0.0015 J		0.0016 J		0.002 U	0.0012 J	0.0012 J	0.002 U
Cobalt	mg/L	0.001 U	0.00018 J	0.0002 J	0.0002 J	0.001 U	0.001 U	0.00029 J	0.00025 J	0.001 U	0.001 U		0.001 U		0.00038 J	0.00049 J	0.00055 J	0.00035 J
Fluoride	mg/L	0.15 J+	10 U	10 U	0.22 J	0.13 J	0.14 J	0.16 J	0.13 J	0.18 J	2 J	0.21 J	5 U	0.26 J-	0.28	0.27	0.27	0.33
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.0019 J	0.008 U	0.008 U	0.0016 J	0.0011 J	0.0012 J	0.008 U	0.008 U	0.0017 J	0.0018 J		0.008 U		0.008 U	0.008 U	0.008 U	0.008 U
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.02	0.017	0.029	0.023	0.027	0.027	0.021	0.021	0.028	0.032		0.025	0.035	0.04	0.043	0.043	0.035
Radium, Total	pci/L	1.5	0.568	0.477 U	0.467 U	0.55	0.469	0.593	0.414	0.707	0.803		1.45 J+	0.096	0.679	0.505	0.427 U	
Radium-226	pci/L	0.506 J+	0.231	0.397 U	0.257	0.134	0.166	0.194	0.205	0.255 J+	0.357		0.188	0.204	0.446	0.33	0.355 U	
Radium-228	pci/L	0.994	0.349 U	0.477 U	0.467 U	0.427 U	0.432 U	0.398	0.36 U	0.452	0.446		1.26 J+	-0.108	0.361 U	0.428 U	0.427 U	
Selenium	mg/L	0.014	0.0091	0.0049 J	0.011	0.014	0.014	0.019	0.02	0.013	0.027		0.0082	0.011	0.0098	0.012	0.012	0.0077
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U
Supplemental Parameters																		
Alkalinity, Bicarbonate (HCO3)	mg/L																	
Alkalinity, Carbonate (CO3)	mg/L																	
Alkalinity, Hydroxide (OH)	mg/L																	
Alkalinity, Total	mg/L														150	110	100	110
Ferric Iron	mg/L														0.042 J			
Ferrous Iron	mg/L														0.05 UJ			
Iron	mg/L															0.027 J	0.038 J	0.037 J
Magnesium	mg/L														21	21	19	16
Manganese	mg/L															0.011 J	0.013 J	0.0083 J
Nitrate as N	mg/L															5.6	5.6	7.1
Nitrite as N	mg/L																	
Nitrogen, Nitrate-Nitrite	mg/L														1.4			
Phosphorus (as phosphate)	mg/L														0.31 U	0.31 U	0.31 U	0.31 UJ
Potassium	mg/L														9	7.2	7.1	5.6
Sodium	mg/L														38	35	33	28
Sample Parameters																		
Dissolved Oxygen	mg/L	3.59	6.69	1.98	6.1		3.41		3.92	5.27	3.24	5.98	6.71	5.43	0.22		5.82	5.54
Oxidation Reduction Potential	mV	-1.4	75.7	27.6	236		90.5		152.6	280.8	58.9	139.5	-116.3	-90.8	-48.8		53.6	-25.7
Eh	mV	198.6	275.7	227.6	436.0		290.5		352.6	480.8	258.9	339.5	83.7	109.2	151.2		253.6	174.3
pH	SU	7.27	7.25	7.12	6.68		7.44		7.15	7.25	7.31	7.3	7.28	6.87	6.88		7.1	7.06
Specific Conductance	uS/cm	1671	736	1110	822		1041		1209	702	1542	1331	600	1156	1274		888	685
Temperature	deg C	14.4	18.4	16.9	11.9		10.75		11.9	14.7	17.2	18.2	10.2	10.6	17.9		11.4	15.9
Turbidity	NTU	1.59	3.92	1.15	1.34		3.12		1.88	1.91	0.91	0.39	0.82	2.44	2.41		3.41	1.55

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

		Location	GAMW09B																	
		Sample Date	2016-07-13		2016-09-08	2016-11-09	2017-01-10	2017-03-01	2017-04-26	2017-06-28	2017-08-23		2017-10-03	2018-03-14	2018-04-23	2018-09-06	2018-10-26	2019-05-08		2019-11-07
		Sample Type	FD	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	FD	N	N
Chemical Name	Unit																			
CCR Appendix III																				
Boron	mg/L		24	25	25	16	11	11	11	12	16	16	16		14	12	12		14	8
Calcium	mg/L		260	280	270	190	200	170	170	180	180	180	160		160	150	180		150	150
Chloride	mg/L		210	180	190	130	110	120	130	150	170	160	140		150	180	150		140	110
Fluoride	mg/L		0.54 J+	0.55 J+	0.67 J	0.68 J	0.1 J	1.3 J	1.2 J	1.4 J	1.2 J	0.37 J	1.5 J	1.4 J	1.6 J	1.8 J	1.6		1.6	1.5
pH	SU			7.08	7.15	6.96	7.36	7.44	7.29	7.36		7.46	7.36	7.56	7.43	7.32	7.46		7.49	7.56
Sulfate	mg/L		970 J-	1000 J-	960	740	670 J+	550	570	640	630	650	550		430	570	580		520	440
Total Dissolved Solids	mg/L		2100	2000	2100	1700	1300	1200	1200	1500	1500	1500	1300		990	1300	1200		1200	990
CCR Appendix IV																				
Antimony	mg/L		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U		0.002 U	0.002 U
Arsenic	mg/L		0.0024 J	0.0026 J	0.002 J	0.0014 J	0.0027 J	0.005 U	0.004 J	0.004 J	0.0031 J	0.0031 J		0.0054	0.0064	0.0044 J	0.004 J		0.0057	0.0042 J
Barium	mg/L		0.069	0.071	0.076	0.062	0.048	0.04	0.046	0.055	0.062	0.058		0.045	0.04	0.049	0.047		0.041	0.029
Beryllium	mg/L		0.00012 J	9.1E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U		0.001 U	0.001 U
Cadmium	mg/L		0.00027 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U		0.001 U	0.001 U
Chromium	mg/L		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U		0.002 U	0.002 U
Cobalt	mg/L		0.001 U	0.001 U	0.00069 J	0.00028 J	0.00045 J	0.001 U	0.00028 J	0.00045 J	0.00041 J	0.00041 J		0.001 U		0.00058 J	0.00028 J		0.00025 J	0.001 U
Fluoride	mg/L		0.54 J+	0.55 J+	0.67 J	0.68 J	0.1 J	1.3 J	1.2 J	1.4 J	1.2 J	0.37 J	1.5 J	1.4 J	1.6 J	1.8 J	1.6		1.6	1.5
Lead	mg/L		0.001 U	0.001 U	0.001 U	0.00017 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U		0.001 U	0.001 U
Lithium	mg/L		0.0055 J	0.0065 J	0.008 U	0.008 U	0.0049 J	0.0045 J	0.0056 J	0.0054 J	0.0047 J	0.0042 J		0.0031 J		0.0037 J	0.0052 J		0.0055 J	0.0033 J
Mercury	mg/L		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U		0.0002 U	0.0002 U
Molybdenum	mg/L		0.01 U	0.0079 J	0.0075 J	0.0097 J	0.013	0.015	0.015	0.013	0.0094 J	0.01		0.014	0.012	0.01	0.011		0.012	0.0096 J
Radium, Total	pci/L		1.12	1.86	1.65	1.14	0.453	1.09	0.774	1.85	1.01	1.27		1.18 J+	0.868	1.04	1.24 J+		1.01	
Radium-226	pci/L		0.809 J+	0.947 J+	0.907	0.579	0.476	0.585	0.316	0.781 J+	0.585	0.709		0.482	0.301	0.653	0.69 J+		0.449	
Radium-228	pci/L		1 U	0.913	0.743	0.559	0.41 U	0.508	0.458	1.07	0.422	0.563		0.699 J+	0.567	0.386	0.546		0.564	
Selenium	mg/L		0.005 U	0.005 U	0.005 U	0.005 U	0.002 J	0.005 U	0.0014 J	0.001 J	0.0015 J	0.0016 J		0.005 U		0.002 J	0.0019 J		0.005 U	0.0011 J
Thallium	mg/L		0.0003 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U		0.0002 J	0.001 U
Supplemental Parameters																				
Alkalinity, Bicarbonate (HCO3)	mg/L															190				
Alkalinity, Carbonate (CO3)	mg/L															5 U				
Alkalinity, Hydroxide (OH)	mg/L															5 U				
Alkalinity, Total	mg/L															190	200	200	200	170
Ferric Iron	mg/L															2.5 J	2.1			
Ferrous Iron	mg/L															0.1 R	0.55 J			
Iron	mg/L																	3.2	3.2	3
Magnesium	mg/L															57	60	64	63	54
Manganese	mg/L																	1.2	1.2	1.2
Nitrate as N	mg/L															0.05 R		0.1 U	0.1 U	0.12
Nitrite as N	mg/L															0.05 R				
Nitrogen, Nitrate-Nitrite	mg/L																0.077			
Phosphorus (as phosphate)	mg/L															0.09	0.31 U	0.31 U	0.31 U	0.31 UJ
Potassium	mg/L															4 J	3.8 J	4 J	4 J	2.4 J
Sodium	mg/L															150	94	110	110	46
Sample Parameters																				
Dissolved Oxygen	mg/L			0.44	1.06	0.43	0.38	0.44	0.61	0.71		0.57	0.45	0.1	0.04	0.61	0.28		0.04	0.35
Oxidation Reduction Potential	mV			-57.7	67.3	-76.4	-100.1	-80.6	-102.6	68.2		19.7	-46.8	-121.6	-130.5	-100.5	-101.1		-16.8	-131.8
Eh	mV			142.3	267.3	123.6	99.9	119.4	97.4	268.2		219.7	153.2	78.4	69.5	99.5	98.9		183.2	68.2
pH	SU			7.08	7.15	6.96	7.36	7.44	7.29	7.36		7.46	7.36	7.56	7.43	7.32	7.46		7.49	7.56
Specific Conductance	uS/cm			2356	2435	2088	1559	1352	1592	1561		1922	1722	1053	1301	1556	1693		1165	9.24
Temperature	deg C			14.1	14.7	15.1	13.6	13.45	14.5	14.8		15.5	16	14	14.4	16.1	16		14.2	14.4
Turbidity	NTU			3.48	4.29	2.17	0.99	2.58	1.88	1.69		2.54	1.96	4.18	4.11	2.96	1.39		4.7	3.36

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW15														
Sample Date		2016-07-13	2016-09-08		2016-11-09	2017-01-11	2017-03-02	2017-04-27	2017-06-29	2017-08-23	2017-10-03	2018-03-15	2018-04-24	2018-10-26	2019-05-06	2019-11-08
Sample Type		N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N
Chemical Name	Unit															
CCR Appendix III																
Boron	mg/L	0.75	0.45 J	1 J	1.1	0.6	0.44	0.45	0.87	0.91	0.66		0.72	0.76	0.71	0.73
Calcium	mg/L	100	130	120	100	82	81	95	160	150	77		170	120	140	100
Chloride	mg/L	28	31	31	27	28	27	27	27	25	19		24	21	22	28
Fluoride	mg/L	1.2 J+	0.85 J	0.85 J	0.74 J	0.8 J	0.77 J	0.74 J	0.82 J	0.82 J	0.93 J	0.67 J	0.76 J	0.69	0.52	0.73
pH	SU	6.88		6.98	6.83	6.96	6.99	6.76	6.61	6.96	6.88	6.95	6.89	5.2	7.1	7.34
Sulfate	mg/L	160 J-	260	260	150	140	140	160	300	330	260		410	240	380	260
Total Dissolved Solids	mg/L	570	660	630	520	400	400	420	780	750	660		790	5900	740	640
CCR Appendix IV																
Antimony	mg/L	0.002 U	0.00041 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.056	0.072	0.069	0.078	0.076	0.054	0.062	0.059	0.066		0.058		0.091	0.081	0.075
Barium	mg/L	0.044	0.053	0.053	0.039	0.032	0.031	0.034	0.054	0.058		0.047		0.046	0.047	0.037
Beryllium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.00027 J	0.00028 J	0.00029 J	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.0019	0.0022	0.0022	0.0021	0.0019	0.0018	0.0022	0.0029	0.0027		0.0025		0.0023	0.0035	0.0017
Fluoride	mg/L	1.2 J+	0.85 J	0.85 J	0.74 J	0.8 J	0.77 J	0.74 J	0.82 J	0.82 J	0.93 J	0.67 J	0.76 J	0.69	0.52	0.73
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.0053 J	0.008 U	0.008 U	0.008 U	0.004 J	0.0024 J	0.0041 J	0.0058 J	0.005 J		0.0023 J		0.0054 J	0.0053 J	0.0027 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.02	0.027	0.026	0.023	0.022	0.022	0.026	0.017	0.019		0.029		0.016	0.017	0.029
Radium, Total	pci/L	5 U	0.479	0.513	0.646 U	0.555 J+	0.339 U	0.463 U	0.335	0.342 U		0.657 J+		0.858 J+	0.476 U	
Radium-226	pci/L	1 U	0.202	0.145	0.337 U	0.38	0.127 U	0.1	0.0965 J+	0.104		0.0817		0.527 J+	0.28 U	
Radium-228	pci/L	1 U	0.397 U	0.382 U	0.646 U	0.401 U	0.339 U	0.463 U	0.278 U	0.342 U		0.576 J+		0.407 U	0.476 U	
Selenium	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U		0.005 U		0.005 U	0.005 U	0.005 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U
Supplemental Parameters																
Alkalinity, Bicarbonate (HCO3)	mg/L															
Alkalinity, Carbonate (CO3)	mg/L															
Alkalinity, Hydroxide (OH)	mg/L															
Alkalinity, Total	mg/L													180	180	170
Ferric Iron	mg/L													4.3		
Ferrous Iron	mg/L													5.2 J		
Iron	mg/L														11	5.4
Magnesium	mg/L													24	30	24
Manganese	mg/L														0.089	0.055
Nitrate as N	mg/L														0.1 U	0.1 U
Nitrite as N	mg/L															
Nitrogen, Nitrate-Nitrite	mg/L													0.05 U		
Phosphorus (as phosphate)	mg/L													4	1.4	1.3
Potassium	mg/L													2.6 J	3.2 J	3.3 J
Sodium	mg/L													24	32	30
Sample Parameters																
Dissolved Oxygen	mg/L	0.48		0.48	0.14	0.25	0.16	0.19	1	0.32	0.29	0.06	0.02	1.97	0.15	0.12
Oxidation Reduction Potential	mV	-79.2		-60.1	-111	-114.3	-104.1	-104.4	-46.9	-43.7	-13.8	-56.8	-99.1	-254.7	-27.5	-100
Eh	mV	120.8		139.9	89.0	85.7	95.9	95.6	153.1	156.3	186.2	143.2	100.9	-54.7	172.5	100.0
pH	SU	6.88		6.98	6.83	6.96	6.99	6.76	6.61	6.96	6.88	6.95	6.89	5.2	7.1	7.34
Specific Conductance	uS/cm	779		909	733	594	584	674	9.32	1004	901	581	933	855	730	598
Temperature	deg C	15.3		20.3	19.9	14.6	12.1	11.6	14.6	16.6	18.1	10.8	10.6	17.1	8.3	15.8
Turbidity	NTU	4.48		2.96	3.41	3.98	4.4	4.92	4.2	3.1	4.11	3.98	4.29	3.1	4.9	6.9

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW15B																
Sample Date		2016-07-13	2016-09-08	2016-11-09	2017-01-11	2017-03-02	2017-04-27	2017-06-29	2017-08-24	2017-10-03	2018-03-15	2018-04-24	2018-09-06		2018-10-26	2019-05-08	2019-11-08	
Sample Type		N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	FD	N
Chemical Name	Unit																	
CCR Appendix III																		
Boron	mg/L	1.1	1.7	2	3.7	3.3	3.6	3.1	2.1	2.1		4.4		4.1	4.9	10		6.2
Calcium	mg/L	160	160	160	180	160	170	190	170	73		230		200	210	280		280
Chloride	mg/L	52	58	62	81	64	65	71	64	64		87		89	93	110		80
Fluoride	mg/L	0.65 J+	0.62 J	0.46 J	0.74 J	0.77 J	0.75 J	0.72 J	0.61 J	0.5 J	0.69 J	0.79 J		0.6 J	0.6	0.84 J+		0.89
pH	SU	7.81	7.49	7.04	7.52	7.48	7.11	7.26	7.37	7.42	7.45	7.36		7.8	6.74	7.43		7.57
Sulfate	mg/L	380 J-	390	340	500	390	460	530	540	500		790		720	770	1300		940
Total Dissolved Solids	mg/L	830	800	840	1000	890	980	1200	1100	1100		1400		1400	1400	2100		1600
CCR Appendix IV																		
Antimony	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U			0.002 U	0.002 U	0.002 U		0.002 U
Arsenic	mg/L	0.003 J	0.0011 J	0.0014 J	0.0022 J	0.0011 J	0.00098 J	0.00084 J	0.00081 J		0.005 U			0.005 U	0.005 U	0.00088 J		0.005 U
Barium	mg/L	0.054	0.053	0.056	0.056	0.051	0.052	0.064	0.069		0.068			0.07	0.064	0.081		0.054
Beryllium	mg/L	7.8E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U			0.001 U	0.001 U	0.001 U		0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U			0.001 U	0.001 U	0.001 U		0.001 U
Chromium	mg/L	0.00062 J	0.002 U	0.002 U	0.00033 J	0.00034 J	0.002 U	0.002 U	0.002 U		0.002 U			0.002 U	0.002 U	0.002 U		0.002 U
Cobalt	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.00016 J	0.001 U	0.001 U	0.001 U		0.00029 J			0.00037 J	0.001 U	0.001 U		0.001 U
Fluoride	mg/L	0.65 J+	0.62 J	0.46 J	0.74 J	0.77 J	0.75 J	0.72 J	0.61 J	0.5 J	0.69 J	0.79 J		0.6 J	0.6	0.84 J+		0.89
Lead	mg/L	0.001 U	0.001 U	0.00023 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U			0.001 U	0.001 U	0.001 U		0.001 U
Lithium	mg/L	0.0069 J	0.008 U	0.008 U	0.0077 J	0.0053 J	0.0082	0.0082	0.0077 J		0.007 J			0.008	0.0096	0.012		0.0085
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U			0.0002 U	0.0002 U	0.0002 U		0.0002 U
Molybdenum	mg/L	0.011	0.013	0.01	0.012	0.015	0.014	0.014	0.012		0.011			0.01	0.011	0.012		0.01
Radium, Total	pci/L	1.26	0.594	0.61	1.14 J+	0.876	0.687	0.789	0.872		1.69 J+			1.31	1.51 J+	1.61		
Radium-226	pci/L	0.607 J+	0.442	0.361 U	0.785	0.441	0.442	0.537 J+	0.547		0.752			0.711	0.837 J+	1.07		
Radium-228	pci/L	1 U	0.389 U	0.498 U	0.502 U	0.435	0.378 U	0.329 U	0.363 U		0.94 J+			0.603	0.676	0.544		
Selenium	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U		0.005 U			0.0017 J	0.005 U	0.005 U		0.005 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U			0.001 U	0.001 U	0.0003 J		0.001 U
Supplemental Parameters																		
Alkalinity, Bicarbonate (HCO3)	mg/L												180	180				
Alkalinity, Carbonate (CO3)	mg/L												5 U	5 U				
Alkalinity, Hydroxide (OH)	mg/L												5 U	5 U				
Alkalinity, Total	mg/L												180	180	200	200	180	180
Ferric Iron	mg/L												2 J	2.1 J	1.8			
Ferrous Iron	mg/L												0.1 R	0.1 R	0.38 J			
Iron	mg/L															4.6	3	3.1
Magnesium	mg/L												36	39	39	62	43	45
Manganese	mg/L															0.59	0.54	0.57
Nitrate as N	mg/L												0.05 R	0.05 R		0.1 U	0.1 U	0.1 U
Nitrite as N	mg/L												0.05 R	0.05 R				
Nitrogen, Nitrate-Nitrite	mg/L														0.05 U			
Phosphorus (as phosphate)	mg/L												0.031 U	0.031 U	0.31 U	0.14 J	0.31 U	0.31 U
Potassium	mg/L												4.5 J	5	4.7 J	7.2	5.1	5.3
Sodium	mg/L												140	150	170	280	130	130
Sample Parameters																		
Dissolved Oxygen	mg/L	0.22	0.91	0.56	0.22	0.46	0.3	0.43	0.64	0.23	0.08	0.04		0.29	2.06	0.23		0.16
Oxidation Reduction Potential	mV	-129.7	-21.6	-94.6	-132.6	-81.7	-79.6	-21.3	-36.5	-42.6	-64	-102.4		-91.2	-256.1	46.3		-189.2
Eh	mV	70.3	178.4	105.4	67.4	118.3	120.4	178.7	163.5	157.4	136.0	97.6		108.8	-56.1	246.3		10.8
pH	SU	7.81	7.49	7.04	7.52	7.48	7.11	7.26	7.37	7.42	7.45	7.36		7.8	6.74	7.43		7.57
Specific Conductance	uS/cm	834	1049	1060	1237	940	1096	1099	1110	1294	1255	1612		2757	1889	1798		1384
Temperature	deg C	12.71	15.9	16.1	13.9	13.6	13	13.8	14.2	14.5	13.3	13		14.13	13.6	8.1		13.8
Turbidity	NTU	4.72	1.56	1.48	3.8	2.23	3.65	3.16	1.78	0.4	4.59	4.88		3.59	1.35	3.56		1.49

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW16															
Sample Date		2016-07-13	2016-09-08	2016-11-09	2017-01-11	2017-03-02	2017-04-27	2017-06-29	2017-08-24	2017-10-04	2018-03-15	2018-04-24	2018-10-29		2019-05-03	2019-11-08	
Sample Type		N	N	N	N	N	N	N	N	N	N	N	FD	N	N	FD	N
Chemical Name	Unit																
CCR Appendix III																	
Boron	mg/L	1.1	1.8	1.6	1.2	0.89	1.3	1	1.4	1.1		1.4	1.4	1.4	1.6		1.9
Calcium	mg/L	230	180	170	120	160	210	220	240	57		220	160	160	210		210
Chloride	mg/L	53	37	30	28	24	25	28	31	42		58	36	36	28		59
Fluoride	mg/L	1.4 J+	1.6 J	1.3 J	1.5	1.3 J	1.3 J	1.2 J	1.3 J	1.5 J	1 J	1.2 J	1.1	1.1	0.99		1.1
pH	SU	7.92	7.18	7.48	7.5	7.58	7.17	7.36	7.06	7.62	7.41	7.67		7.28	7.46		7.8
Sulfate	mg/L	530 J-	400	320	47	300	500	480	630	520		530	340	350	570		530
Total Dissolved Solids	mg/L	1100	810	790	570	670	930	1000	1100	980		1100	740	730	1100		1100
CCR Appendix IV																	
Antimony	mg/L	0.002 U	0.002 U	0.00028 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U		0.002 U
Arsenic	mg/L	0.011	0.0077	0.012	0.0084	0.0079	0.006	0.008	0.0096		0.002 J	0.0065	0.01	0.0098	0.005		0.0082
Barium	mg/L	0.049	0.042	0.035	0.024	0.029	0.043	0.044	0.054		0.057	0.045	0.035	0.035	0.034		0.034
Beryllium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U		0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U		0.001 U
Chromium	mg/L	0.00062 J	0.002 U	0.002 U	0.0031	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U		0.002 U
Cobalt	mg/L	0.001 U	0.00068 J	0.00051 J	0.00046 J	0.00055 J	0.00092 J	0.00094 J	0.0011		0.0013		0.00059 J	0.00061 J	0.00066 J		0.00061 J
Fluoride	mg/L	1.4 J+	1.6 J	1.3 J	1.5	1.3 J	1.3 J	1.2 J	1.3 J	1.5 J	1 J	1.2 J	1.1	1.1	0.99		1.1
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U		0.001 U
Lithium	mg/L	0.00043 J	0.008 U	0.008 U	0.00023 J	0.008 U	0.008 U	0.008 U	0.008 U		0.008 U		0.008 U	0.008 U	0.008 U		0.008 U
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U		0.0002 U
Molybdenum	mg/L	0.024	0.036	0.045	0.044	0.03	0.027	0.023	0.024		0.027	0.031	0.033	0.033	0.027		0.028
Radium, Total	pci/L	1.68	0.543	0.527 U	0.629 U	0.648	0.392 U	0.339 U	0.429		0.862 J+	0.29	0.862 J+	1.32 J+	0.685 U		
Radium-226	pci/L	0.537 J+	0.249	0.363 U	0.256 U	0.129 U	0.094	0.106 J+	0.246		0.1	0.0822	0.214 J+	0.278 J+	0.277 U		
Radium-228	pci/L	1.14	0.395 U	0.527 U	0.629 U	0.528	0.392 U	0.339 U	0.322 U		0.762 J+	0.208	0.648 J+	1.04 J+	0.685 U		
Selenium	mg/L	0.005 U	0.005 U	0.0005 J	0.0005 J	0.005 U	0.0012 J	0.005 U	0.005 U		0.0015 J		0.005 U	0.005 U	0.005 U		0.0015 J
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U		0.001 U
Supplemental Parameters																	
Alkalinity, Bicarbonate (HCO3)	mg/L																
Alkalinity, Carbonate (CO3)	mg/L																
Alkalinity, Hydroxide (OH)	mg/L																
Alkalinity, Total	mg/L													180	200	5 U	210
Ferric Iron	mg/L													1.8			
Ferrous Iron	mg/L													0.19 J			
Iron	mg/L														1.4	1.6	1.7
Magnesium	mg/L													23	29	29	31
Manganese	mg/L														0.35	0.29	0.31
Nitrate as N	mg/L														0.042 J	0.1 U	0.1 U
Nitrite as N	mg/L																
Nitrogen, Nitrate-Nitrite	mg/L													0.056			
Phosphorus (as phosphate)	mg/L													1.2	0.55	0.47	0.42
Potassium	mg/L													4.3 J	4.2 J	4.9 J	5.2
Sodium	mg/L													41	41	36	38
Sample Parameters																	
Dissolved Oxygen	mg/L	0.16	0.27	0.48	0.31	0.36	0.14	0.5	0.14	0.06	0.22	0.22		1.27	0.29		4.02
Oxidation Reduction Potential	mV	-18.06	711.6	-124.8	-78.8	-136.9	-73.6	-114.2	9.6	-158.4	-55.9	-106.5		-216.8	8		-2
Eh	mV	181.9	911.6	75.2	121.2	63.1	126.4	85.8	209.6	41.6	144.1	93.5		-16.8	208.0		198.0
pH	SU	7.92	7.18	7.48	7.5	7.58	7.17	7.36	7.06	7.62	7.41	7.67		7.28	7.46		7.8
Specific Conductance	uS/cm	1331	1112	927	751	821	1257	1123	1406	1254	1029	1239		1046	1001		1014
Temperature	deg C	15.02	18.8	18.15	12.1	9.72	10.6	15.41	18	17.8	8.71	9.2		17.81	10.5		17.52
Turbidity	NTU	3.89	2.16	1.93	3.16	4.14	3.25	4.33	2.45	4.95	4.62	12.81		3.64	4.65		3.98

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW16B																
	Sample Date	2016-07-13	2016-09-08	2016-11-09		2017-01-11	2017-03-02	2017-04-27	2017-06-29	2017-08-24	2017-10-04	2018-03-15	2018-04-24	2018-09-07	2018-10-29	2019-05-06	2019-11-08	
	Sample Type	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	FD	N
Chemical Name	Unit																	
CCR Appendix III																		
Boron	mg/L	1.8	1.6	1.4	1.4	1.4	1.4	1.1	3.4	6.5	2.9		4.1	7.6	9.7	12	11	10
Calcium	mg/L	230	190	180	180	210	210	270	220	260	100		250	310	350	350	300	280
Chloride	mg/L	63	56	57	55	57	47	71	71	120	78		140	160	150	190	220	210
Fluoride	mg/L	1.1 J+	1.1 J	0.84 J	0.73 J	0.99 J	0.87 J	0.83 J	0.76 J	0.78 J	1 J	0.8 J	0.76 J	0.73 J	0.64	0.76	1	1
pH	SU	7.76	7.47		7.41	7.57	7.55	7.3	7.51	7.28	7.54	7.6	7.65	7.97	7.02	7.49		7.85
Sulfate	mg/L	580 J-	480	500	440	50	470	730	720	640	580		690	760	890	940	1500	1500
Total Dissolved Solids	mg/L	1100	1000	1000	1000	1000	1000	1300	1200	1400	1200		1400	20 U	1600	1800	2400	2400
CCR Appendix IV																		
Antimony	mg/L	0.002 U	0.002 U	0.00057 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.00095 J		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.0068	0.0064	0.011	0.011	0.012	0.0095	0.012	0.0096	0.0081		0.0099	0.0097	0.011	0.0088	0.0071	0.0079	0.0076
Barium	mg/L	0.072	0.04	0.036	0.035	0.038	0.039	0.055	0.043	0.046		0.053	0.058	0.068	0.071	0.079	0.055	0.054
Beryllium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.00022 J		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.00029 J	0.002 U	0.00026 J	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.00016 J	0.00019 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.0003 J		0.00054 J	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	1.1 J+	1.1 J	0.84 J	0.73 J	0.99 J	0.87 J	0.83 J	0.76 J	0.78 J	1 J	0.8 J	0.76 J	0.73 J	0.64	0.76	1	1
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.0055 J	0.008 U	0.0032 J	0.0022 J	0.0058 J	0.0035 J	0.0072 J	0.006 J	0.0061 J		0.007 J		0.0059 J	0.0059 J	0.007 J	0.0054 J	0.0055 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.013	0.012	0.012	0.012	0.012	0.013	0.023	0.016	0.013		0.016	0.015	0.012	0.011	0.014	0.02	0.019
Radium, Total	pci/L	1.31	1.05	0.866	0.794	0.998 J+	0.577	1.23	0.795	1.21		1.11 J+	0.99	1.17 J+	1.64 J+	0.984		
Radium-226	pci/L	0.651 J+	0.458	0.427	0.412 U	0.507	0.348	0.635	0.54 J+	0.559		0.443	0.535	0.724 J+	0.719 J+	0.753		
Radium-228	pci/L	0.66	0.59	0.467 U	0.435 U	0.491 J+	0.399 U	0.597	0.287 U	0.647		0.671 J+	0.455	0.522 U	0.919 J+	0.459 U		
Selenium	mg/L	0.005 U	0.005 U	0.00061 J	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U		0.005 U		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Supplemental Parameters																		
Alkalinity, Bicarbonate (HCO3)	mg/L													200				
Alkalinity, Carbonate (CO3)	mg/L													5 U				
Alkalinity, Hydroxide (OH)	mg/L													5 U				
Alkalinity, Total	mg/L													200	210	190		200
Ferric Iron	mg/L													6 J	5.1			
Ferrous Iron	mg/L													0.1 R	1.8 J			
Iron	mg/L															9.2		7.5
Magnesium	mg/L													46	53	58		49
Manganese	mg/L															0.49		0.39
Nitrate as N	mg/L													0.05 R		0.018 J		0.1 U
Nitrite as N	mg/L													0.05 R				
Nitrogen, Nitrate-Nitrite	mg/L														0.063			
Phosphorus (as phosphate)	mg/L													0.19	0.28 J	0.22 J		0.17 J
Potassium	mg/L													4.9 J	5.2	5.5		6.3
Sodium	mg/L													84	84	97		380
Sample Parameters																		
Dissolved Oxygen	mg/L	1.23	1.63		0.39	0.3	0.21	0.12	0.32	0.16	0.15	0.28	0.25	1.02	4.23	0.33		3.41
Oxidation Reduction Potential	mV	-122.6	-89		-126.3	-148.5	-132.2	-130.2	-123.1	-32.7	-135.8	-75.5	-117.8	-101.5	-166.8	21.2		-99.5
Eh	mV	77.4	111.0	200.0	73.7	51.5	67.8	69.8	76.9	167.3	64.2	124.5	82.2	98.5	33.2	221.2		100.5
pH	SU	7.76	7.47		7.41	7.57	7.55	7.3	7.51	7.28	7.54	7.6	7.65	7.97	7.02	7.49		7.85
Specific Conductance	uS/cm	1147	1297		1158	1230	1192	1645	1333	1665	1461	1142	1653	3104	2098	1692		2340
Temperature	deg C	13.04	14.44		15.27	14.3	13.37	12.3	13.48	14.3	15	12.6	12.3	15	17.7	11.2		14.65
Turbidity	NTU	4.1	3.99		1.8	2.76	4.21	4.58	3.27	2.48	3.9	4.08	4.2	4.99	3.49	3.72		2.81

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW17																
	Sample Date	2016-07-14	2016-09-08	2016-11-09	2017-01-10	2017-03-02	2017-04-27	2017-06-29	2017-08-24	2017-10-04	2018-03-14		2018-04-23		2018-10-29	2019-05-09	2019-11-08
	Sample Type	N	N	N	N	N	N	N	N	N	FD	N	FD	N	N	N	N
Chemical Name	Unit																
CCR Appendix III																	
Boron	mg/L	12	12	11	11	11	8.9	7.6	12	12			5.8	5.8	16	7.7	4.9
Calcium	mg/L	150	160	170	180	200	180	120	150	64			110	110	200	130	120
Chloride	mg/L	110	100	130	150	140	81	170	130	160			40	38	150	90	92
Fluoride	mg/L	1.8 J+	2.2 J	2 J	1.9 J	1.6 J	1.6 J	0.79 J	1.9 J	2.4 J	5 U	1.7 J	1.9 J	1.9 J-	1.7	1.6	1.7
pH	SU	7.56	7.27	7.21	7.33	7.54	7.23	7.4	7.16	7.22		7.62		7.82	6.85	7.53	7.75
Sulfate	mg/L	330 J-	330	360	390	390	390	520	250	350			240	220	430	300	290
Total Dissolved Solids	mg/L	940	920	940	1000	1100	950	1400	890	1000			630	620	1100	800	860
CCR Appendix IV																	
Antimony	mg/L	0.00034 J	0.00032 J	0.00032 J	0.002 U	0.00028 J	0.002 U	0.002 U	0.002 U		0.002 U	0.002 U			0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.0054	0.0056	0.0042 J	0.0069	0.0055	0.0054	0.0035 J	0.0028 J		0.005 U	0.0027 J			0.004 J	0.0021 J	0.0028 J
Barium	mg/L	0.047	0.056	0.054	0.05	0.054	0.048	0.044	0.06		0.041	0.058		0.029	0.073	0.041	0.052
Beryllium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.00076 J	0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.0015 J	0.002 U	0.0011 J	0.0011 J	0.0012 J	0.0012 J	0.002 U	0.002 U		0.0017 J	0.0014 J			0.002 U	0.002 U	0.002 U
Cobalt	mg/L	6.3E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U
Fluoride	mg/L	1.8 J+	2.2 J	2 J	1.9 J	1.6 J	1.6 J	0.79 J	1.9 J	2.4 J	5 U	1.7 J	1.9 J	1.9 J-	1.7	1.6	1.7
Lead	mg/L	0.00018 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.0047 J	0.008 U	0.0036 J	0.0047 J	0.0024 J	0.0045 J	0.0058 J	0.0076 J		0.008 U	0.0035 J			0.0066 J	0.0035 J	0.0052 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U	0.0002 U			0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.015	0.012	0.011	0.01 U	0.01	0.011	0.018	0.024		0.024	0.024		0.02	0.017	0.017	0.012
Radium, Total	pci/L	0.569	0.451 U	0.447 U	0.553 U	0.428	0.477	0.403 U	0.71		0.816 J+	0.384 U		0.205	1.1 J+	0.518 U	
Radium-226	pci/L	1 U	0.331	0.415 U	0.246 U	0.222	0.23	0.191 J+	0.215		0.202	0.112		0.0399	0.315 J+	0.26 U	
Radium-228	pci/L	1 U	0.451 U	0.447 U	0.553 U	0.402 U	0.406 U	0.403 U	0.495		0.614 J+	0.384 U		0.166	0.783 J+	0.518 U	
Selenium	mg/L	0.019	0.03	0.018	0.023	0.028	0.026	0.0081	0.0032 J		0.0074	0.021		0.015	0.022	0.004 J	0.011
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.00063 J	0.001 U
Supplemental Parameters																	
Alkalinity, Bicarbonate (HCO3)	mg/L																
Alkalinity, Carbonate (CO3)	mg/L																
Alkalinity, Hydroxide (OH)	mg/L																
Alkalinity, Total	mg/L														190	160	160
Ferric Iron	mg/L														0.1 U		
Ferrous Iron	mg/L														0.05 UJ		
Iron	mg/L															0.2 U	0.2 U
Magnesium	mg/L														67	49	40
Manganese	mg/L															0.015 U	0.015 U
Nitrate as N	mg/L															0.97	2
Nitrite as N	mg/L																
Nitrogen, Nitrate-Nitrite	mg/L														2.8		
Phosphorus (as phosphate)	mg/L														0.47	0.28 J	0.3 J
Potassium	mg/L														5.3	3.5 J	5
Sodium	mg/L														34	31	28
Sample Parameters																	
Dissolved Oxygen	mg/L	5.78	1.7	1.8	1.01	2.35	7.33	3.18	4.33	3.3		4.99		9	1.78	5.75	6.47
Oxidation Reduction Potential	mV	45.8	825.9	6.1	82.3	6.6	67.9	23.3	8	57.9		-90.2		-90.2	-237	53.1	35
Eh	mV	245.8	1025.9	206.1	282.3	206.6	267.9	223.3	208.0	257.9	200.0	109.8		109.8	-37.0	253.1	235.0
pH	SU	7.56	7.27	7.21	7.33	7.54	7.23	7.4	7.16	7.22		7.62		7.82	6.85	7.53	7.75
Specific Conductance	uS/cm	1059	1287	1141	1272	1541	1290	902	1151	1357		832		675	1513	894	798
Temperature	deg C	17.23	20.6	18.63	13.6	10.95	11.8	17.71	24.4	22.3		10.9		11.4	20	12.1	17.23
Turbidity	NTU	1.56	1.09	0.58	2.58	0.44	2.21	1.02	1.5	2.51		0.54		1.19	0.45	0.44	0.86

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW17B														
	Sample Date	2016-07-13	2016-09-08	2016-11-09	2017-01-10	2017-03-02	2017-04-27	2017-06-29	2017-08-23	2017-10-04	2018-03-14	2018-04-23	2018-09-06	2018-10-29	2019-05-09	2019-11-08
	Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Chemical Name	Unit															
CCR Appendix III																
Boron	mg/L	18	19	19	21	22	20	16	13	11		13	10	12	12	9.4
Calcium	mg/L	230	250	240	250	270	250	240	160	57		180	150	150	180	150
Chloride	mg/L	180	170	180	190	200	200	71	99	130		140	120	110	130	110
Fluoride	mg/L	0.9 J+	0.98 J	0.68 J	0.58 J	0.6 J	0.6 J	2.1 J	1.3 J	1.1 J	0.55 J	0.58 J	0.84 J	0.71	0.62	0.67
pH	SU	7.43	7.37	7.1	7.24	7.44	7.02	7.25	7.19	7.38	7.48	7.39	7.63	7.4	7.15	7.66
Sulfate	mg/L	710 J-	680	710	740	710	680	300	380	420		520	350	350	270	350
Total Dissolved Solids	mg/L	1500	1400	1400	1500	1700	1500	660	1000	960		1100	940	950	980	990
CCR Appendix IV																
Antimony	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.0024 J	0.0021 J	0.0024 J	0.0035 J	0.0023 J	0.0022 J	0.0023 J	0.0026 J		0.0011 J		0.0017 J	0.0023 J	0.0022 J	0.0019 J
Barium	mg/L	0.078	0.079	0.086	0.092	0.1	0.089	0.065	0.06		0.085	0.069	0.066	0.073	0.11	0.074
Beryllium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.00033 J	0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.0003 J	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	0.9 J+	0.98 J	0.68 J	0.58 J	0.6 J	0.6 J	2.1 J	1.3 J	1.1 J	0.55 J	0.58 J	0.84 J	0.71	0.62	0.67
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.0017 J	0.008 U	0.008 U	0.0019 J	0.00046 J	0.0021 J	0.0019 J	0.008 U		0.008 U		0.008 U	0.008 U	0.008 U	0.008 U
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.024	0.021	0.013	0.011	0.012	0.011	0.017	0.021		0.017	0.016	0.01	0.011	0.0073 J	0.01
Radium, Total	pci/L	1.79	1.84	2.53	2.58	1.25	1.94	1.03	2.4			1.21	1.47	2.48 J+	1.71	
Radium-226	pci/L	0.882 J+	0.864	1.28	1.4	1.01	1.09	0.639 J+	0.867			0.518	0.945	1.15 J+	0.964	
Radium-228	pci/L	0.913	0.98	1.25	1.17	0.423 U	0.846	0.395	1.53			0.696	0.524	1.33 J+	0.748	
Selenium	mg/L	0.005 U	0.005 U	0.005 U	0.00053 J	0.00051 J	0.005 U	0.005 U	0.005 U		0.005 U		0.0011 J	0.005 U	0.005 U	0.005 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.00022 J	0.001 U
Supplemental Parameters																
Alkalinity, Bicarbonate (HCO3)	mg/L												210			
Alkalinity, Carbonate (CO3)	mg/L												5 U			
Alkalinity, Hydroxide (OH)	mg/L												5 U			
Alkalinity, Total	mg/L												210	230	300	190
Ferric Iron	mg/L												4.1 J	3		
Ferrous Iron	mg/L												0.1 R	1.5 J		
Iron	mg/L														6.8	5.1
Magnesium	mg/L												32	33	53	44
Manganese	mg/L														1	0.76
Nitrate as N	mg/L												0.05 R		0.1 U	0.1 U
Nitrite as N	mg/L												0.05 R			
Nitrogen, Nitrate-Nitrite	mg/L													0.23		
Phosphorus (as phosphate)	mg/L												0.46	0.17 J	0.31 U	0.31 U
Potassium	mg/L												5.7	6.2	9.5	6.1
Sodium	mg/L												83	110	39	42
Sample Parameters																
Dissolved Oxygen	mg/L	0.33	0.24	0.67	0.36	0.13	0.13	0.18	0.14	0.09	0.16	0.11	0.2	0.88	0.23	4.2
Oxidation Reduction Potential	mV	-115	654	-100.8	-119.6	-91.8	102.3	-98.6	-51.1	-129.4	-95.2	-131.9	-91.9	-244.5	11.8	-3.6
Eh	mV	85.0	854.0	99.2	80.4	108.2	302.3	101.4	148.9	70.6	104.8	68.1	108.1	-44.5	211.8	196.4
pH	SU	7.43	7.37	7.1	7.24	7.44	7.02	7.25	7.19	7.38	7.48	7.39	7.63	7.4	7.15	7.66
Specific Conductance	uS/cm	1525	1734	1568	171.9	2251	1950	1488	1244	1337	1235	1463	2077	1380	1060	890
Temperature	deg C	15.29	16.16	15.77	15	14.8	14.4	15.62	16.5	16.6	15.2	15.2	16.55	16.1	13.6	15.05
Turbidity	NTU	4.09	2.48	0.62	0.92	0.58	2.11	2.35	1.86	3.45	3.76	3.88	3.55	4.86	3.61	2.68

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW18																	GAMW18B				
Sample Date		2016-07-13	2016-09-08	2016-11-09		2017-01-10	2017-03-01	2017-04-26	2017-07-12		2017-08-23	2017-10-03		2018-03-14	2018-04-23	2018-10-25	2019-04-29	2019-11-07	2018-09-10	2018-10-25		2019-04-29	2019-11-07
Sample Type		N	N	FD	N	N	N	N	FD	N	N	FD	N	N	N	N	N	N	N	FD	N	N	N
Chemical Name	Unit																						
CCR Appendix III																							
Boron	mg/L	1.8	3.5	1.9	1.8	1.3	1	0.77	1.2	1.2	1.5	1.9	1.9		1.2	1.7	0.95	1.7	13	12	13	14	11
Calcium	mg/L	320	610	370	360	330	280	210	280	290	300	380 J	64 J		320	230	320	360	260	200	220	240	180
Chloride	mg/L	17	39	17	17	9.3	5	4.3	10	10	11	23	23		7.3	22	12	27	150	140	140	170	140
Fluoride	mg/L	0.047 J+	0.036 J	10 U	10 U	5 U	5 U	2 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	0.057	0.074	0.15	0.77 J	0.74	0.73	0.88	0.99
pH	SU	6.95	6.83		6.7	6.88	7.11	6.6		6.96	7.02		6.91	7.2	7.21	6.54	6.71	7.18	7.73		6.86	7.15	7.68
Sulfate	mg/L	760 J-	1400	850	830	640	540	370	600	610	690	960	950		670	550	780	920	1100	1000	1100	1100	840
Total Dissolved Solids	mg/L	1300	2200	1500	1500	1200	1000	730	1100	1100	1300	1600	1500		2400	1100	1400	1500	2100	2000	2000	2100	1500
CCR Appendix IV																							
Antimony	mg/L	0.002 U	0.002 U	0.00096 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U			0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.0014 J	0.0023 J	0.0014 J	0.00091 J	0.0014 J	0.005 U	0.0015 J	0.0021 J	0.0021 J	0.0011 J			0.005 U		0.005 U	0.00079 J	0.005 U	0.0018 J	0.0026 J	0.0028 J	0.0037 J	0.0041 J
Barium	mg/L	0.038	0.047	0.041	0.039	0.037	0.024	0.021	0.051	0.052	0.055			0.048	0.035	0.037	0.039	0.05	0.048	0.035	0.039	0.039	0.024
Beryllium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.00094 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00053 U	0.001 U
Cadmium	mg/L	8.1E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.00067 J	0.00046 J	0.0005 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U			0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.00023 J	0.00047 J	0.0002 J	0.00024 J	0.001 U	0.00023 J	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.00028 J	0.001 U	0.00027 J	0.00026 J	0.00028 J	0.00024 J	0.00024 J
Fluoride	mg/L	0.047 J+	0.036 J	10 U	10 U	5 U	5 U	2 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	0.057	0.074	0.15	0.77 J	0.74	0.73	0.88	0.99
Lead	mg/L	0.001 U	0.001 U	0.00051 J	0.00025 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.00067 J		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.00096 J	0.008 U	0.008 U	0.008 U	0.00042 J	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U			0.008 U		0.008 U	0.008 U	0.008 U	0.025	0.015	0.016	0.023	0.015
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ			0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.11	0.18	0.14	0.13	0.094	0.1	0.1	0.1	0.11	0.1			0.097	0.085	0.057	0.062	0.076	0.024	0.014	0.015	0.026	0.011
Radium, Total	pci/L	5 U	0.803	0.474	0.449	0.581 U	0.398 U	0.384 U	0.493	0.337 U	0.629			0.373 U	0.259	0.477	0.365 U		1.7	1.28	1.46		
Radium-226	pci/L	1 U	0.348	0.334 U	0.33 U	0.325	0.13	0.131 U	0.166 J+	0.179 J+	0.332			0.111	0.0715	0.291	0.325 U		0.773 J+	0.717	0.748	0.41	
Radium-228	pci/L	1 U	0.49 U	0.455 U	0.413 U	0.581 U	0.398 U	0.384 U	0.381 U	0.337 U	0.369 U			0.373 U	0.187	0.357 U	0.365 U		0.928	0.562	0.708	0.941	
Selenium	mg/L	0.01	0.018	0.0065	0.0052	0.0099	0.011	0.0053	0.012	0.012	0.006			0.009	0.0084	0.015	0.015	0.012	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Supplemental Parameters																							
Alkalinity, Bicarbonate (HCO3)	mg/L																		230				
Alkalinity, Carbonate (CO3)	mg/L																		5 U				
Alkalinity, Hydroxide (OH)	mg/L																		5 U				
Alkalinity, Total	mg/L															240	190	250	230		230	210	200
Ferric Iron	mg/L															0.032 J			6.8 J		2.9		
Ferrous Iron	mg/L															0.05 UJ			0.1 R		1.3 J		
Iron	mg/L																0.16 J	0.083 J				3.6	3
Magnesium	mg/L															16	17	23	66		58	67	51
Manganese	mg/L																0.0047 J	0.014 J				0.69	0.66
Nitrate as N	mg/L																0.19	0.51	0.05 UJ			0.1 U	0.1 U
Nitrite as N	mg/L																		0.05 UJ				
Nitrogen, Nitrate-Nitrite	mg/L															0.55					0.05 U		
Phosphorus (as phosphate)	mg/L															0.31 U	0.14 J	0.31 UJ	0.031 U		0.31 U	0.31 U	0.31 UJ
Potassium	mg/L															3.4 J	2 J	3.7 J	7.3		5.7	7.8	4.4 J
Sodium	mg/L															28	24	39	260		240	260	180
Sample Parameters																							
Dissolved Oxygen	mg/L	4.83	4.77		5.93	7.52	8.86	7.79		6.04	4.52		5.32	6.5	8.49	3.78	7.01	2.95	0.24		0.29	0.92	0.36
Oxidation Reduction Potential	mV	98.9	76.8		28.7	106.8	97.9	209.2		203.2	24.7		121.9	-129.6	-51.6	-36.6	129.2	-41.1	-140.7		-103.4	109.2	-144.8
Eh	mV	298.9	276.8		228.7	306.8	297.9	409.2	200.0	403.2	224.7		321.9	70.4	148.4	163.4	329.2	158.9	59.3		96.6	309.2	55.2
pH	SU	6.95	6.83		6.7	6.88	7.11	6.6		6.96	7.02		6.91	7.2	7.21	6.54	6.71	7.18	7.73		6.86	7.15	7.68
Specific Conductance	uS/cm	1474	2362		1740	1255	986	970		1299	1414		1760	905	1170	1230	1060	1338	3311		2147	1902	1475
Temperature	deg C	16.3	20.1		16.6	9.65	8.47	11.2		17.9	19.8		19.3	8.1	8.9	17.4	8.8	14.2	15.39		14.9	11.8	13.7
Turbidity	NTU	3.32	1.63		2.38	3.05	4.44	2.48		1.71	1.03		4.16	4.59	0.71	1.29	4.55	2.04	2.78		3.58	3.21	3.14

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW46								GAMW46B								GAMW52					
Sample Date		2018-06-13	2019-03-01	2019-04-17	2019-06-06	2019-07-18	2019-08-26	2019-10-04	2019-11-19	2018-06-13	2019-03-04	2019-04-17	2019-06-07	2019-07-18	2019-08-26	2019-10-04	2019-11-19	2018-09-10	2018-10-31		2019-05-09	2019-11-14	
Sample Type		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	FD	N
Chemical Name	Unit																						
CCR Appendix III																							
Boron	mg/L	0.055 J	0.1 U	0.033 J	0.1 U	0.032 J	0.053 J	0.043 J	0.049 J	0.05 J	0.05 J	0.037 J	0.047 J	0.03 J	0.05 J	0.047 J	0.046 J	0.34		0.17	0.077 J		0.13
Calcium	mg/L	56	14	28	25 J-	25	25	23	27	25	58	58	56	52	58	49	56	75		59	52		72
Chloride	mg/L	8.4	2.4	1.9		1.8	1.6	1.6	1.6	3	7.9	7.9		7.2	8	7.1	6.9	34		9.1	5.5		37
Fluoride	mg/L	0.052 J	0.068	0.063		0.065	0.06	0.079 J+	0.062	0.048 J	0.066	0.076		0.072	0.069	0.073 J+	0.072	0.36 J		0.3	0.25 J+		0.3
pH	SU	7.93	8.17	8.23	7.52	8.15	7.9	7.81	7.77	8.2	7.11	7.99	7.58	8.18	7.62	7.44	7.47	7.5		7.06	7.17		7.59
Sulfate	mg/L	55	34	30		28	29	30	27	29	64	64		64	68	65	64	86		39	24		67
Total Dissolved Solids	mg/L	260	160	150		130	150	140 J+	140	150	260	290		240	220 J	250	240	400		250	240		350
CCR Appendix IV																							
Antimony	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U	0.002 U		0.002 U
Arsenic	mg/L	0.0014 J	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.00086 J	0.005 U	0.0015 J	0.0012 J	0.00076 J	0.005 U	0.00091 J	0.00095 J	0.0013 J	0.001 J	0.005 U		0.005 U	0.005 U		0.005 U
Barium	mg/L	0.027	0.0028 J	0.0059	0.0065	0.0054	0.0054	0.0049 J	0.0059	0.0086	0.027	0.026	0.025	0.023	0.024	0.021	0.025	0.039		0.019	0.015		0.02
Beryllium	mg/L	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00054 J	0.001 U	0.001 U	0.0011	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0011	0.001 U		0.001 U	0.001 U		0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.00024 J	0.001 U		0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.0014 J	0.002 U	0.002 U	0.0021	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U	0.002 U		0.002 U
Cobalt	mg/L	0.0002 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00034 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00058 J		0.00031 J	0.001 U		0.001 U
Fluoride	mg/L	0.052 J	0.068	0.063		0.065	0.06	0.079 J+	0.062	0.048 J	0.066	0.076		0.072	0.069	0.073 J+	0.072	0.36 J		0.3	0.25 J+		0.3
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U		0.001 U
Lithium	mg/L	0.008 U	0.04 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.0017 J	0.008 U	0.008 U	0.002 J	0.008 U	0.008 U	0.003 J	0.0017 J		0.008 U	0.008 U		0.0025 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U		0.0002 U	0.0002 U		0.0002 U
Molybdenum	mg/L	0.0031 J	0.01	0.01 U	0.01 U	0.01 U	0.01 U	0.0015 J	0.01 U	0.0018 J	0.0024 J	0.0022 J	0.0025 J	0.0028 J	0.0028 J	0.0025 J	0.003 J	0.005 J		0.0035 J	0.0016 J		0.0017 J
Radium, Total	pci/L	0.384 U	0.486 U	0.33 U		0.427 U	0.505 U	0.566		0.392 U	0.402 U	0.308 U		0.427 U	0.609 U	0.408 U		0.796		1 J+	0.53 U		
Radium-226	pci/L	0.244 U	0.103 U	0.0708 U		0.214 U	0.0925 UJ	0.179 J+		0.223 U	0.286	0.108		0.232 U	0.105 UJ	0.192 J+		0.46 J+		0.299 J+	0.436		
Radium-228	pci/L	0.384 U	0.486 U	0.33 U		0.427 U	0.505 UJ	0.481 U		0.392 U	0.402 U	0.308 U		0.427 U	0.609 UJ	0.408 U		0.392 U		0.706 J+	0.53 U		
Selenium	mg/L	0.001 J	0.025 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.0017 J	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.0014 J		0.0017 J	0.0014 J		0.0011 J
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00059 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00068 J	0.001 U		0.001 U	0.001 U		0.001 U
Supplemental Parameters																							
Alkalinity, Bicarbonate (HCO3)	mg/L																	210					
Alkalinity, Carbonate (CO3)	mg/L																	5 U					
Alkalinity, Hydroxide (OH)	mg/L																	5 U					
Alkalinity, Total	mg/L			82					73			140					130	210	180	190	170	190	190
Ferric Iron	mg/L																	0.2 J	0.1 U	0.1 U			
Ferrous Iron	mg/L																	0.1 R	0.05 J	0.05 UJ			
Iron	mg/L			0.054 J					0.2 U			1.5					1.6				0.2 U	0.2 U	0.2 U
Magnesium	mg/L			9.7					7.8			15					14	20	16	15	16	20	21
Manganese	mg/L			0.0066 J					0.015 U			0.26					0.23				0.0022 J	0.017	0.02
Nitrate as N	mg/L			0.58					0.48			0.1 U					0.1 U	1 J			1.9	1.1	1.1
Nitrite as N	mg/L																	0.089 J					
Nitrogen, Nitrate-Nitrite	mg/L																		1.3	1.3			
Phosphorus (as phosphate)	mg/L			0.16 J					0.31 U			0.15 J					0.31 U	0.031 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U
Potassium	mg/L			0.97 J					1 J			0.83 J					0.82 J	4.7	3 J	2.9 J	2.1 J	3.1 J	3.3 J
Sodium	mg/L			4.6 J					2.4 J			5.4					4.6 J	25	13	13	9.8	18	21
Sample Parameters																							
Dissolved Oxygen	mg/L	0.12	1.85	4.18	6.44	6.58	4.03	2.44	3.36	3.59	0.08	1.9	0.3	1.4	1.25	0.31	0.3	0.48		0.21	6.42		2.2
Oxidation Reduction Potential	mV	-171.4	1.9	7.7	157.6	25.5	40.6	9.16	-141.1	-29.4	111.9	-111.1	-133.1	-93.9	-119.9	33.7	-229.6	-30.3		85.1	108.2		-43.2
Eh	mV	28.6	201.9	207.7	357.6	225.5	240.6	209.2	58.9	170.6	311.9	88.9	66.9	106.1	80.1	233.7	-29.6	169.7		285.1	308.2	200.0	156.8
pH	SU	7.93	8.17	8.23	7.52	8.15	7.9	7.81	7.77	8.2	7.11	7.99	7.58	8.18	7.62	7.44	7.47	7.5		7.06	7.17		7.59
Specific Conductance	uS/cm	367	155	161	179	153	153	152	132	211	268	294	282	274	284	260	242	0.896		448	308		320
Temperature	deg C	11.4	8	9.1	11.1	13.2	14.2	14.8	11.7	11.3	9.6	10.8	11	11.9	12.3	12.3	11.3	19.97		17.6	14.2		15.3
Turbidity	NTU	3.96	1.91	1.33	0.51	0.82	0.69	0.89	0.66	3.45	3.26	4.3	3.25	3.11	1.15	4.16	2.84	0.45		0.83	0.42		0.74

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW52B				GAMW53				GAMW53B					GAMW54				GAMW54B				
Sample Date		2018-09-11	2018-10-31	2019-05-09	2019-11-14	2018-09-11	2018-10-30	2019-04-30	2019-11-14	2018-09-11	2018-10-30		2019-04-30	2019-11-14	2018-09-10	2018-10-31	2019-04-30	2019-11-14	2018-09-10	2018-10-31		2019-05-01	2019-11-15
Sample Type		N	N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N	N	FD	N	N	N
Chemical Name	Unit																						
CCR Appendix III																							
Boron	mg/L	0.75	0.8	1	1.3	0.19	0.25	0.056 J	0.13	2.5		3.1	2.2	0.73	0.84	0.77	0.39	0.37	5.6		6.5	5.9	6
Calcium	mg/L	160	160	110	130	45	53	17	25	180		190	150	140	93	88	93	81	210		220	200	240
Chloride	mg/L	530	470	380	370	4.9	4.6	1.9	3.6	90		85	81	74	15	10	10	4	100		95	110	120
Fluoride	mg/L	10 U	0.18	0.21 J+	0.23	0.17 J	0.17	0.05 U	0.05 U	0.52 J		0.46	0.51	0.7	0.18 J	0.17	0.14	0.28	0.41 J		0.52	0.59	0.58
pH	SU	8.3	7.1	7.42	7.34	6	6.47	5.93	6.21	7.3		7.35	7.41	7.52	6.24	7.92	6.82	7.08	6.95		8.71	7.27	7.2
Sulfate	mg/L	210	190	220	290	51	56	37	36	430		510	340	320	190	150	190	76	750		730	710	720
Total Dissolved Solids	mg/L	1500	1300	1100	1100	240	250	130	160	1100		1100	900	770	500	400	470	350	1600		1400	1500	1400
CCR Appendix IV																							
Antimony	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.00061 J	0.002 U		0.002 U	0.002 U	0.002 U	0.0011 J	0.00074 J	0.00078 J	0.001 J	0.002 U		0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.0013 J	0.0016 J	0.00083 J	0.0012 J	0.013	0.015	0.00097 J	0.0018 J	0.00079 J		0.00083 J	0.001 J	0.0016 J	0.0024 J	0.0028 J	0.0022 J	0.0045 J	0.0025 J		0.0032 J	0.0045 J	0.005
Barium	mg/L	0.32	0.31	0.25	0.28	0.027	0.028	0.019	0.026	0.052		0.054	0.044	0.072	0.043	0.039	0.031	0.031	0.098		0.093	0.08	0.084
Beryllium	mg/L	0.001 U	0.00042 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.00059 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U
Cadmium	mg/L	0.001 U	0.00029 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.0019 J	0.0018 J	0.0012 J	0.002 U	0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.00032 J	0.001 U	0.001 U	0.00084 J	0.00099 J	0.0005 J	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U	0.00053 J	0.00052 J	0.00062 J	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U
Fluoride	mg/L	10 U	0.18	0.21 J+	0.23	0.17 J	0.17	0.05 U	0.05 U	0.52 J		0.46	0.51	0.7	0.18 J	0.17	0.14	0.28	0.41 J		0.52	0.59	0.58
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.0014	0.00089 J	0.00057 J	0.00063 J	0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.0041 J	0.0031 J	0.0033 J	0.0071 J	0.008 U	0.008 U	0.008 U	0.0021 J	0.0042 J		0.0052 J	0.005 J	0.0066 J	0.008 U	0.008 U	0.008 U	0.0023 J	0.0048 J		0.0036 J	0.0048 J	0.0074 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U		0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.014	0.015	0.0095 J	0.0086 J	0.012	0.015	0.0051 J	0.011	0.0083 J		0.0075 J	0.0098 J	0.02	0.043	0.044	0.023	0.03	0.018		0.019	0.0085 J	0.012
Radium, Total	pci/L	3.52	5.55 J+	2.63		0.547 U	1.45 J+	0.344 U		1.69		0.48 J+	1.26		0.5	1.08 J+	0.393 U		2.03		2.7 J+	1.82	
Radium-226	pci/L	2.11	2.76 J+	1.2		0.257	0.795 J+	0.316 U		0.789		0.238 J+	0.544		0.385 J+	0.237 J+	0.337 U		1.18 J+		1.35 J+	0.956	
Radium-228	pci/L	1.41	2.79 J+	1.44		0.547 U	0.658 J+	0.344 U		0.897		0.347 U	0.719		0.385 U	0.843 J+	0.393 U		0.849		1.35 J+	0.865	
Selenium	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U		0.005 U	0.005 U	0.005 U	0.0017 J	0.0012 J	0.0043 J	0.0035 J	0.005 U		0.005 U	0.005 U	0.005 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.00049 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U
Supplemental Parameters																							
Alkalinity, Bicarbonate (HCO3)	mg/L	220				120				250					150				240				
Alkalinity, Carbonate (CO3)	mg/L	5 U				5 U				5 U					5 U				5 U				
Alkalinity, Hydroxide (OH)	mg/L	5 U				5 U				5 U					5 U				5 U				
Alkalinity, Total	mg/L	220	230	220	200	120	140	53	73	250	240	250	260	190	150	160	160	230	240	230	230	250	260
Ferric Iron	mg/L	5 J	3.4			2 J	1			3.2 J	2.3	2.7			0.13 J	0.14			5.9 J	4.5	3.4		
Ferrous Iron	mg/L	0.1 R	0.32 J			0.1 R	0.5 J			0.1 R	0.56 J	1 J			0.1 R	0.029 J			0.1 R	0.94 J	1.6 J		
Iron	mg/L			2.7	2.5			0.25	0.28				3.1	2.4			0.14 J	0.31				5.4	5.4
Magnesium	mg/L	37	38	30	28	15	15	8.9	11	23	24	25	23	19	19	18	21	17	38	38	36	42	46
Manganese	mg/L			0.21	0.25			0.0079 J	0.015 U				0.4	0.32			0.0097 J	0.015 U				0.48	0.51
Nitrate as N	mg/L	0.05 UJ		0.1 U	0.1 U	1.3 J		1.4	0.4	0.05 UJ			0.1 U	0.1 U	0.028 J		0.49	0.15	0.05 UJ			0.1 U	0.1 U
Nitrite as N	mg/L	0.05 UJ				0.03 J				0.05 UJ					0.05 UJ				0.05 UJ				
Nitrogen, Nitrate-Nitrite	mg/L		0.052				0.05 U				0.099	0.74 J-				0.21				0.15	0.091		
Phosphorus (as phosphate)	mg/L	0.056	0.21 J	0.31 U	0.11 J	0.32	0.31 U	0.31 U	0.31 U	0.031 U	0.14 J	0.52	0.31 U	0.31 U	0.031 U	0.31 U	0.11 J	0.31 U	0.079	0.31 U	0.39	0.38	0.3 J
Potassium	mg/L	6	6.4	7	6.5	2.2	5 U	1.3 J	1.6 J	4.6	5.2	5.4	4.9 J	4.5 J	1.9	1.8 J	1.2 J	1.6 J	6.8	6.8	6.2	6.3	5.6
Sodium	mg/L	220	250	250	210	6.5	7.8	4.9 J	3.9 J	120	130	130	99	75	21	21	15	11	200	200	180	160	140
Sample Parameters																							
Dissolved Oxygen	mg/L	0.44	0.1	0.15	0.19	0.53	0.86	3.11	0.84	0.26		0.8	0.36	0.09	0.61	1.41	0.72	0.26	0.42		2.12	0.42	0.31
Oxidation Reduction Potential	mV	-214.9	-103.5	6.31	-102.9	-24.6	-199.5	43.7	-54.8	-183.2		-168	27.7	-75.3	107.8	-294.7	48.4	-69.5	-123.4		-315.7	-23.1	-43.3
Eh	mV	-14.9	96.5	206.3	97.1	175.4	0.5	243.7	145.2	16.8		32.0	227.7	124.7	307.8	-94.7	248.4	130.5	76.6	200.0	-115.7	176.9	156.7
pH	SU	8.3	7.1	7.42	7.34	6	6.47	5.93	6.21	7.3		7.35	7.41	7.52	6.24	7.92	6.82	7.08	6.95		8.71	7.27	7.2
Specific Conductance	uS/cm	1934	2005	1652	1353	307	400	125	155	1354		1620	1160	870	675	630	493	374	1816		1983	1636	1310
Temperature	deg C	17.26	16.6	15.3	16.1	21.3	20.1	11.4	17.5	20.89		20.4	18.7	19.7	21.2	18.53	10.5	15.3	17.6		17.29	15.5	15.8
Turbidity	NTU	1.6	0.88	2.35	1.01	9.93	5.17	4.76	4.8	2.43		3	3.45	2.5	2.03	1	3.24	2.31	4.2		1.64	4.49	1.67

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW55				GAMW55R	GAMW55B					GAMW56				GAMW56B			
Sample Date		2018-09-10		2018-10-29		2019-11-15	2018-09-11		2018-10-29	2019-05-01	2019-11-15	2018-09-11	2018-10-26	2019-04-29	2019-11-15	2018-09-11	2018-10-29	2019-04-29	2019-11-15
Sample Type		FD	N	FD	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N
Chemical Name	Unit																		
CCR Appendix III																			
Boron	mg/L	1.9	1.9	1.8	1.8	1.1	7.1	7.4	8.2	9.1	11	0.26	0.28	0.21	0.2	1.2	1.2	2.3	3.2
Calcium	mg/L	260	250	270	260	180	250	250	260	210	210	130	110	91	120	140	140	150	150
Chloride	mg/L	58	59	69	70	61	220	220	190	170	150	3.1	2.4	3.2	2.1	50	36	55	64
Fluoride	mg/L	0.51 J	0.52 J	0.47	0.47	0.62	0.29 J	10 U	0.25	0.31	0.31	1.2 J	0.99	0.53	0.71	0.41 J	0.33	0.4	0.44
pH	SU		6.77		7.04	7.46	7.31		7.07	7.19	7.31	6.82	7.17	6.83	7.06	6.95	6.91	7.08	7.21
Sulfate	mg/L	590	600	630	620	480	820	820	910	790	750	57	63	54	56	170	130	260	360
Total Dissolved Solids	mg/L	1200	1300	1300	1300	950	1800	1900	1800	1700	1400	470	480	420	440	740	690	830	860
CCR Appendix IV																			
Antimony	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002	0.002 U
Arsenic	mg/L	0.00083 J	0.005 U	0.005 U	0.005 U	0.005 U	0.0014 J	0.0011 J	0.005 U	0.005 U	0.005 U	0.019	0.022	0.011	0.0097	0.005 U	0.005 U	0.005	0.005 U
Barium	mg/L	0.099	0.097	0.068	0.069	0.035	0.14	0.14	0.12	0.074	0.067	0.068	0.049	0.044	0.04	0.076	0.072	0.082	0.076
Beryllium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001	0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001	0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002	0.002 U
Cobalt	mg/L	0.0065	0.0058	0.0044	0.0044	0.001 U	0.00034 J	0.00028 J	0.001 U	0.001 U	0.001 U	0.0017	0.0053	0.0084	0.0081	0.001 U	0.001 U	0.001	0.001 U
Fluoride	mg/L	0.51 J	0.52 J	0.47	0.47	0.62	0.29 J	10 U	0.25	0.31	0.31	1.2 J	0.99	0.53	0.71	0.41 J	0.33	0.4	0.44
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001	0.001 U
Lithium	mg/L	0.0021 J	0.0017 J	0.008 U	0.008 U	0.0035 J	0.0064 J	0.0064 J	0.0054 J	0.0055 J	0.0078 J	0.0034 J	0.0039 J	0.0023 J	0.0053 J	0.0051 J	0.0035 J	0.0044	0.0062 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002	0.0002 U
Molybdenum	mg/L	0.03	0.028	0.026	0.026	0.024	0.0057 J	0.0055 J	0.0055 J	0.0046 J	0.005 J	0.013	0.0094 J	0.0072 J	0.0079 J	0.004 J	0.003 J	0.0031	0.0064 J
Radium, Total	pci/L	1.4	0.802	0.922 J+	1.24 J+		3.35	3.18	3.66 J+	2.08		0.728	0.698 J+			1.26	1.28 J+		
Radium-226	pci/L	0.574 J+	0.474 J+	0.363 J+	0.447 J+		1.72	1.75	1.86 J+	1.15		0.504	0.357 J+	0.334 U		0.763	0.578 J+	0.506	
Radium-228	pci/L	0.824	0.403 U	0.559 J+	0.796 J+		1.63	1.43	1.79 J+	0.926		0.371 U	0.429 U	0.373 U		0.493	0.698 J+	0.571	
Selenium	mg/L	0.0037 J	0.0031 J	0.0027 J	0.0027 J	0.0046 J	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005	0.005 U
Thallium	mg/L	0.00021 J	0.001 U	0.00023 J	0.00022 J	0.00022 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001	0.001 U
Supplemental Parameters																			
Alkalinity, Bicarbonate (HCO3)	mg/L		240					230				370				370			
Alkalinity, Carbonate (CO3)	mg/L		5 U					5 U				5 U				5 U			
Alkalinity, Hydroxide (OH)	mg/L		5 U					5 U				5 U				5 U			
Alkalinity, Total	mg/L		240		240	230		230	220	230	230	370	370	300	330	370	410	330	270
Ferric Iron	mg/L		0.65 J		0.19			5.2 J	2.5			13 J	5.5			6.4 J	3.5		
Ferrous Iron	mg/L		0.1 R		0.058 J			0.1 R	2.8 J			0.1 R	6.5 J			0.1 R	1.7 J		
Iron	mg/L					0.044 J				4.2	4.1			10	3.9			5.7	4.3
Magnesium	mg/L		32		39	28		46	51	50	42	24	25	27	24	37	38	40	38
Manganese	mg/L					0.22				0.58	0.46			0.25	0.45			0.33	0.29
Nitrate as N	mg/L		0.68 J			1.4		0.05 UJ		0.1 U	0.1 U	0.05 UJ		1.5	0.13	0.05 UJ		0.1 U	0.1 U
Nitrite as N	mg/L		0.058 J					0.05 UJ				0.05 UJ				0.05 UJ			
Nitrogen, Nitrate-Nitrite	mg/L				0.44				0.05 U				0.062				0.05 U		
Phosphorus (as phosphate)	mg/L		0.031 U		0.31 U	0.31 U		2.1	0.7	0.31 U	0.16 J	0.031 U	0.31 U	0.12 J	0.31 U	0.045	0.15 J	0.14 J	0.31 U
Potassium	mg/L		8.3		9.5	7.2		6	6.6	6.2	4.8 J	2.6	2.4 J	1.6 J	1.9 J	3.3	3.6 J	3.7 J	3.6 J
Sodium	mg/L		58		72	79		200	230	200	180	11	12	6.3	5.5	50	49	58	62
Sample Parameters																			
Dissolved Oxygen	mg/L		1.73		0.33	0.17	0.72		0.37	0.17	0.11	0.99	0.28	1.3	0.34	0.29	0.26	0.79	0.18
Oxidation Reduction Potential	mV		21.6		-69.4	-137.9	-28.9		-129.5	-115.9	-57.5	-97.4	-95.4	64	-86.6	-102.8	-44.4	31.8	-105.7
Eh	mV		221.6	200.0	130.6	62.1	171.1		70.5	84.1	142.5	102.6	104.6	264.0	113.4	97.2	155.6	231.8	94.3
pH	SU		6.77		7.04	7.46	7.31		7.07	7.19	7.31	6.82	7.17	6.83	7.06	6.95	6.91	7.08	7.21
Specific Conductance	uS/cm		1493		1574	1491	1017		2109	2201	1967	749	835	460	466	928	1036	856	741
Temperature	deg C		21.1		19.4	17.9	16.7		19.2	18.5	18.1	17	15.7	8.7	14	13.9	13.8	11.6	12.9
Turbidity	NTU		1.74		0.66	3.92	2.26		4.38	1.74	4.77	2.91	2.99	2.31	2.01	2.96	1.45	4.77	1.4

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Prepared by: DFSC
Checked by: KMC
Reviewed by MAH

Appendix A-2: Porewater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

SYS_LOC_CODE		DAPZ-02A	DAPZ-02B	GAPIEZ06	GAPIEZ06	GAPIEZ06
SAMPLE_DATE_yyyy-MM-dd		2020-03-03	2020-03-03	2018-08-09	2018-09-13	2018-10-31
FRACTION		T	T	D	T	T
Chemical Name	Unit					
CCR Appendix III						
Boron	mg/L	7.4	13.8	9.6	8.6	8.3
Calcium	mg/L	489	175	210	210	210
Chloride	mg/L	21.9	119	56	58	55
Fluoride	mg/L	0.16	0.72	0.91	1.1 J	0.92
pH	SU	7.33	7.62	7.51	7.43	9.37
Sulfate	mg/L	1760	2420	750	720	740
Total Dissolved Solids	mg/L	2810	3830		1300	1300
CCR Appendix IV						
Antimony	mg/L	0.001 U	0.001 U	0.0014 J	0.002 U	0.002 U
Arsenic	mg/L	0.001 U	0.0018	0.011	0.011	0.012
Barium	mg/L	0.028	0.033	0.03	0.029	0.03
Beryllium	mg/L	0.0002 U	0.0002 U	0.001 U	0.00052 J	0.001 U
Cadmium	mg/L	0.00052	0.0002 U	0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.002 U	0.0038	0.0023 J+	0.002 U	0.002 U
Cobalt	mg/L	0.0022	0.001 U	0.0004 J	0.00029 J	0.001 U
Fluoride	mg/L	0.16	0.72	0.91	1.1 J	0.92
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.008 U	0.016	0.0041 J	0.0038 J	0.0033 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.81	0.063	0.079	0.094	0.11
Selenium	mg/L	0.011	0.001 U	0.001 J	0.005 U	0.005 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Supplemental Parameters						
Alkalinity, Bicarbonate (HCO3)	mg/L				170	
Alkalinity, Carbonate (CO3)	mg/L				5 U	
Alkalinity, Hydroxide (OH)	mg/L				5 U	
Alkalinity, Total	mg/L	99.6	224	170	170	160
Ferric Iron	mg/L			2.8 J	2.7 J	0.19
Ferrous Iron	mg/L			0.1 U	0.1 R	0.088 J
Iron	mg/L	0.61	14.2			
Magnesium	mg/L	48.9	18.4	53	51	45
Manganese	mg/L	0.12	0.7			
Nitrate	mg/L			0.031 J		
Nitrate as N	mg/L	0.75 J+	0.1 U		0.05 U	
Nitrite as N	mg/L				0.05 U	
Nitrogen, Nitrate-Nitrite	mg/L					0.038 J
Phosphorus (as phosphate)	mg/L			0.031 U	0.028 J	0.12 J
Potassium	mg/L	59.1	17.5	3.9 J	4.1	5 U
Sodium	mg/L	286	1050	100	110	99
Field Parameters						
Dissolved Oxygen	mg/L	0.61	0.00	1.33	0.7	0.80
Oxidation-Reduction Potential	mV	66.9	-197.4	-130.8	-118.2	-261
Eh	mV	266.9	2.6	69.2	81.8	-61
pH	SU	7.33	7.62	7.51	7.43	9.37
Specific Conductance	uS/cm	3025	4772	1518	1371	1672
Temperature	deg C	9.4	11.7	15.91	16.1	15.1
Turbidity	NTU	28.9	2.74	3.73	4.29	3.4

Notes:
CCR= coal combustion residual
mg/L = milligrams per liter
mV= millivolts
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"R"= Indicates the result was rejected during data validation.

Prepared by: DFSC
Checked by: KMC
Reviewed by: MAH

APPENDIX B

Groundwater Flow Model Technical Memorandum

TECHNICAL MEMORANDUM

DATE November 12, 2020

TO Danielle Sylvia Cofelice, PE and PJ Nolan, Ph.D.

CC Mark Haney, Joe Gormley, and Rens Verburg

FROM: Ross Bennett, PE(NH) and Brandon Poiencot, PE

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM

R.M. SCHAHFER GENERATING STATION

1.0 GROUNDWATER MODELING

This Memorandum presents Golder's summary of groundwater modeling activities associated with the evaluation of hydrogeologic conditions and potential remedial designs at the R.M. Schahfer Generating Station in Wheatfield, Indiana (the Site).

A steady state groundwater flow model was developed and calibrated. This memorandum includes the following to document development of the groundwater flow model and includes:

1) Objectives;
2) Groundwater Flow Model Development
3) Model selection (numerical);
4) Model Geometry
5) Boundary Conditions
6) Input Parameters
7) Model Calibration and Verification
8) Parameter Sensitivity analysis
9) Design Simulations
10) Summary

The conceptual model (including geology, hydrology, lithology and analytical data) used to support numerical model development is described Section 2.0 of the CCR Assessment of Corrective Measures Report (Golder, 2019).

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1.1 Objectives

The primary objective of the modeling was to simulate the groundwater flow conditions in the area surrounding R.M. Schahfer Generating Station to support evaluation of the remedy design including the feasibility of Monitored Natural Attenuation (MNA) as part of the assessment of corrective measures process for the Coal Combustion Residuals (CCR) surface impoundments for the Site.

The general scope of the groundwater modeling is to:

- Simulate the groundwater flow regimes on Site;
- Predict the travel times and flow paths of unattenuated particles originating at areas impacted by metals contamination;
- Inform remedy design (e.g., groundwater pump and treat design);
- Inform the groundwater monitored natural attenuation study.

2.0 GROUNDWATER FLOW MODEL DEVELOPMENT

2.1 Numerical Implementation

Golder developed the groundwater flow model for the site using the USGS MODFLOW-2005 Modular Three-Dimensional Finite-Difference Groundwater Flow Model (Harbaugh, 2005). The pre- and post-processing software used for the modeling was Groundwater Vistas (Vistas) Version 7.24 (Environmental Simulations Inc.).

Development of a numerical groundwater flow model involved the following steps:

- Definition of the model geometry including lateral and vertical extent, number and thickness of model layers, and grid spacing
- Definition and placement of model boundary conditions
- Selection of input parameters such as hydraulic conductivity (horizontal and vertical) and precipitation recharge

The following sections describe the steps used to develop the model.

2.2 Model Geometry

The finite-difference model grid location is shown on Attachment A**.** The model area (excluding no-flow cells) is approximately 10,800 feet (along x-axis) by 12,300 feet (along y-axis) at the widest points. The southwest corner of the model grid (model coordinates 0, 0) corresponds with Site coordinates 2165530.5N and 2962863.0 W (Indiana State Plane West). The model grid is oriented parallel with cardinal directions. The model grid contains 504 rows and 432 columns. The grid cell size in the XY direction is uniform, at 25 feet by 25 feet across the entire model domain. Based on geologic and hydrogeologic conditions discussed in Section 2.0 of the CCR Assessment of Corrective Measures Report (Golder, 2019), the model utilizes three layers, with the lowermost layer representing the medium to coarse sand and the upper two layers representing the fine sands. Layers 1 and 2 have the same hydraulic properties, but they were divided to focus boundary condition cells in the upper portion of the aquifer using Layer 1. The base of Layer 3 is the top of the shale bedrock surface and ranges from 597 to 624

feet mean sea level (MSL). The surface topography is based on publicly available lidar data and ranges from 646 to 723 feet MSL. A cross section of model geometry along model column 200 is shown on Attachment B.

2.3 Model Boundary Conditions

Boundary conditions in groundwater models consist of physical and hydraulic boundaries within the model area. Physical boundary conditions are well-defined geologic and hydrologic features that influence groundwater flow patterns. The following sections describe the boundary conditions used in the model.

2.3.1 Constant Head Boundaries

Constant head boundaries (CHB) were assigned along an unnamed stream in Layer 1 in the southwestern corner of the model to recreate the approximate constant hydraulic heads where long-term average stream water levels are expected to remain relatively constant. Constant heads were also used within the basins that are surrounded slurry walls to simulate the average surface water elevations in the basins. The modeled CHBs are shown on Attachment C and summarized on Table B-1.

2.3.2 River Boundary Conditions

River boundary conditions are a head-dependent boundary condition, where the model computes the difference in head between the boundary and the model cell where the boundary is defined. River Boundary condition cells were used for the Kankakee River, as shown in Attachment A. River heads were defined by two USGS gauging stations that fell within the model grid, downstream at USGS station 05517530 in Kouts and upstream at USGS 05517500 at Dunns Bridge. The river width was estimated from satellite imagery, the river bottom elevation was assumed to be three feet lower than the stage, and the bed thickness was assumed to be 10 feet. The hydraulic conductivity of the river was set through calibration at 64.5 feet/day which is slightly lower than aquifer hydraulic conductivities discussed in Section 1.1.2.4.1.

2.3.3 Stream Boundary Conditions

Stream boundary conditions are a simplified version of river boundary conditions where surface water flow is monitored by MODFLOW and water is added or removed from the model based on the stream stage. Stream boundary conditions were used in the Model for Davis Ditch and Stalbaum Ditch, as shown in Attachment C. The stream width was estimated from satellite imagery, the stream bottom elevation was assumed to be 0.5 to 2 feet lower than the stage depending on size of the stream, and the bed thickness was assumed to be 5 feet. The hydraulic conductivity of the river was set at 100 feet/day for Davis Ditch where loosing stream conditions were expected, and at 0.5 feet per day in Stalbaum ditch where perched conditions where assumed to exist. Stream stage was set off two gauging stations in Stalbaum, SW-04 and SW-10. Elsewhere stream stage was estimated from surface elevations and then refined through model calibration.

2.3.4 Drain Boundary Conditions

Drain boundary conditions are a version of river/stream boundary conditions that can only remove water from the model. Drain boundary conditions were used in the Model for intermittent streams and drainage ditches, as shown in Attachment C. The drain width was estimated from satellite imagery, the drain bottom elevation was assumed to be 1 to 2 feet lower than the stage depending on size of the drain, and the bed thickness was assumed to be 1 foot. The hydraulic conductivity of the drains was set at 100 feet/day. Drain stage was estimated from surface elevations and then refined through model calibration.

2.3.5 No Flow Boundaries

No flow boundaries were assigned to the northeast side of the Kankakee River, as shown in Attachment C.

2.3.6 Horizontal Flow Barriers

A hydraulic flow barrier (HFB) or wall is a condition that limits flow between adjacent cells based on an assigned thickness and hydrologic conductivity. To model the slurry walls that are present around ponds, Golder used the HFB boundary condition with an assigned thickness of 1 foot and a horizontal hydraulic conductivity (K) value of 0.0000001 to model slurry walls that surround the basins. The location of HFB boundaries are presented in Attachment C

2.4 Model Input Parameters

The following paragraphs describe the input parameter data used for the model. Golder simulated steady state conditions in the model. Transient dependent parameters such as porosity and storage/storativity were not included in the model calibration process.

2.4.1 Hydraulic Conductivity

Golder based hydraulic conductivity values for the Site model on pumping test analysis results as discussed in Section 6.0 of the AT-01 Aquifer Test Report (Golder, 2020) and summarized in Table B-2. Golder used these results to assign initial hydraulic conductivity values to the groundwater flow model, and to check that the hydraulic conductivity values resulting from model calibration were within the range of values observed. Golder assigned a uniform Kx/Ky hydraulic conductivity value of 215 feet/day and a Kz of 21.5 feet/day across the entire model area for Layers 1 and 2. Layer 3 had a slightly lower hydraulic conductivity of 200 feet/day and a Kz of 20.0 feet/day across the entire model area. These hydraulic conductivities are based on a best fit from model calibration, and are within range of measured conductivities.

2.4.2 Precipitation Recharge

Precipitation recharge is the amount of precipitation that recharges the aquifer, which is generally the precipitation rate minus losses due to runoff and evapotranspiration. Recharge rates calculated for the area were presented in Letsinger (2015) and used in the model. After model calibration a best fit recharge value of 7.1 inches per year (0.00162 feet/day) was established, which was similar to the published rates. A recharge rate of 0.04 inches/year (0.00001 ft/day) was used for the capped landfill areas. Precipitation recharge rates are shown in Attachment D.

2.4.3 Groundwater Extraction and Recharge Wells

Groundwater extraction or recharge wells are present on and adjacent to the Site and were modeled in all versions of the model, as shown in Attachment D. The well field located on the northeast corner of the model contains eight wells that remove a total of 55,343 cubic feet/day. In the central portion of the Site the 5 cooling tower wells and two Miox wells remove a total of 7,701 cubic feet/day, and just west of the Site on well on the adjacent property removes 9,625 cubic feet/day.

3.0 MODEL CALIBRATION AND VERIFICATION

Model calibration consists of successive refinement of the model property assignments and input data from initial assumptions/estimates to improve the fit between observed and model-predicted results. A solution of a groundwater flow model problem requires information including aquifer parameters such as hydraulic conductivity, spatial boundary conditions, and the location and magnitude of applied stresses, such as recharge and drainage.

A solution is attained only when the proper combination of the above parameters and inputs are selected such that the physical problem is accurately represented by the model. The calibrated model described below should be considered a limited hydrologic effort founded on the available information within the context of necessary simplifying assumptions.

The purpose of the calibration effort was to simulate "steady-state" groundwater flow conditions that approximate the general flow patterns inferred from September 2019 groundwater level measurements. The model was calibrated through trial-and-error adjustment of model parameter values and through use of Model-Independent PEST, developed by Watermark Computing, to refine aquifer parameters. PEST allows model input parameters to be adjusted automatically over a given range until the model predicted head matches the observed head with the lowest possible numerical difference, referred to as the calibration residual (Doherty, 2016). Golder set the allowable range of parameter adjustment in PEST to represent realistic values as determined by previously published literature for the region and aquifer tests at the Site.

At each well location, the head residuals were calculated in Groundwater Vistas as the difference between the measured and simulated head values. Positive residual values indicate simulated head values were lower than measured elevations, while negative residual values indicate simulated head values were higher than measured elevations.

As a measure of the accuracy of the model, Groundwater Vistas calculates summary statistics using calculated residuals, which are used as measures of error in the calibrated model. The residual mean (RM) is the arithmetic mean of all calculated residual values. The absolute residual mean (ARM) is the arithmetic mean of the absolute value of the residuals (i.e., all negative residuals are considered positive). The root mean square error (RMSE) is the square root of the mean of the squared value of target residuals. Other statistics such as the residual standard deviation (RSD) (i.e., the square root of the variance [the average of the squared deviations from the mean]), and the sum of squared residuals (SSR) (computed by squaring each residual and adding them together) can also be useful in evaluation of the calibration process. While calibrating the model, Golder selected parameters estimated by PEST that were within a valid range from published literature or Site-specific data that resulted in improved calibration summary statistics.

3.1 Simulated Heads Calibrated to September 2019 Conditions

Measured groundwater elevations for 112 monitoring points from September 2019 were used for calibration, as presented in Table B-3. The model files for September 2019 calibration simulation use the root file name *V12_2019.* The simulated heads and residuals for targets screened in Layer 1 are presented in Attachment F. Based on the simulated contours of groundwater elevation, groundwater flows from the south/southwest toward the Site before it travels to the Kankakee River in the north/northeast.

A comparison of model-predicted versus observed September 2019 potentiometric heads for the 112 selected calibration points resulted in a RM of -0.36 feet and a RMSE of 0.72 feet. The calibration statistics for the model are presented in Table B-4. The RM of -0.36 feet, represents 4.9 percent of the total measured head difference for the model area (approximately 7.41 feet). The absolute residual mean for the model run is 0.57 feet, which is 7.7 percent of the total hydraulic head difference for the entire modeling area. The residual mean and the absolute residual mean are within the generally accepted standard of 10 percent of the total hydraulic head difference for the modeling area.

3.1.1 Water Balance

An effective measure of model calibration is the analysis of the water budget calculated by MODFLOW. The model provides flows across boundaries, flows to and from all sources and sinks, and flows generated by storage. Inflows into the model include:

- Constant head boundaries: 16,716 ft^3/d,
- Rivers: 165,339 ft^3/d,
- Streams: 182,984 ft^3/d and
- Recharge: 545,949 ft^3/d.

Outflows in the model include

- Constant head boundaries: 5,640 ft^3/d,
- Wells: 70,469 ft^3/d,
- Rivers: 474,633 ft^3/d,
- Streams: 400,512 ft^3/d, and
- Drains: 45,574 ft^3/d.

The outflow deficit is 85,842 cubic feet per day (ft^3/d), which is equivalent to error between outflow and inflow estimates of approximately 8.9 percent.

3.1.2 Numerical Model Verification

Model verification was performed using a second water level calibration data set from October 2018. The model input parameter values defined in the September 2019 simulation were maintained. The verification data is presented in Table B-5. The model files for the October 2018 conditions use the root file name *V12.1_2019*. The verification results indicate a RM of 0.33 feet, which represents 4.1 percent of the total hydraulic head difference for the model area. The absolute residual mean for this simulation was 0.52 feet, which is 6.5 percent of the total hydraulic head difference for the entire model area. The verification statistics suggests that the model is calibrated and verified.

4.0 DESIGN SIMULATIONS

Using the calibrated model, Golder used MODPATH (Pollack, 1989) to simulate travel times for particles released from the metals cleaning basin. Particles were started in Layer 3 of the model to simulate the release of contaminants in the deeper part of the aquifer where Boron concentrations exceeded 10 micrograms/liter. Effective porosity of the aquifer was varied between 0.16, 0.3, and 0.46 to represent values within the expected range for medium to fine sand. The length of the particle traces produced by MODPATH along with travel time estimates were used to calculate average groundwater velocities. These travel time calculations are presented in Table B-6.

5.0 GROUNDWATER MODELING SUMMARY

Through standard numerical groundwater modeling procedures, Golder developed a steady state groundwater flow model for the Site that is considered calibrated and verified. This model was utilized to inform the groundwater monitored natural attenuation study by simulating travel times for particles released from the metals cleaning basin.

6.0 REFERENCES

Doherty, 2016. PEST, Model-Independent Parameter Estimation. User Manual 6th Edition.

Golder, 2019, CCR Assessment of Corrective Measures Northern Indiana Public Service Company Rollin M Schahfer Generating Station Wheatfield, Indiana. April 2019.

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Letsinger, S. L., 2015, Map of Indiana showing near-surface aquifer recharge: Indiana Geological Survey Miscellaneous Map 92, scale 1:500,000.

Pollock, D.W., 1989 Documentation of computer programs to compute and display pathlines using results from the U.S. Geological Survey modular three-dimensional finite-difference groundwater flow model. U.S. Geological Survey, Open File Report 89-381.

List of Attachments:

Attachment A Model Grid

Attachment B Cross Section of Model Grid

Attachment C Boundary Conditions

Attachment D Precipitation Recharge Zones

Attachment E Active Pumping Wells

Attachment F Model Calibration – September 2019

List of Tables

Table B-1 Boundary Conditions

Table B-2 Site Pumping Test Results

Table B-3 Measured Groundwater Elevations - September 2019

Table B-4 Calibration Residuals and Summary Statistics - September 2019

Table B-5 Verification Residuals and Summary Statistics – October 2018

Table B-6 Travel Time Simulations

Table B-1: Boundary Conditions
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Constant Head Boundaries

Name	Layer	Reach	Starting Head (ft)	Ending Head (ft)
Intake Settling Basin	1	104	675.0	675.0
Final Settling Basin	1	101	675.0	675.0
Drying Area	1	100	672.0	672.0
Unnamed SW. Stream	1	1	663.17	661.20

Rivers

Name	Layer	Starting Stage (ft)	Starting Bed Elevation (ft)	Ending Stage (ft)	Ending Bed Elevation (ft)	Starting Width (ft)	Ending Width (ft)	Length (ft)	Thickness of Bed (ft)	Hydraulic Conductivity (ft/d)
Kakakanee River	1	651.82	649.10	646.72	644.01	135.28	159.88	24.0	10.0	64.41

Streams

Name	Layer	Starting Stage (ft)	Starting Bed Elevation (ft)	Ending Stage (ft)	Ending Bed Elevation (ft)	Starting Width (ft)	Ending Width (ft)	Length (ft)	Thickness of Bed (ft)	Hydraulic Conductivity (ft/d)	Slope of Channel (ft/ft)
Davis Ditch	1	661.99	659.99	650.29	646.31	20.05	74.80	50	10.0	63.41	0.001
Stalbaum Ditch	1	660.74	659.74	654.5	652.0	10.07	50	28	1.0	50	0.001
Fisher Ditch	1	661.49	659.49	660.88	658.88	30.04	32.08	51	5.0	100	0.001
Stalbaum South Ancillary Ditch	1	661.50	660.0	659.21	657.76	2.06	29.93	31	1.0	10	0.001
Stalbaum East Ancillary Ditch	1	661.0	655.36	657.17	655.21	18.80	30.36	13	5.0	0.1	0.001
Coal Yard Ditch	1	660.7	659.00	660.7	659	5.0	5.0	50	1.0	50	0.001

Drains

Name	Layer	Starting Stage (ft)	Ending Stage (ft)	Starting Width (ft)	Ending Width (ft)	Length (ft)	Thickness of Bed (ft)	Hydraulic Conductivity (ft/d)
Sands Ditch	1	662.0	654.1	1.0	5	38	1	50
W. Sands Drain	1	660.0	655.6	2	2	27	1	50
Hilliard St Ditch	1	659	659	2	2	24	1	10
N. LF Drain	1	661	661	8.8	8.8	50.0	1.0	62.0
S. LF Drain	1	661	661	8.8	8.8	50.0	1.0	62.0
W. LF Drain	1	661	661	5	5	50	2	100

Hydraulic Flow Barriers (Slurry Walls)

Name	First Layer	Last Layer	Thickness (ft)	Hydraulic Conductivity (ft/d)
Intake Settling Basin Slurry Wall	1	3	1	1.00E-07
Final Settling Basin Slurry Wall	1	3	1	1.00E-07
Drying Area Slurry Wall	1	3	1	1.00E-06

Table B-2: Site Pumping Test Results
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Pumping Test Results		Estimated Hydraulic Conductivity (ft/d)
SHALLOW WELLS	*Minimum:*	192
	Maximum:	363
	Arithmetic Mean:	266
DEEP WELLS	*Minimum:*	234
	Maximum:	320
	Arithmetic Mean:	268

Table B-3: Measured Groundwater Elevations - September 2019
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Well ID	Layer	Groundwater Elevation (ft msl)
GAMW01	1	658.89
GAMW01B	3	658.72
GAMW03	1	659.84
GAMW03B	3	659.26
GAMW07	1	660.74
GAMW07B	3	660.79
GAMW08	1	658.87
GAMW08B	3	658.98
GAMW09	1	659.27
GAMW09B	3	658.87
GAMW12	1	658.64
GAMW12B	3	658.66
GAMW13	1	658.35
GAMW13B	3	658.37
GAMW14	1	658.14
GAMW14B	3	658.12
GAMW15	1	660.35
GAMW15B	3	660.33
GAMW16	1	659.31
GAMW16B	3	659.46
GAMW17B	3	658.92
GAMW18	1	658.92
GAMW18B	3	659.17
GAMW20	1	658.21
GAMW24	1	658.66
GAMW24B	2	658.73
GAMW25	1	658.41
GAMW25B	2	658.41
GAMW26	1	658.33
GAMW26B	3	658.26
GAMW27	1	658.29
GAMW27B	3	658.32
GAMW29	1	657.48
GAMW29B	3	657.48
GAMW30	1	657.42
GAMW30B	3	657.51
GAMW31	1	657.24
GAMW31B	2	657.25
GAMW32	1	657.19
GAMW32B	3	657.15
GAMW33	1	657.04
GAMW33B	3	657.13
GAMW34	1	657.58

Table B-3: Measured Groundwater Elevations - September 2019
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Well ID	Layer	Groundwater Elevation (ft msl)
GAMW34B	3	657.59
GAMW35B	2	658.16
GAMW36	1	656.67
GAMW36B	3	656.69
GAMW37B	2	657.26
GAMW38	1	657.91
GAMW38B	3	657.91
GAMW39	2	657.88
GAMW39B	3	657.84
GAMW40	1	657.66
GAMW40B	3	657.65
GAMW42	1	658.12
GAMW42B	3	658.13
GAMW43	1	657.83
GAMW43B	3	657.83
GAMW44	1	657.71
GAMW44B	3	657.69
GAMW45B	3	654.52
GAMW46	1	655.22
GAMW46B	3	655.21
GAMW48	1	654.5
GAMW48B	3	654.51
GAMW49	1	656.26
GAMW49B	3	656.34
GAMW50	1	656.37
GAMW50B	3	656.35
GAMW51	1	658.07
GAMW51B	3	658.19
GAMW52	1	657.81
GAMW52B	3	657.82
GAMW53	1	658.04
GAMW53B	3	658.21
GAMW54	1	657.87
GAMW54B	3	657.82
GAMW55B	3	657.78
GAMW56	1	657.81
GAMW56B	3	657.77
GAMW02	1	660.14
GAMW05	1	658.17
GAMW06	1	659.65
GAMW10	1	657.63
GAMW11	1	657.37
GAMW20B	3	658.25

Table B-3: Measured Groundwater Elevations - September 2019
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Well ID	Layer	Groundwater Elevation (ft msl)
MW-1D	3	659.11
MW-1S	2	659.09
MW-2S	2	657.7
MW-3D	3	656.68
MW-4S	2	657.08
MW-5D	3	658.17
MW-5S	2	658.14
MW-6D	3	654.1
MW-6S	2	654.07
MW-7D	3	656.12
MW-7S	2	656.1
MW-8S	3	654.65
MW-9D	3	655.18
MW-9S	3	655.14
MW-10D	3	658.66
MW-10S	1	658.61
MW-11D	3	656.75
MW-11S	2	656.73
MW-12D	3	656.97
MW-12S	2	656.95
MW-13D	3	657.2
MW-13S	2	657.17
MW-14D	2	656.51
MW-14S	2	656.54
SW-4	1	661.48
SW-10	1	660

Table B-4: Calibration Residuals and Summary Statistics - September 2019
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Name	Observed Groundwater Elevation (ft msl)	Computed Groundwater Elevation (ft msl)	Residual (ft)
Layer 1			
GAMW01	658.89	658.87	0.02
GAMW03	659.84	660.22	-0.38
GAMW07	660.74	662.14	-1.40
GAMW08	658.87	658.87	0.00
GAMW09	659.27	659.05	0.22
GAMW12	658.64	658.58	0.06
GAMW13	658.35	658.50	-0.15
GAMW14	658.14	658.57	-0.43
GAMW15	660.35	662.08	-1.73
GAMW16	659.31	659.11	0.20
GAMW18	658.92	659.30	-0.38
GAMW20	658.21	658.72	-0.51
GAMW24	658.66	659.16	-0.50
GAMW25	658.41	658.67	-0.26
GAMW26	658.33	658.34	-0.01
GAMW27	658.29	658.09	0.20
GAMW29	657.48	658.19	-0.71
GAMW30	657.42	658.20	-0.78
GAMW31	657.24	658.12	-0.88
GAMW32	657.19	657.99	-0.80
GAMW33	657.04	657.92	-0.88
GAMW34	657.58	658.44	-0.86
GAMW36	656.67	657.59	-0.92
GAMW38	657.91	658.24	-0.33
GAMW40	657.66	658.27	-0.61
GAMW42	658.12	658.62	-0.50
GAMW43	657.83	658.54	-0.71
GAMW44	657.71	658.56	-0.85
GAMW46	655.22	654.39	0.83
GAMW48	654.5	654.25	0.25
GAMW49	656.26	656.37	-0.11
GAMW50	656.37	656.86	-0.49
GAMW51	658.07	658.84	-0.77
GAMW52	657.81	657.89	-0.08
GAMW53	658.04	658.21	-0.17
GAMW54	657.87	658.36	-0.49
GAMW56	657.81	658.51	-0.70
GAMW02	660.14	659.81	0.33
GAMW05	658.17	658.77	-0.60
GAMW06	659.65	660.42	-0.77

Table B-4: Calibration Residuals and Summary Statistics - September 2019
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Name	Observed Groundwater Elevation (ft msl)	Computed Groundwater Elevation (ft msl)	Residual (ft)
GAMW10	657.63	658.34	-0.71
GAMW11	657.37	658.19	-0.82
MW-10S	658.61	659.16	-0.55
SW-4	661.48	657.77	3.71
SW-10	660	659.21	0.79
Layer 2			
GAMW24B	658.73	659.16	-0.43
GAMW25B	658.41	658.67	-0.26
GAMW31B	657.25	658.12	-0.87
GAMW35B	658.16	659.00	-0.84
GAMW37B	657.26	658.24	-0.98
GAMW39	657.88	658.29	-0.41
MW-1S	659.09	659.72	-0.63
MW-2S	657.7	658.54	-0.84
MW-4S	657.08	657.79	-0.71
MW-5S	658.14	658.13	0.01
MW-6S	654.07	654.60	-0.53
MW-7S	656.1	656.26	-0.16
MW-11S	656.73	657.28	-0.55
MW-12S	656.95	657.48	-0.53
MW-13S	657.17	657.95	-0.78
MW-14S	656.54	657.27	-0.73
Layer 3			
GAMW01B	658.72	658.87	-0.15
GAMW03B	659.26	660.22	-0.96
GAMW07B	660.79	660.99	-0.20
GAMW08B	658.98	658.87	0.11
GAMW09B	658.87	659.05	-0.18
GAMW12B	658.66	658.58	0.08
GAMW13B	658.37	658.50	-0.13
GAMW14B	658.12	658.57	-0.45
GAMW15B	660.33	662.22	-1.89
GAMW16B	659.46	659.11	0.35
GAMW17B	658.92	659.55	-0.63
GAMW18B	659.17	659.30	-0.13
GAMW26B	658.26	658.34	-0.08
GAMW27B	658.32	658.13	0.19
GAMW29B	657.48	658.19	-0.71
GAMW30B	657.51	658.20	-0.69
GAMW32B	657.15	657.98	-0.83
GAMW33B	657.13	657.92	-0.79

Table B-4: Calibration Residuals and Summary Statistics - September 2019
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Name	Observed Groundwater Elevation (ft msl)	Computed Groundwater Elevation (ft msl)	Residual (ft)
GAMW34B	657.59	658.44	-0.85
GAMW36B	656.69	657.59	-0.90
GAMW38B	657.91	658.24	-0.33
GAMW39B	657.84	658.29	-0.45
GAMW40B	657.65	658.27	-0.62
GAMW42B	658.13	658.62	-0.49
GAMW43B	657.83	658.54	-0.71
GAMW44B	657.69	658.56	-0.87
GAMW45B	654.52	653.66	0.86
GAMW46B	655.21	654.39	0.82
GAMW48B	654.51	654.24	0.27
GAMW49B	656.34	656.36	-0.02
GAMW50B	656.35	656.86	-0.51
GAMW51B	658.19	658.84	-0.65
GAMW52B	657.82	657.88	-0.06
GAMW53B	658.21	658.21	0.00
GAMW54B	657.82	658.36	-0.54
GAMW55B	657.78	658.47	-0.69
GAMW56B	657.77	658.51	-0.74
GAMW20B	658.25	658.72	-0.47
MW-1D	659.11	659.72	-0.61
MW-3D	656.68	657.50	-0.82
MW-5D	658.17	658.13	0.04
MW-6D	654.1	654.61	-0.51
MW-7D	656.12	656.26	-0.14
MW-8S	654.65	654.32	0.33
MW-9D	655.18	654.27	0.91
MW-9S	655.14	654.28	0.86
MW-10D	658.66	659.16	-0.50
MW-11D	656.75	657.27	-0.52
MW-12D	656.97	657.48	-0.51
MW-13D	657.2	657.95	-0.75
MW-14D	656.51	657.27	-0.76

Calibration Parameter	Value
Residual Mean (ft)	-0.36
Redsidual Standard Deviation (ft)	0.63
Absolute Residual Mean (ft)	0.57
Residual Sum of Squares	59
RMS Error	0.72
Minimum Residual (ft)	-1.89
Maximum Residual (ft)	3.71

Table B-4: Calibration Residuals and Summary Statistics - September 2019
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Name	Observed Groundwater Elevation (ft msl)	Computed Groundwater Elevation (ft msl)	Residual (ft)
Range of Observations (ft)			7.41
Scaled Residual Standard Deviation			0.085
Scaled Absolute Mean			0.076
Scaled RMS (%)			9.8
Number of Observations			112

Table B-5: Verification Residuals and Summary Statistics – October 2018
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Name	Observed Groundwater Elevation (ft msl)	Computed Groundwater Elevation (ft msl)	Residual (ft)
Layer 1			
GAMW01	659.19	658.87	0.32
GAMW03	660.82	660.22	0.60
GAMW07	659.27	660.62	-1.35
GAMW08	659.06	658.87	0.19
GAMW09	660.34	659.05	1.29
GAMW12	658.84	658.58	0.26
GAMW13	658.72	658.50	0.22
GAMW14	659.55	658.57	0.98
GAMW15	659.10	660.00	-0.90
GAMW16	659.07	659.11	-0.04
GAMW18	659.57	659.30	0.27
GAMW20	659.81	658.72	1.09
GAMW24	659.90	659.16	0.74
GAMW25	659.67	658.67	1.00
GAMW26	659.73	658.34	1.39
GAMW27	659.67	658.09	1.58
GAMW29	658.28	658.19	0.09
GAMW30	658.62	658.20	0.42
GAMW31	658.13	658.12	0.01
GAMW32	657.99	657.99	0.00
GAMW33	657.84	657.92	-0.08
GAMW34	658.47	658.44	0.03
GAMW36	657.71	657.59	0.12
GAMW38	659.19	658.24	0.95
GAMW40	658.76	658.27	0.49
GAMW42	658.40	658.62	-0.22
GAMW43	658.16	658.54	-0.38
GAMW44	657.95	658.56	-0.61
GAMW46	655.25	654.39	0.86
GAMW48	654.68	654.25	0.43
GAMW49	656.86	656.37	0.49
GAMW50	657.22	656.86	0.36
GAMW51	658.42	658.84	-0.42
GAMW52	657.99	657.89	0.10
GAMW53	658.14	658.21	-0.07
GAMW54	658.47	658.36	0.11
GAMW56	658.86	658.51	0.35
GAMW02	660.52	659.81	0.71
GAMW05	658.53	658.77	-0.24
GAMW06	658.63	660.42	-1.79

Table B-5: Verification Residuals and Summary Statistics – October 2018
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Name	Observed Groundwater Elevation (ft msl)	Computed Groundwater Elevation (ft msl)	Residual (ft)
GAMW10	658.61	658.34	0.27
GAMW11	657.97	658.19	-0.22
MW-10S	659.83	659.16	0.67
SW-4	662.48	657.77	4.71
SW-10	660.45	659.21	1.24
Layer 2			
GAMW24B	659.95	659.16	0.79
GAMW25B	659.69	658.67	1.02
GAMW31B	658.14	658.12	0.02
GAMW35B	659.16	659.00	0.16
GAMW37B	658.42	658.24	0.18
GAMW39	659.08	658.29	0.79
MW-1S	659.76	659.72	0.04
MW-2S	658.58	658.54	0.04
MW-4S	657.62	657.79	-0.17
MW-5S	659.47	658.13	1.34
MW-6S	654.83	654.60	0.23
MW-7S	656.72	656.26	0.46
MW-11S	657.55	657.28	0.27
MW-12S	657.68	657.48	0.20
MW-13S	657.97	657.95	0.02
MW-14S	657.49	657.27	0.22
Layer 3			
GAMW01B	659.23	658.87	0.36
GAMW03B	660.31	660.22	0.09
GAMW07B	659.29	660.56	-1.27
GAMW08B	659.12	658.87	0.25
GAMW09B	659.94	659.05	0.89
GAMW12B	657.90	658.58	-0.68
GAMW13B	658.70	658.50	0.20
GAMW14B	658.50	658.57	-0.07
GAMW15B	659.13	660.03	-0.90
GAMW16B	659.14	659.11	0.03
GAMW17B	659.18	658.84	0.34
GAMW18B	660.15	659.30	0.85
GAMW26B	659.66	658.34	1.32
GAMW27B	659.70	658.13	1.57
GAMW29B	658.43	658.19	0.24
GAMW30B	658.71	658.20	0.51
GAMW32B	657.95	657.98	-0.03
GAMW33B	657.89	657.92	-0.03

Table B-5: Verification Residuals and Summary Statistics – October 2018
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Name	Observed Groundwater Elevation (ft msl)	Computed Groundwater Elevation (ft msl)	Residual (ft)
GAMW34B	658.46	658.44	0.02
GAMW36B	657.72	657.59	0.13
GAMW38B	659.21	658.24	0.97
GAMW39B	659.04	658.29	0.75
GAMW40B	658.68	658.27	0.41
GAMW42B	658.41	658.62	-0.21
GAMW43B	658.10	658.54	-0.44
GAMW44B	657.91	658.56	-0.65
GAMW45B	654.52	653.66	0.86
GAMW46B	655.24	654.39	0.85
GAMW48B	654.67	654.24	0.43
GAMW49B	656.94	656.36	0.58
GAMW50B	657.25	656.86	0.39
GAMW51B	658.58	658.84	-0.26
GAMW52B	658.00	657.88	0.12
GAMW53B	658.24	658.21	0.03
GAMW54B	658.42	658.36	0.06
GAMW55B	658.68	658.47	0.21
GAMW56B	658.87	658.51	0.36
GAMW20B	659.85	658.72	1.13
MW-1D	659.76	659.72	0.04
MW-3D	657.50	657.50	0.00
MW-5D	659.47	658.13	1.34
MW-6D	654.86	654.61	0.25
MW-7D	656.70	656.26	0.44
MW-8S	654.80	654.32	0.48
MW-9D	655.15	654.27	0.88
MW-9S	655.14	654.28	0.86
MW-10D	659.83	659.16	0.67
MW-11D	657.52	657.27	0.25
MW-12D	657.64	657.48	0.16
MW-13D	657.96	657.95	0.01
MW-14D	657.46	657.27	0.19

Calibration Parameter	Value
Residual Mean (ft)	0.33
Redsidual Standard Deviation (ft)	0.71
Absolute Residual Mean (ft)	0.52
Residual Sum of Squares	69
RMS Error	0.78
Minimum Residual (ft)	-1.79
Maximum Residual (ft)	4.71

Table B-5: Verification Residuals and Summary Statistics – October 2018
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Name	Observed Groundwater Elevation (ft msl)	Computed Groundwater Elevation (ft msl)	Residual (ft)
Range of Observations (ft)			7.96
Scaled Residual Standard Deviation			0.09
Scaled Absolute Mean			0.066
Scaled RMS (%)			9.9
Number of Observations			112

Table B-6: Travel Time Simulations
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

	Shallow Flow Paths				Deep Flow Paths			
Starting Well	**GAMW-16**	**GAMW-18**	**GAMW-17B**	**GAMW-09B**	**GAMW-16B**	**GAMW-18B**	**GAMW-17B**	**GAMW-09B**
Ending Well	**GAMW-53**	**GAMW-55**	**GAMW-54B**	**GAMW-54B**	**GAMW-53B**	**GAMW-55B**	**GAMW-54B**	**GAMW-54B**
Distance (ft)	**1521**	**1964**	**1200**	**1714**	**1521**	**1964**	**1200**	**1714**
Effective Porosity = 16%								
Travel Time (years)	4.8	11.0	4.5	8.9	5.0	11.0	5.5	9.0
Velocity (ft/year)	317	179	267	193	304	179	218	190
Time to Davis Ditch (years)	5.5	-	-	-	6	-	-	-
Time to property boundry near GAMW46B (years)	-	27	49	41	-	28.5	45	41
Effective Porosity = 30%								
Travel Time (years)	8.5	19.8	8.0	16.0	8.9	20.0	10.0	16.5
Velocity (ft/year)	179	99	150	107	171	98	120	104
Time to Davis Ditch (years)	10	-	-	-	9.9	-	-	-
Time to property boundry near GAMW46B (years)	-	49.8	79	75	-	51.5	80	76
Effective Porosity = 46%								
Travel Time (years)	13.0	31.0	12.0	25.0	13.5	29.0	15.0	25.0
Velocity (ft/year)	117	63	100	69	113	68	80	69
Time to Davis Ditch (years)	15	-	-	-	15	-	-	-
Time to property boundry near GAMW46B (years)	-	76.8	122	117	-	77	130	120

Notes:
ft = feet



LEGEND

NOTE(S)
1. BASED ON MODEL V12_2019.

REFERENCE(S)
1. COORDINATE SYSTEM: WGS 1984 WEB MERCATOR AUXILIARY SPHERE

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRB, MCWB, AND DRYING AREA
NIPSCO LLC R. M. SCHAHFER GENERATING STATION

TITLE

MODEL GRID

CONSULTANT

GOLDER

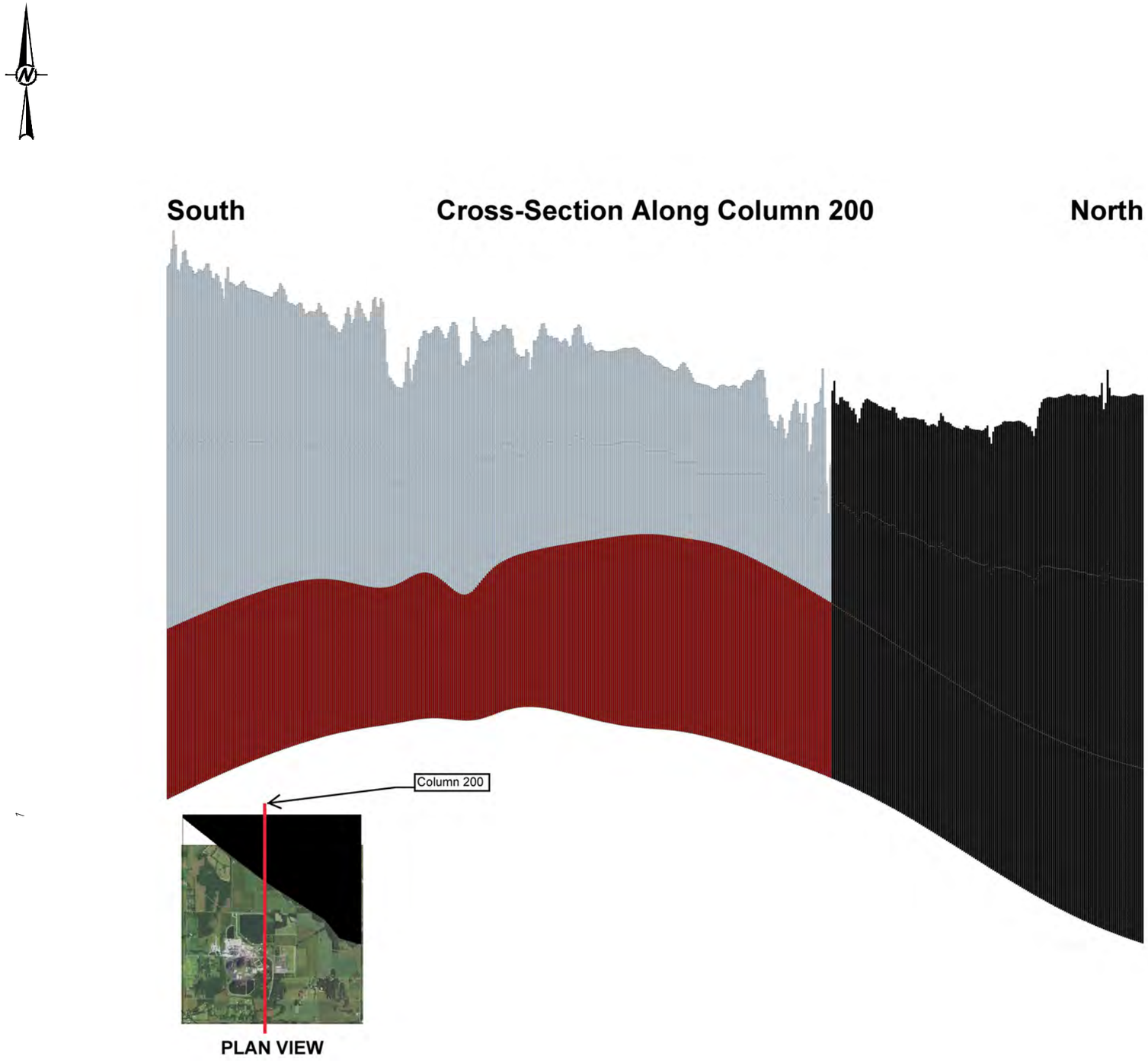
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REVIEWED	BP
APPROVED	RWB

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LEGEND

NOTE(S)
1. BASED ON MODEL V12_2019.

REFERENCE(S)
1. COORDINATE SYSTEM: WGS 1984 WEB MERCATOR AUXILIARY SPHERE

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRB, MCWB, AND DRYING AREA
NIPSCO LLC R. M. SCHAHFER GENERATING STATION

TITLE

CROSS SECTION OF MODEL GRID

CONSULTANT

GOLDER

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APPROVED	RWB

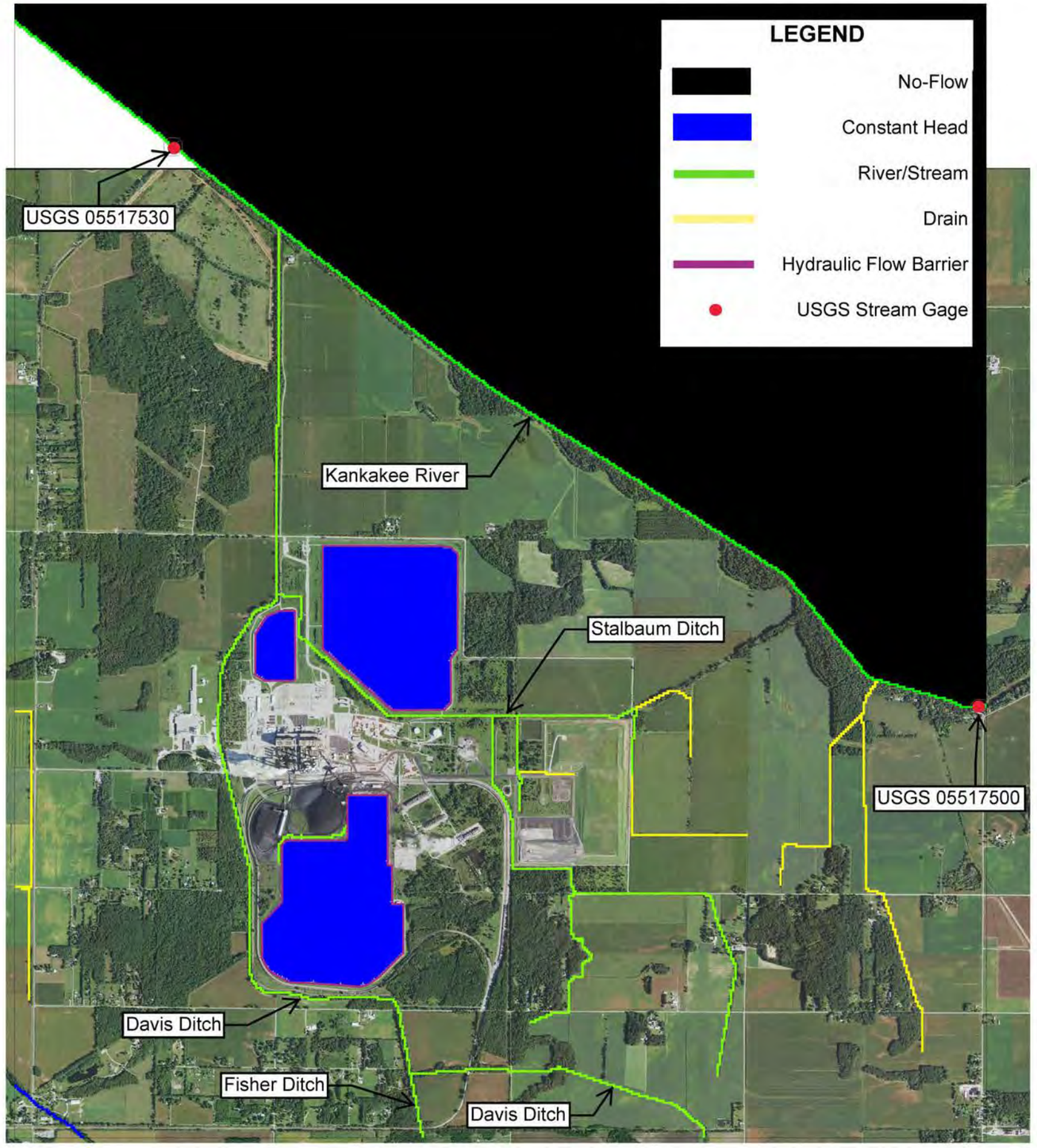
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NOTE(S)
1. BASED ON MODEL V12_2019.

REFERENCE(S)
1. COORDINATE SYSTEM: WGS 1984 WEB MERCATOR AUXILIARY SPHERE

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRB, MCWB, AND DRYING AREA
NIPSCO LLC R. M. SCHAHFER GENERATING STATION

TITLE

BOUNDARY CONDITIONS

CONSULTANT

GOLDER

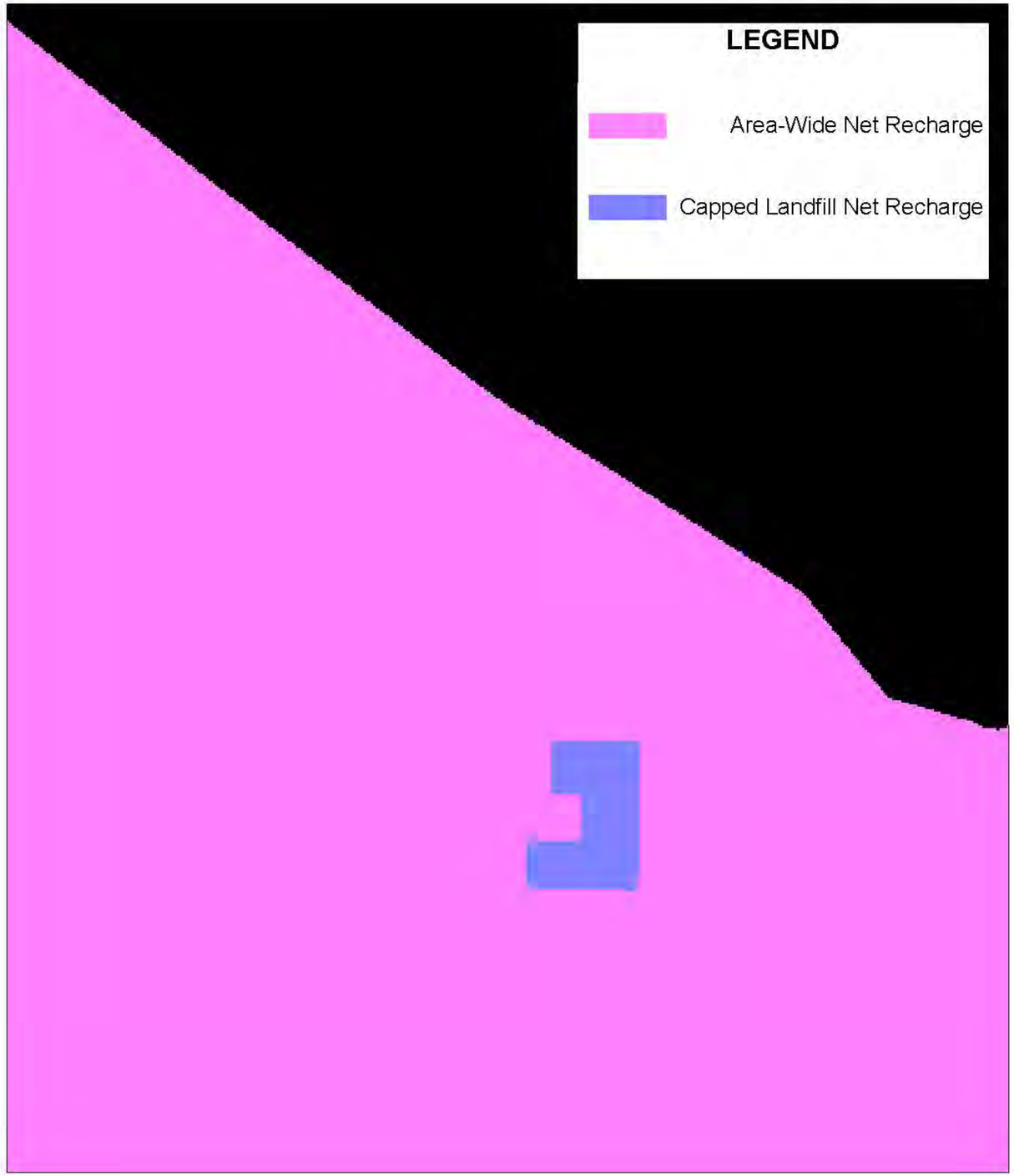
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APPROVED	RWB

PROJECT NO.	CONTROL	REV.	ATTACHMENT
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NOTE(S)
1. BASED ON MODEL V12_2019.

REFERENCE(S)
1. COORDINATE SYSTEM: WGS 1984 WEB MERCATOR AUXILIARY SPHERE

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT
GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRB, MCWB, AND DRYING AREA
NIPSCO LLC R. M. SCHAHFER GENERATING STATION

TITLE

PRECIPITATION RECHARGE ZONES

CONSULTANT

GOLDER

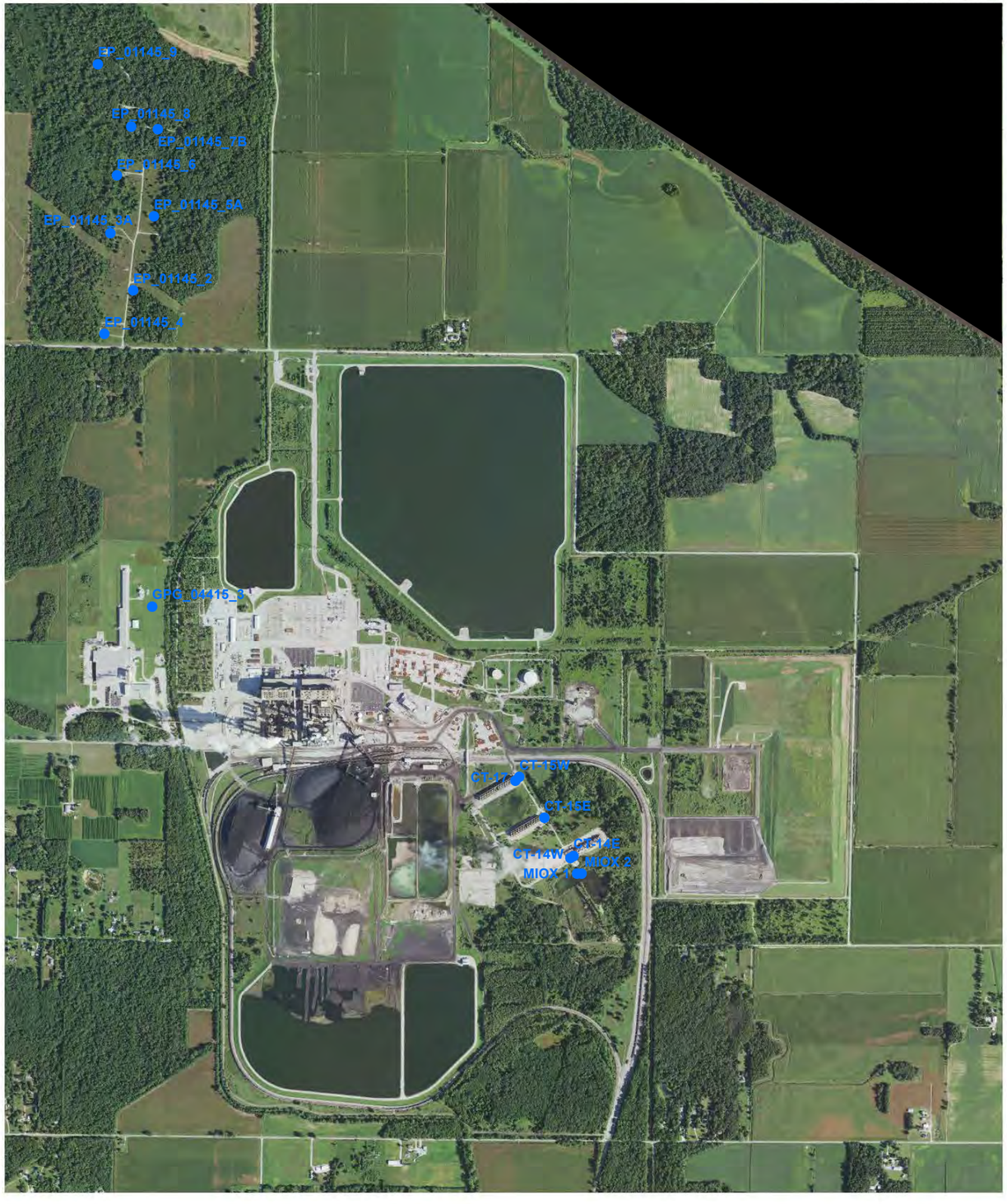
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APPROVED	RWB

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LEGEND

- Well Location

0 840 1,680

Feet

1 " = 1,667 feet

NOTE(S)

1. BASED ON MODEL V12_2019.

REFERENCE(S)

1. COORDINATE SYSTEM: NAD 1983 STATEPLANE INDIANA WEST FIPS 1302 FEET
2. 2016 NAIP IMAGERY SOURCED FROM AGOL ONLINE FEATURE SERVICE LAYER.

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRB, MCWB, AND DRYING AREA
NIPSCO LLC R. M. SCHAHFER GENERATING STATION

TITLE

ACTIVE PUMPING WELLS

CONSULTANT

GOLDER

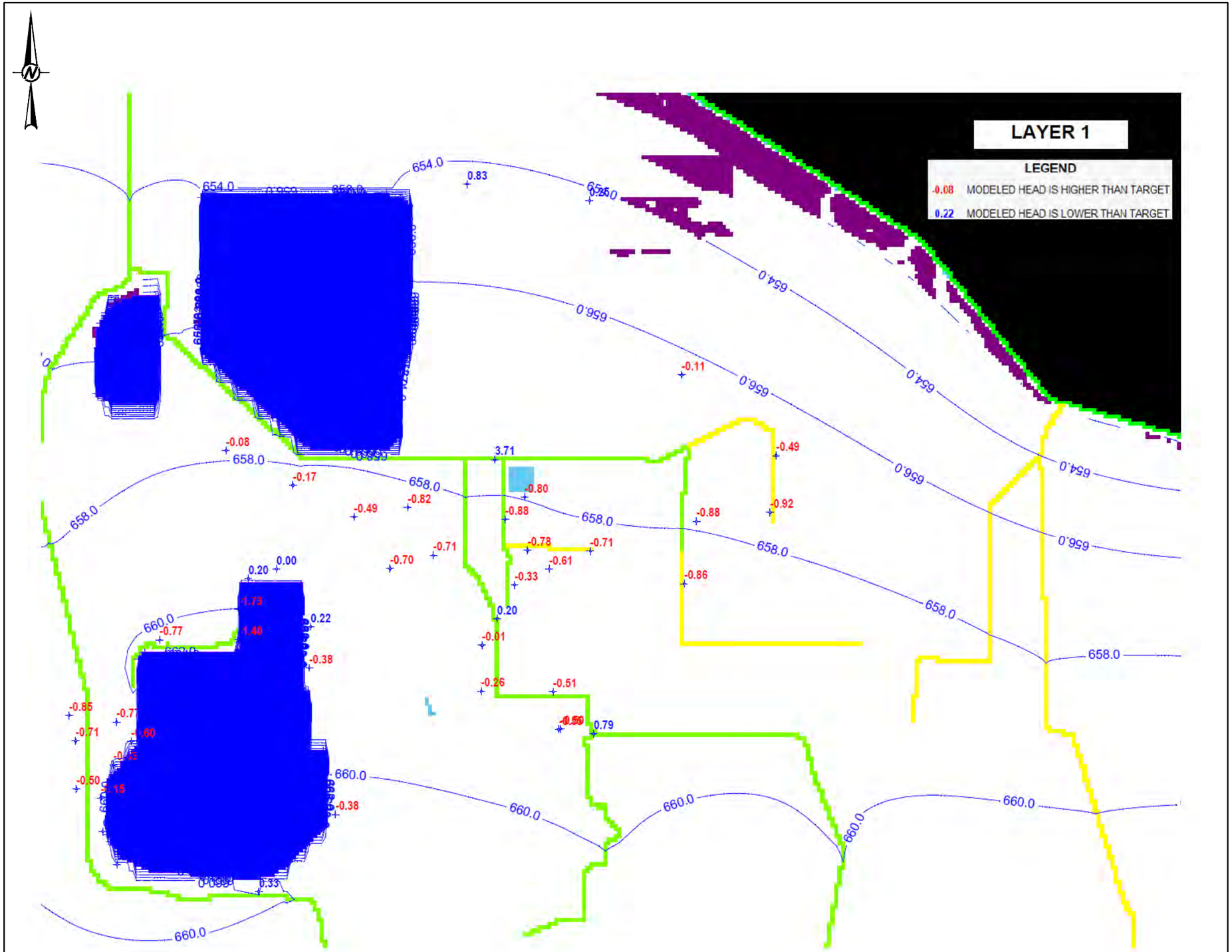
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REVIEWED	BP
APPROVED	RWB

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LEGEND

NOTE(S)
1. BASED ON MODEL V12_2019.

REFERENCE(S)
1. COORDINATE SYSTEM: WGS 1984 WEB MERCATOR AUXILIARY SPHERE

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRB, MCWB, AND DRYING AREA
NIPSCO LLC R. M. SCHAHFER GENERATING STATION

TITLE

MODEL CALIBRATION - SEPTEMBER 2019

CONSULTANT

GOLDER

YYYY-MM-DD	2020-10-23
DESIGNED	RWB
PREPARED	SHL
REVIEWED	BP
APPROVED	RWB

PROJECT NO.	CONTROL	REV.	ATTACHMENT
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golder.com

APPENDIX O

CCR Assessment of Corrective Measures Addendum 3 – March 2022

GOLDER
MEMBER OF WSP

REPORT

MCU Assessment of Corrective Measures - Addendum #3

Northern Indiana Public Service Company LLC
Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Submitted to:

Northern Indiana Public Service Company LLC

801 East 86th Avenue
Merriville, Indiana 46410

Submitted by:

Golder Associates USA Inc.

10 Al Paul Lane, 1st Floor
Merrimack, New Hampshire 03054

+1 603 668 0880

20447130.01

June 2022

Northern Indiana Public Service Company LLC (NIPSCO)
R. M. Schahfer Generating Station – MSRB, MCWB and DA (collectively the Multi-Cell Unit [MCU] or CCR Unit)
Wheatfield, Indiana

Certification of Addendum #3 to the Assessment of Corrective Measures Report 40 CFR §257.96 & Corresponding Regulations under Indiana Administrative Code

I have personally reviewed Addendum #3 to the assessment of corrective measures (ACM) report that was prepared by Golder Associates Inc. (Golder) and dated July 2021. The subject of Addendum #3 to the ACM Report is three impoundments, the Material Storage Runoff Basin (MSRB), Metal Cleaning Waste Basin (MCWB), and Drying Area (DA), which are collectively referred to as the Multi-Cell Unit (MCU) or simply the CCR Unit, at the NIPSCO R. M. Schahfer Generating Station. Based on an inquiry of those individuals immediately responsible and on supporting data that I understand to be true, accurate, and complete, I verify the information in this Addendum #3 to the ACM Report is accurate and meets the applicable requirements of the CCR Rule and Indiana Administrative Code. In consideration of the above, I certify to the best of my knowledge, information, and belief, that Addendum #3 to the ACM Report for the regulated CCR management unit referred to as the MCU has been prepared and meets the applicable requirements of 40 CFR §257.96 and corresponding State of Indiana requirements.



Joseph Bernard Gormley, Jr.
Indiana Professional Engineer
License #: PE11900213

6/17/2022
Date

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Acronyms

ACM	Assessment of Corrective Measures
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
COC	Constituents of Concern
DA	Drying Area
GAC	granular activated carbon
GDL	Geocomposite drainage layer
GWPS	Groundwater Protection Standards
Golder	Golder Associated USA Inc.
IDEM	Indiana Department of Environmental Management
ISS	In situ Stabilization/Solidification
LLDPE	linear low-density polyethylene
MCWB	Metal Cleaning Waste Basin
MCU	Multi-Cell Unit
MNA	Monitored Natural Attenuation
MSRB	Material Storage Runoff Basin
NIPSCO	Northern Indiana Public Service Company LLC
NPDES	National Pollutant Discharge Elimination System
O&M	Operations & Maintenance
POC	Point of Compliance
POTW	Publicly Owned Treatment Works
PRB	Permeable Reactive Barrier
SSL	Statistically Significant Level
SOR	Selection of Remedy
ug/L	Microgram per liter
USEPA	United States Environmental Protection Agency
ZVI	zero-valent iron

1.0 INTRODUCTION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), Golder Associates USA Inc*., a member of WSP* (Golder) has prepared this Addendum #3 to supplement, refine, and update findings of the April 2019 CCR Assessment of Corrective Measures (ACM) Report and the November 2020 and July 2021 ACM Addenda for the Rollin M. Schahfer Generating Station (RMSGS, Site) located at 2723 E 1500 N Road, in Wheatfield, Jasper County, Indiana (see ACM Addendum #3, Figure 1). Specifically, Golder has included updated findings relative to the detection of cobalt, a 40 Code of Federal Regulations (CFR) Coal Combustion Residuals (CCR) Rule as amended Appendix IV constituent, at a statistically significant level (SSL) above the groundwater protection standard (GWPS). Cobalt has been identified as the only CCR Rule Appendix IV SSL above the GWPS, detected at a single shallow groundwater monitoring location immediately downgradient of three collectively monitored impoundments, the Material Storage Runoff Basin (MSRB), Metal Cleaning Waste Basin (MCWB), and Drying Area (DA), together the Multi-Cell Unit (MCU) or simply the CCR Unit (ACM Report, Golder 2019; ACM Addendum #1, Golder 2020; and ACM Addendum #2, Golder 2021). Addendum #3, Figure 2 shows the location of the MCU on RMSGS as well as the names/locations of the individual impoundments.

Previous ACM documents were by design predicated on and tied closely to time frames associated with key regulatory agency approval processes and NIPSCO planned impoundment closure events. These include the MCU Closure Application regulatory review and approval by Indiana Department of Environmental Management (IDEM) and NIPSCO's scheduled 2023 construction implementation. The MCU Closure Application, which addresses critical aspects interrelated with the groundwater remedy, has undergone multiple reviews by IDEM and revisions by NIPSCO. However, additional review comments were recently received, and the Closure Application has not yet been approved by IDEM. Nevertheless, although lacking this approval, NIPSCO/Golder will immediately proceed to the Selection of Remedy (SOR) process following completion of this ACM Addendum #3.

Preparation of an SOR report will be preceded by scheduling/holding a public meeting to present the results of the revised ACM. This meeting will be held at least 30 days prior to the final selection of a groundwater remedy. At present, NIPSCO believes an ACM-based public meeting can be held within the next 60-90 days, subject to personnel availability, logistical details, and input from IDEM.

Following a preliminary review by and based on feedback from conversations with United States Environmental Protection Agency (EPA) Headquarters CCR Rule staff, Golder prepared ACM Addendum #1 to the initial April 2019 ACM to provide further details of its evaluation of the potential corrective measures for the MCU. In accordance with EPA Headquarters staff observations and late 2020 informal discussions with EPA regarding NIPSCO ACM documents prepared at that time, ACM Addendum #1 and succeeding Addenda specifically focus on addressing the following requirements under 40 CFR §257.96(c)

> *"The assessment under paragraph (a) of this section must include an analysis of the effectiveness of potential corrective measures in meeting all of the requirements and objectives of the remedy as described under §257.97 addressing at least the following:*
>
> *1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies including safety impacts, cross-media impacts, and control of exposure to any residual contamination;*
>
> *2) The time required to begin and complete the remedy;*

3) *The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).”*

Like the ACM and Addendum #1, ACM Addendum #2 addressed potential groundwater impacts beyond the identified Appendix IV constituent SSL, cobalt. ACM Addendum #2, which superseded and fully replaced ACM Addendum #1, also revised and updated information provided in the predecessor documents, and it incorporated an enhanced final cap design along with post-closure management requirements to supplement MCU source removal (i.e., impoundment closure-by-removal) in all corrective measure alternatives.

Evolution and revision of the enhanced cover system design reflected ongoing requests for additional information by and subsequent discussions with IDEM over the course of more than a year. Although a final closure design in accordance with IDEM requests was prepared and submitted in May 2021, IDEM provided further comments and requested additional information in March 2022. NIPSCO/Golder are currently working to address these requests. Thus, IDEM approval and public notification and request for comment on the draft Closure Application have not yet been issued.

Like the ACM and previous addenda, ACM Addendum #3 addresses groundwater remedial alternatives, consistent with the requirements of the assessment of corrective measures process as outlined in 40 CFR §257.96. Unlike the previous documents, however, ACM Addendum #3 focuses solely on cobalt. This focus is based on an evaluation of groundwater monitoring results from July 2016 to present that showed the following:

- Cobalt is the sole Appendix IV constituent detected in shallow groundwater at a statistically significant level (SSL)
- The Cobalt SSL was detected in a single shallow-screened monitoring well that is located immediately downgradient of the MCU
- Cobalt concentrations have been and are continuing to decline since the initial identification of cobalt at an SSL.

This progression of the ACM process, including revision of the most recent ACM document and preparation of this ACM Addendum #3, reflects the ongoing CCR Unit-specific state regulatory review and closure approval processes. Furthermore, this progression is consistent with EPA Headquarters’ staff observations and their subsequent discussions with NIPSCO regarding previously prepared ACM documents. The specific discussion during October 13 and November 24, 2020, conference calls included comments by several senior EPA representatives[1] that ACMs were “living documents” and thus subject to revisions in accordance with changes in conditions. As part of this progression, NIPSCO has revised the ACM, as appropriate, in response to site conditions, evolving state regulatory agency (i.e., IDEM) requests/requirements, and changing Federal (i.e., EPA) regulation and policy interpretations.

This Addendum #3, in combination with the remaining applicable sections of the ACM Report (Golder 2019) and Addendum #2 (Golder 2021), results in a process for NIPSCO to move forward towards the selection of a corrective measure that addresses cobalt impacts in groundwater. The following text provides an updated

[1] Senior EPA representatives on the October 13, 2020, conference call included Lydia Anderson, Frank Behan, Laurel Celeste, Kirsten Hillyer, Richard Huggins, Susan Mooney, and Jessica Schumacher. Senior EPA representatives on the November 24, 2020, conference call included Richard Huggins and Stacey Yonce.

summary of the Site background and contaminant plume conditions along with modifications to the identification and evaluation sections of the ACM.

2.0 BACKGROUND

NIPSCO owns and operates the RMSGS which, among other activities, manages CCR in surface impoundments subject to applicable requirements of 40 CFR Part 257 as amended (CCR Rule). Pursuant to 40 CFR §257.96(a), the MCU is subject to an ACM, the results of which were presented in the ACM Report and Addenda. ACM Addendum #3, Figures 2 through 6, show the monitoring well network, geologic cross sections, groundwater elevation contours and cobalt isoconcentration contour maps for the Site. Regional and Site Hydrogeology are summarized in the ACM and supported by mass and volume calculations, slug test data and calculations, and vertical gradient calculation included in Appendices A, B, and C, respectively.

NIPSCO plans to close the MCU by removal in accordance with 40 CFR §257.102(c) and an approved IDEM Closure Application. To meet the requirements of 40 CFR §257.97-98, NIPSCO plans to combine the following MCU closure activities in conjunction with additional groundwater corrective measures for cobalt to demonstrate achievement of applicable groundwater protection standards (GWPS):

- Removal of CCR source material from the MCU
- Construction and maintenance of a low permeability cap over residual materials in the MCU
- Long-term monitoring

These corrective measures are further described in ACM Addendum #3, Table 1.

In the 2019 ACM Report, Golder presented the analytical data for the MCU monitoring wells, identified general groundwater response actions (Table 3), presented an initial screening of corrective measure alternatives/process options for groundwater, and identified eight potential groundwater corrective measures and their key components for further consideration following closure of the MCU.

After preparation of the ACM Report and ACM Addendum #1, NIPSCO performed additional work with respect to future performance of the initially proposed closure approach and its possible impact on groundwater conditions. Based upon this assessment, NIPSCO determined that an enhanced combination soil/geomembrane cap along with a minor modification of the remaining in-place slurry wall, designed to alleviate potential groundwater level build up under the cap, would provide better long-term performance post-closure than either no cap or a soil-only cap. Consequently, NIPSCO proposed this alternative design to IDEM and prepared ACM Addendum #2. As referenced above and as of this writing, consideration of the alternative design remains under IDEM review.

Based on further review of groundwater data and recent EPA policy interpretations, Golder prepared Addendum #3, to modify the ACM to include an evaluation of groundwater remediation alternatives to address cobalt in groundwater.

Because of NIPSCO's decision and subsequent proposal to IDEM to construct a low permeability cap in conjunction with source removal during the closure process, ACM Alternative 2 – Capping with MNA was effectively removed from future consideration. Furthermore, other alternatives that did not previously include or consider the implications of constructing a low permeability cap immediately following source removal were likewise removed from future consideration while other alternatives were modified to reflect the inclusion of a low

permeability cap. The alternatives that were previously removed or modified in ACM Addenda #1 and #2 are listed below:

Alternatives Removed

- In situ Stabilization/Solidification (ISS) and MNA
- Capping, Pump-and-Treat and MNA
- ISS, Pump-and-Treat, and MNA

Alternatives Modified

- MNA
- Vertical Barrier/Hydraulic Controls and MNA
- Pump-and-Treat and MNA
- Vertical Barrier/Hydraulic Controls, Pump-and-Treat, and MNA

Based on the revised focus of Addendum #3 on the SSL exceedance of cobalt in a single shallow location, certain previously removed technologies and alternatives may now be feasible and will be revaluated. These alternatives include Vertical Barriers in the form of permeable reactive barriers and ISS with MNA as presented in the table below:

Alternative	**Status**	**Comments**
Monitored Natural Attenuation (MNA)	Retained	MNA feasibility and appropriateness is validated by the Tier I-III evaluation and requires no modifications to the current closure strategy.
Capping and MNA	Removed	Capping is already included in the current closure strategy but remains under review by IDEM with no predictable approval status or timeframe.
Vertical Barrier/Hydraulic Controls and MNA	Retained/Modified	Hydraulic controls can be integrated into the current closure strategy with limited modifications to the cap.
In situ Stabilization/Solidification (ISS) and MNA	Reevaluated	ISS cannot be integrated into the current closure strategy without significant modifications and potentially severe damage to the cap. However, ISS may be an appropriate remedial alternative for the cobalt groundwater plume located downgradient of the MCU.
Pump-and-Treat and MNA	Retained/Modified	Pump and treat external to the current MCU footprint can be integrated into the current closure strategy with no impact to the cap.

Alternative	Status	Comments
Capping, Pump-and-Treat, and MNA	Removed	Capping is already included in the current closure strategy.
Vertical Barrier/Hydraulic Control, Pump-and-Treat, and MNA	Retained/Modified	Hydraulic controls and pump-and-treat external to the current MCU footprint can be integrated into the current closure strategy with limited modifications to the cap.
ISS, Pump-and-Treat, and MNA	Removed	ISS cannot be integrated into the current closure strategy without significant modifications and potentially severe damage to the cap. Furthermore, ISS and pump-and-treat would be incompatible technologies for treatment of the downgradient cobalt plume.

3.0 CONTAMINANT PLUME CONDITIONS

Due to the required schedule for closure and EPA's recent interpretations of the timeline to select and implement a corrective remedy, the ACM is being revised to address Appendix IV constituents with SSL exceedances as described in Section 1. The only such constituent is cobalt, which has been found to exceed the SSL level of 6 micrograms per liter (μg/L) and the GWPS of 10 μg/l in one well, GAMW-08 located hydraulically downgradient and immediately to the north of the MCU.

In accordance with the requirement of 40 CFR 257.95(g)(1), the nature, mass, and extent of contamination must be characterized for the ACM. Groundwater samples have been collected at least bi-annually from GAMW-08 since July 2016. The analytical sampling results indicate cobalt concentrations ranging from 7.9 to 59 μg/L, with an average of 29 μg/L. The cobalt concentration detected during the most recent monitoring event in September 2021 was 15 μg/L (see Table 2) which exceeds the GWPS. However, cobalt concentrations in this well have reflected a generally decreasing trend since November 2016.

No other assessment monitoring wells adjacent to the MCU have been found to contain cobalt at an SSL above the GWPS. The maximum cobalt concentration detected in porewater samples collected from the MSRB portion of the MCU is 2.2 μg/L. An alternative source determination has not been made regarding the detections in GAMW-08; therefore, for the purposes of this ACM addendum the source of the contamination is assumed to be due to a release from the MCWB portion of the MCU, the porewater of which has not been sampled. Cobalt has not been detected in monitoring well GAMW-08B, which is co-located with GAMW-08 and screened from 27.5 to 37.5 feet below ground surface (ft bgs), compared to the screened interval of GAMW-08 which extends from 5 to 15 ft bgs.

The assumed extent of the plume potentially requiring treatment (i.e., cobalt concentrations exceeding the GWPS) is shown on Figure 6. The plume dimensions shown were developed by extrapolating cobalt concentrations between an assumed concentration of 20 μg/L at the downgradient end of the slurry wall and known concentrations at GAWM-08, cross-gradient wells GAMW-16R and -17, and downgradient wells GAMW-53, -54, and -55. Based on these extents and concentrations the mass of cobalt within the plume needing to be treated was calculated to be between 0.07 and 0.18 kilograms (see Appendix A for calculation).

4.0 IDENTIFICATION OF POTENTIAL CORRECTIVE MEASURES

4.1 Source Material

As discussed in the ACM Report and Addendum #2, NIPSCO plans to close the MCU in accordance with 40 CFR §257.102(c) and an approved IDEM Closure Application. NIPSCO's approach combines CCR source removal/capping and groundwater remediation, including addressing a single-location cobalt GWPS exceedance in accordance with recommendations of the ACM/SOR processes, and monitoring to demonstrate achievement of the IDEM-approved Closure Application requirements and applicable GWPS. The multi-part corrective action approach will be integrated, but it will also be sequenced to address both the requirements of 40 CFR §257.97-98 for cobalt exceedances of GWPS during the near-term and allow for monitoring of early-stage post-closure results and plume stability. This approach will facilitate optimization of subsequent groundwater monitoring steps following completion of the initial source removal and capping stages.

The first phase of the integrated CCR Unit closure approach is closure by removal/capping of the MCU. Following dewatering activities, the three impoundments will be excavated. In accordance with the Closure Application, excavations are being planned to remove CCR and non-CCR materials to the original design limits (sides and bottom) of the impoundments, leaving the slurry wall in-place. Satisfactory excavation will be confirmed by a visual determination that the CCR materials have been removed (Wood 2021).

Following completion of CCR excavation and visual verification of the source removal activities, a final low permeability cap will be installed. As proposed to IDEM, the final cap will consist of the following components presented in descending order from top to bottom (Wood 2021):

- Topsoil (6-inch)
- Cover soil (18-inch)
- Geocomposite drainage layer (GDL)
- 40-mil linear low-density polyethylene (LLDPE) geomembrane
- Subgrade fill.

During cap construction a hydraulically downgradient section of the slurry wall will be permanently removed down to the average elevation of the groundwater table to address the water buildup/overtopping possibility within the former impoundment. This action should reduce concerns regarding long-term cap performance and maintenance; however, it may result in periodic discharges from within the former impoundment of diluted water that has previously been in contact with CCR. Monitoring within and outside the capped former impoundment will inform NIPSCO with future water quality data, allowing review of closure remedy performance and identifying post-closure groundwater quality trends outside the former CCR Unit.

4.2 Groundwater Impacts

As noted above, ACM Addendum #3 focuses on addressing cobalt-impacted groundwater downgradient of the MCU. As such, those alternatives that are effective at remediating groundwater in the downgradient plumes will be evaluated further. These include alternatives that were previously considered and are still applicable (e.g., ISS), and alternatives that were not previously considered but are now applicable (e.g., passive reactive barriers). For clarification and to differentiate the ACM Addendum #3 alternatives from those presented and discussed in predecessor documents, the remaining alternatives are renumbered as follow:

- Alternative A – MNA
- Alternative B – Vertical Barrier/Hydraulic Controls and MNA
- Alternative C – Pump-and-Treat and MNA
- Alternative D – Vertical Barrier and MNA
- Alternative E – ISS and MNA

Initial corrective action measures screening results are presented in ACM Addendum #3 Table 4 and a summary of the retained groundwater corrective measure alternatives is shown in ACM Addendum #3 Table 5. The remedial components of the groundwater corrective measure alternatives following source removal and capping are described further in Section 5.

5.0 EVALUATION OF POTENTIAL GROUNDWATER CORRECTIVE MEASURES

5.1 Evaluation Criteria

In conformance with the applicable requirements of 40 CFR §257.96 and 40 CFR §257.97, Golder evaluated the effectiveness of each of the five remaining potential groundwater corrective measures originally identified in the ACM Report (Golder 2019) using the following criteria:

- **Performance** - Potential corrective measures were evaluated for their relative performance based on the magnitude of reduction of existing risks, ability to obtain the GWPS at the point of compliance (POC), the magnitude of residual risks in terms of likelihood of future releases due to remaining CCR following implementation of remedy, and the required type and degree of long-term management including monitoring, operation, and maintenance associated with the corrective measure.
- **Reliability** - Potential corrective measures were evaluated for their relative reliability based on the long-term reliability of engineering and institutional controls, potential need for the replacement of the remedy, extent to which containment practices will reduce further releases, and extent to which the treatment technologies may be used.
- **Ease of Implementation** - Potential corrective measures were evaluated based on their relative ease of implementation based on difficulty associated with construction of the technology, operational reliability of the technology(ies), coordination of regulatory approvals and permits from pertinent agencies, availability of necessary equipment and specialists, and availability capacity and location of needed treatment, storage, and disposal services.
- **Potential Impacts** - Potential corrective measures were evaluated based on their relative potential impacts based on safety impacts, cross-media impacts, and control of exposure. Exposure controls include short-term risks during implementation of a remedy and potential exposure to remaining wastes to the community or environment including potential threats associated with excavation, transportation, re-disposal of CCR, or contaminant.
- **Time Requirements** - Potential corrective measures were evaluated based on the time required to initiate, construct, and complete the remedy.

- **Institutional Requirements** - Potential corrective measures were evaluated based on their institutional requirements including local, state, and federal permit needs.

5.2 Evaluation Summaries

Relative to the above evaluation criteria, the following sections present brief summaries of the proposed groundwater corrective measure alternatives considered prior to and following source removal, associated dewatering, and capping. It should be noted that these closure-related actions are considered a part of all the remedial alternatives discussed in this section because source removal and dewatering will address and help control the presumed source of the release and reduce or eliminate further releases of cobalt (and any other CCR-related Appendix IV constituents) as required under 40 CFR 257.97(b)(3). In addition, the summaries highlight areas where a particular remedy may perform well or poorly relative to other alternatives. A summary of Golder's evaluation of the retained groundwater corrective measure alternatives is provided in ACM Addendum #3 Table 6.

5.2.1 Alternative A: Monitored Natural Attenuation

Golder evaluated MNA alone as a potential groundwater corrective measure for a number of CCR-related potential Site constituents of concern (COCs), including the Appendix IV SSL cobalt. The MNA Evaluation (Golder 2020) is presented in Appendix D. The results of the evaluation indicate that MNA is a technically feasible and appropriate corrective measure for groundwater at the Site based on the following factors:

- Attenuation is already occurring at the Site at a reasonable rate
- The dissolved plume is stable
- The aquifer has the long-term capacity to attenuate COCs
- Cobalt has been detected at only a single location immediately downgradient of the MCU and concentrations appear to be decreasing with time

Based on the results of the Tier I, II, and III MNA evaluations for the Site, Golder concluded that MNA is expected to provide good long-term performance at reducing cobalt concentrations through chemical (i.e., adsorption and co-precipitation) and physical processes (e.g., diffusion, dispersion). While MNA alone typically will not substantially affect groundwater concentrations in the short-term, Golder's review of cobalt concentrations since monitoring began in 2016 indicates the concentrations are currently decreasing.

Linear Regression Analysis

A linear regression analysis of the cobalt concentrations at GAMW-08 indicates that groundwater would attain the GWPS for cobalt (0.010 mg/l) by January 2022 without implementation of any active remedial technologies. Furthermore, if similar attenuation rates are assumed at the MCU boundary along with a starting cobalt concentration of 0.020 mg/l, groundwater will meet the GWPS at the downgradient side of the MCU in approximately 2 years.

The above cobalt concentration estimates are based on current conditions and do not take source removal and dewatering into account, which would likely further shorten these timeframes. While these timeframes are based on incomplete data and linear interpolation of existing data with a degree of variation, they do provide an order-of-magnitude estimate of the remediation timeline indicating a relatively short timeframe for MNA alone to remediate groundwater at the Site.

MNA Evaluation

For the MNA evaluation, Golder conducted a point decay evaluation at monitoring wells downgradient of the MCU. Based on the results of the evaluation, the maximum concentration of cobalt observed in downgradient wells over the period of monitoring would take approximately 39 years to attenuate to concentrations below the GWPS (Golder 2020). However, this estimate is based on a point decay constant calculated using the decrease in concentration between GAWM-08 and the next nearest downgradient well GAMW-52, which is located approximately 1,200 feet downgradient. Cobalt has not been detected in GAMW-52 so the point decay constant and subsequently the estimated time for the cobalt concentration to reach the GWPS was a conservative estimate. As discussed above, more recent data from GAMW-08 indicates that the rate of attenuation may be significantly higher than estimated.

For the evaluation, Golder also considered the following factors:

- The low groundwater flow velocities observed at the Site
- The distance from the MCU to the property boundary and lack of off-Site migration of groundwater impacts
- The lack of potable water supply wells at the Site in the vicinity of the MCU and the downgradient plume
- Planned institutional controls prohibiting use of groundwater from any impacted area at the Site for drinking water

Based on these other factors, MNA is expected to be protective of human health and reduce environmental degradation of groundwater containing cobalt that is not removed during closure.

Because there is an existing monitoring well network downgradient of the MCU, implementation of a supplemental MNA program is unlikely to require any component construction/installation apart from additional monitoring wells between GAMW-08 and GAMW-53, -54, and -55. Installation of such wells may be complicated by the presence of a complex subsurface utility network and surface infrastructure located hydraulically downgradient of and adjacent to the MCU. Therefore, MNA will be relatively easy to implement following regulatory approval and poses no short-term safety risks, but it may not be feasible to install new MNA performance monitoring wells at optimal locations (i.e., immediately downgradient of GAMW-08). Long-term operation and maintenance (O&M) will include routine semi-annual groundwater sampling and potentially periodic well redevelopment.

5.2.2 Alternative B: Vertical Barrier/Hydraulic Controls and MNA

For the Vertical Barrier/Hydraulic Control and MNA Alternative, hydraulic controls within the existing slurry wall would be added to the MNA alternative. The Vertical Barrier/Hydraulic Control and MNA alternative would be implemented to reduce or eliminate downgradient migration of potentially impacted groundwater by generating a hydraulic gradient inward toward the MCU. This alternative assumes that the existing slurry wall is intact, albeit slightly modified from the original design to address potential water buildup with the former impoundment cell, and that implementation of this alternative consists of installation and operation of a pump-and-treat system within the former impoundment areas as necessary to prevent potential over-topping of the modified slurry wall by water impacted above the GWPS due to groundwater recharge.

The Vertical Barrier/Hydraulic Control and MNA Alternative would have a similar effect as the MNA Alternative on groundwater downgradient of the closed MCU with the added benefit of active contaminant mass removal (to the extent such remains an issue of concern following closure by removal) and reduction of Appendix IV constituent

contaminated groundwater releases from the MCU. It would reduce or eliminate the volume of impacted groundwater potentially overtopping and/or passing through the existing or modified slurry wall(s), thus removing a potential residual source of contamination, and allowing for more efficient natural attenuation. This remedy would also result in removal of contaminant mass through groundwater extraction and treatment with an appropriate media such as cobalt-specific ion exchange resin or granular activated carbon (GAC) depending on the results of pilot treatment studies, which would reduce the potential for future releases of impacted groundwater if the integrity of the slurry wall is shown to be compromised.

Because there is an existing and functional slurry wall around the MCU, corrective measure implementation would include design, well installation, enclosure construction, and treatment system assembly/construction. Some treatment system components may require lead times prior to delivery; however, most components should be readily available. An amendment to the Site's National Pollutant Discharge Elimination System (NPDES) permit would likely be required to discharge treated water to an on-site stormwater pond, which could delay implementation while awaiting regulatory review.

Well installation would be complicated due to the geomembrane cap to be installed as part of the unit closure. Extraction wells would either need to be installed prior to cap placement and incorporated into the cap design, or the cap would need to be penetrated and repaired following well installation.

In the event of unidentified contaminant breakthrough, there is the potential for treated water containing unacceptable contaminant levels to be discharged in the treatment system effluent. However, this is unlikely to occur as the treatment media vessel effluent will be monitored routinely and the system will be designed with a redundant "lag" vessel to treat any breakthrough contaminants in the lead vessel effluent until the lead vessel can be changed out.

The hydraulic control system will require a high level of periodic O&M compared to more passive alternatives (i.e., MNA, vertical barriers, ISS) as influent and effluent samples will likely need to be collected monthly and there is significant potential for shut-downs due to the number of different components (filter vessels, ion-exchange columns, pH adjustment system, etc.) that are needed to keep the system operational. Most or all these components will also need replacement over the 30-year design lifetime of the system.

5.2.3 Alternative C: Pump-and-Treat and MNA

For the Pump-and-Treat and MNA Alternative, a groundwater pump-and-treat system would be designed and installed to capture contaminated groundwater present downgradient of the MCU and GAMW-08, to remove impacts from the environment and prevent downgradient off-Site migration. The captured groundwater would then be treated to reduce concentrations to an acceptable concentration and discharged to surface water. Portions of the plume downgradient of the extraction well capture zone would then be subject to MNA as a polishing step in the remedy process.

The Pump-and-Treat and MNA Alternative offers a higher level of short- term protection than vertical barrier/hydraulic control and vertical reactive barriers as it would be quicker and easier to implement due to the limited subsurface infrastructure required and does not need to be coordinated with the CCR Unit closure, though source removal and dewatering during closure are important measures related to controlling/eliminating the release. Contaminant mass removal through operation of the pump-and-treat system will reduce contaminant concentrations and thereby enhance natural attenuation downgradient of the capture zone.

Some treatment system components may require lead times prior to delivery, but most components should be readily available. An amendment to the Site's NPDES permit would likely be required to discharge treated water to an on-site stormwater pond, which could delay implementation while awaiting regulatory review. In the event of unidentified contaminant breakthrough, there is the potential for treated water containing unacceptable contaminant levels to be discharged in the treatment system effluent. However, this is unlikely to occur as the treatment media vessel effluent will be monitored routinely and the system will be designed with a redundant "lag" vessel to treat any breakthrough contaminants in the lead vessel effluent until the lead vessel can be changed out. The system will require a higher level of periodic O&M compared to vertical barrier and ISS as effluent samples will likely need to be collected monthly and there is significant potential for shut-downs due to the number of different components (filter vessels, ion-exchange columns, pH adjustment system, etc.) that are needed to keep the system operational. The O&M would be similar to the vertical barrier/hydraulic control alternative, though would likely be somewhat less onerous due to the need for fewer wells and a lower pumping rate to achieve capture compared to the pumping rate required to generate an inward gradient inside the closed impoundments. Most or all these components will also need replacement over the 30-year design lifetime of the system.

5.2.4 Alternative D: Vertical Barrier and MNA

The Vertical Barrier and MNA Alternative would include a funnel-and-gate permeable reactive barrier (PRB) using an appropriate treatment media such as mixed zero-valent iron (ZVI) and GAC, which has been shown to remove cobalt (Mueller et al. 2009), with MNA to further reduce concentrations of cobalt in any portion of the plume located downgradient of the PRB, and/or cobalt migrating downgradient of the PRB following breakthrough. This alternative would offer a high level of short-term protection as little to no contaminated media would be transported off-site, and long-term protection through the immobilization and subsequent removal (during media changeout) of cobalt-contaminated groundwater. This alternative would offer a similar level of contaminant mass removal to Alternatives B and C as all three alternatives include intercepting or capturing the plume followed by adsorption to a treatment media that can be removed and disposed of off-site. Implementation/installation of a PRB would be substantially more difficult due to the extent and depth of excavation required coupled with the high density of subsurface infrastructure downgradient of the MCU. Long-term O&M requirements consisting of routine monitoring and media changeouts would be less onerous than for the alternatives incorporating active groundwater extraction systems.

5.2.5 Alternative E: ISS and MNA

ISS could be used within the plume area to bind cobalt in a cementitious matrix and reduce its potential to leach into groundwater. MNA would be implemented to address any remaining contaminant mass that is not bound by the ISS process. ISS does not remove contaminant mass, but it does result in sequestration of contaminants from the environment, eliminating potential exposure pathways for human and ecological receptors.

The ISS program would include stabilizing the soil within the cobalt plume. Based on the lack of detections in GAWM-08B and the nearby deep monitoring wells (GAMW-16B and GAMW-17B), the plume appears to be limited vertically to the top 27.5 feet bgs, at most. ISS would be accomplished using a large-diameter (6- to 10-ft diameter) rotary auger capable of injecting slurry chemicals through the auger flight to mix the residual soil with a stabilizing agent. The stabilizing agent will be determined during a design-phase pilot study and will likely consist of a mixture of Portland cement, pozzolans, and/or bentonite. At each location within the plume, the auger would be advanced through the depth of the plume and rotated to thoroughly mix the soil within the auger diameter with the stabilizing agent, generating one "column" of stabilized soil. The auger will then be advanced to an adjacent

area and advanced such that it overlaps with the last column and there are no gaps between stabilized columns. This will continue until the entire plume area exceeding the GWPS has been mixed.

Short-term protection by ISS is low compared to other alternatives due to the high level of effort and materials required to implement and the associated traffic and construction safety issues associated with this technology. ISS offers good long-term protection through the isolation of contaminants from the environment and the geochemical conditions (pH 6.8 to 7.5) at the Site are favorable for the long-term lifetime of the stabilized material. However, due to the high density of subsurface utilities in the area north of the MCU, the ease of implementation for ISS is ranked lowest of the alternatives evaluated and would likely require substantial rerouting of buried piping currently in-service. ISS would also likely take the longest of the alternatives to implement apart from potentially the PRB portion of Alternative D.

5.2.6 Retained Alternatives

Based on the evaluations presented in the preceding sections, each alternative is considered feasible for the Site and fully consistent with the requirements of 40 CFR 257.98, and therefore, retained for further evaluation in the Selection of Remedy (SOR) process. The retained alternatives for the Selection of Remedy process are presented below:

- Alternative A - Monitored Natural Attenuation (MNA)
- Alternative B - Vertical Barrier/Hydraulic Controls and MNA
- Alternative C - Pump-and-Treat and MNA
- Alternative D - Vertical Barrier and MNA
- Alternative E – ISS and MNA

6.0 SUMMARY AND NEXT STEPS

This Addendum #3 supplements the ACM Report (Golder 2019) and replaces in full ACM Addenda #1 (Golder 2020) and #2 (Golder 2021) by providing additional details regarding the remaining five potential groundwater corrective measures originally identified in those reports and evaluating those corrective measures in accordance with the performance requirements identified in 40 CFR §257.96(c). It reflects NIPSCO's enhanced closure strategy, is consistent with ongoing discussions with IDEM in response to comments on the latest Closure Application, and considers recent EPA interpretations of ACM/SOR timing requirements. Addendum #3 is also consistent with EPA's earlier statements regarding ACMs as being living documents, and therefore subject to revision in accordance with changing conditions. A summary of Golder's evaluation of the five retained groundwater corrective measure alternatives is provided in Table 6.

In addition to updating the ACM to reflect the most recent discussions with IDEM and the revision/submission of the Closure Application for IDEM for review and approval, NIPSCO continues to conduct activities in accordance with the expectations of the ACM and SOR processes, including the following:

- Meeting with IDEM mid-April to discuss status and anticipated timing of the Closure Application approval.
- Preparation of bid documents (specifications and drawings) for closure of the MCU.

- Contractor procurement (including contractor pre-qualification, scheduling of site walks, scope of work question-and-answer, request for alternative approach(es), and establishment of a bid due date) to perform the source removal/capping phase of the corrective measures.
- Communications with vendors regarding water treatment technologies, equipment availability, and media costs/handling. This activity also informs and helps refine cost and schedule aspects of the SOR evaluation.
- Developing logistics and potential meeting dates for a public meeting in accordance with 40 CFR 257.96(e).

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Table 1: Applicable Groundwater Cleanup Standards
CCR Unit Schahfer MSRB, MCWB, and DA
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL (mg/L)	GWPS (mg/L)	IDEM RCG (mg/L)
Appendix III Constituents			
Boron	-	NA	4
Calcium	-	NA	-
Chloride	-	NA	-
Fluoride	4	4	0.8
pH	-	NA	-
Sulfate	-	NA	-
Total Dissolved Solids	-	NA	-
Appendix IV Constituents			
Antimony	0.006	0.006	0.006
Arsenic	0.01	0.078	0.01
Barium	2	2	2
Beryllium	0.004	0.004	0.004
Cadmium	0.005	0.005	0.005
Chromium	0.1	0.1	0.1
Cobalt(1)	**0.006(2)**	**0.01**	**0.006**
Fluoride	4	4	0.8
Lead(1)	0.015(2)	0.0007	0.015
Lithium(1)	0.04(2)	0.0082	0.04
Mercury	0.002	0.002	0.002
Molybdenum(1)	0.1(2)	0.036	0.1
Radium 226+228	5	5	-
Selenium	0.05	0.05	0.05
Thallium	0.002	0.002	0.002

Prepared by: DFS
Checked by: KMC
Reviewed by: MAH

Notes:
MCL= Environmental Protection Agency Maximum Contaminant Level
GWPS= Groundwater Protection Standard calculated August 23, 2018.
Guidance- Table A-6 2018 Revision
mg/L= milligrams per liter
NA= not applicable; GWPS are calculated for Appendix IV constituents only
1) These four constituents do not have an established MCL. Prior to the Phase 1 Part 1 amendment, effective August 29, 2018, the GWPS was calculated based on background concentrations according to the CCR Final Rule.

2) The Phase 1 Part 1 amended health-based standard, effective August 29, 2018 pursuant to 40 CFR §257.95(h)(2)

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW04																						
				2016-07-12	2016-09-08	2016-11-09	2017-01-10		2017-03-01	2017-04-26	2017-06-28	2017-08-22	2017-10-04	2018-03-13	2018-03-14	2018-04-20		2018-10-25	2019-04-23	2019-11-07	2020-05-13		2020-10-22	2021-04-15	2021-09-23	2021-09-23
				N	N	N	FD	N	N	N	N	N	N	FD	N	FD	N	N	N	N	FD	N	N	N	FD	N
Appendix III Parameters																										
Boron		4	mg/L	0.48	1.4	2.4 O	1.1	1	1.2	0.74	0.92	1.2	0.54			0.74	0.72	0.78	0.74	1.3	0.66	0.64	0.4	1.1	0.36	0.35
Calcium			mg/L	110	230	300 O	270	240	230	220	200	200	140			140	140	210	130	190	115	112	90.3	178	108	107
Chloride			mg/L	2.2	27	69 O	13	14	13	5.4	12	13	4.5			3.7 J	4.4	10	3.7	9.5	2	2	4.9	6.2	3.7	3.6
Fluoride	4	4	mg/L	0.92 J+	0.2 J	10 UO	0.19 J	0.17 J	5 U	5 U	0.19 J	0.21 J	0.24 J	0.15 J	5 U	5 U	0.17 J-	0.26	0.16 J+	0.23	0.15	0.15	0.59	0.2	0.35	0.35
pH			SU	7.22	6.83	6.75		6.93	7.01	6.76	6.88	7.21	7.28		6.95		7.2	6.39	7	7.14		7.42	7.79	7.26		7.4
Sulfate			mg/L	140 J-	460	480 O	460	470	390	470	370	440	250			220	210	530	260	490	136	139	82.1	375	116	121
Total Dissolved Solids			mg/L	420	990	1400 O	1000	1000	890	870	880	920	610			580 J	580	980	600	900	411	419	299	726	381	380
Appendix IV Parameters																										
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.00027 JO	0.002 U	0.00057 J	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U	0.002 U			0.002 U	0.00065 J	0.00092 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0059	0.013	0.0052 O	0.0058	0.0072	0.005 U	0.0099	0.012	0.012		0.004 J	0.0054			0.014	0.0023 J	0.0018 J	0.002	0.002	0.0055	0.0019	0.0041	0.0036
Barium	2	2	mg/L	0.041	0.077	0.11 O	0.095	0.079	0.089	0.069	0.084	0.09		0.11	0.077			0.074	0.068	0.066	0.076	0.077	0.054	0.079	0.057	0.056
Beryllium	0.004	0.004	mg/L	0.00027 J	0.001 U	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.00048 J	0.00053 J	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.00036 JO	0.00036 J	0.0052 JO	0.002 U	0.002 U	0.002 U	0.002 U		0.0011 J	0.0012 J			0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.001 U	0.00031 J	0.00064 JO	0.0061	0.0058	0.0038	0.0049	0.003	0.0023		0.0028	0.0031			0.0026	0.0011	0.00043 J	0.001 U	0.001 U	0.001 U	0.0016	0.001 U	0.001 U
Fluoride	4	4	mg/L	0.92 J+	0.2 J	10 UO	0.19 J	0.17 J	5 U	5 U	0.19 J	0.21 J	0.24 J	0.15 J	5 U	5 U	0.17 J-	0.26	0.16 J+	0.23	0.15	0.15	0.59	0.2	0.35	0.35
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0018 J	0.008 U	0.008 UO	0.0021 J	0.0023 J	0.0033 J	0.0033 J	0.0062 J	0.0062 J		0.008 U	0.008 U			0.0023 J	0.0045 J	0.0028 J	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 UO	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U	0.0002 U			0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.0075 J	0.023	0.073 O	0.037	0.038	0.034	0.016	0.02	0.034		0.0048 J	0.024			0.039	0.024	0.055	0.022	0.022	0.01	0.066	0.015	0.016
Radium 226 + 228	5		pCi/L	5 U	0.583	0.697 O	0.804	0.515 U	0.362 U	0.379 U	0.364 U	0.352 U		1.35 J+	0.778 J+			0.473	0.591		1.7 U	1.62 U		0.659 U		
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.00064 JO	0.0017 J	0.0021 J	0.005 U	0.005 U	0.005 U	0.005 U		0.001 J	0.001 J			0.005 U	0.0013 J	0.0052	0.001 U	0.001 U	0.001 U	0.0033	0.001 U	0.001 U
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																										
Dissolved Oxygen			mg/L	0.09	0.58	0.37		1.82	1.47	0.12	0.3	0.52	0.09		0.66		2.3	0.15	7.08	2.55		1.32	0.37	1.71		0.31
Oxidation Reduction Potential			millivolts	59.6	-24	-6.9		-31.7	14	-57.8	-45	-27	-105.8		-181.8		-81.2	-58.1	19	-60.7		-28.6	-7	-29		0.149
pH			SU	7.22	6.83	6.75		6.93	7.01	6.76	6.88	7.21	7.28		6.95		7.2	6.39	7	7.14		7.42	7.79	7.26		7.4
Specific Conductivity			uS/cm	595	1345	1681		1109	910	1137	911	1153	813		562		770	1311	549	866		681	521	950		595
Temperature			deg C	13	17.3	16.3		10.5	8.05	10.2	13.1	15.9	16.1		7.55		3.5	15.5	4.2	13.2		9.8	16.2	9.24		15.9
Turbidity			NTU	4.04	1.48	2.21		2.28	4.26	4.04	4.88	1.65	0.51		4.92		3.12	1.92	4.48	1.38		3.51	1.9	4.67		7.06

Notes:
IDEM RCG= Indiana Department of Environmental Management
Remediation Closure Guidance Table A-6 Screening Levels - 2021
Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW07																				GAMW07B							
				2016-07-12	2016-09-08	2016-11-09	2017-01-10	2017-03-01	2017-04-26	2017-06-29	2017-08-23	2017-10-03		2018-03-15	2018-04-23	2018-10-26	2019-05-02	2019-11-08	2020-04-28		2020-10-27	2021-04-16	2021-09-21	2021-09-21	2018-09-06	2018-10-26	2019-05-02	2019-11-12	2020-04-28	2020-10-27	2021-04-16	2021-09-23
				N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	FD	N	N	N	FD	N	N	N	N	N	N	N	N	N
Appendix III Parameters																															
Boron		4	mg/L	1.2	1	0.91	0.91	1	0.68	0.67	0.68	0.71	0.72		1.2	1.3	0.85	0.85	0.87	0.87	1.1	0.81	0.91	0.85	20	23	18	15	11.1	5.3	5.9	6.9
Calcium			mg/L	170	190	200	170	170	190	220	190	220	220		210	230	220	180	209	211	213	198	215	212	370	430	380	400	370	282	327	373
Chloride			mg/L	7.8	6.6	5.3	6	7.6	2.8	3 J	3.2 J	3 J	3.6 J		4.7 J	6.3	6.5	4.8	6.5	6.3	12.3	11.7	11.9	12	10 UO	250	170	150	113	21	38	60.3
Fluoride	4	4	mg/L	0.72 J+	0.91 J	0.8 J	0.85 J	0.66 J	0.76 J	0.79 J	0.66 J	1.1 J	0.93 J	0.58 J	0.57 J	0.73	0.97	0.88	0.64	0.64	0.88	0.66	0.85	0.85	10 UO	1.5	1.3	1.2	1.2	1.2	0.79	0.95
pH			SU	7.03	7.27	7.04	7.15	7.2	7.17	6.57	7.2		7.1	7.28	7.35	5.71	7.2	7.44		7.3	6.98	7.14		7.14	8.29	6.78	7.58	7.13	7.73	8.26	7.94	7.58
Sulfate			mg/L	310 J-	330	320	320	290	310	360	380	460	450		450	530	500	480	403	399	439	352	362	359	10 UO	1600	1500	1400	1260	1040	1010	1060
Total Dissolved Solids			mg/L	770	830	840	750	710	810	970	910	970	1000		900	970	1100	940	840	846	911	846	887	894	2700	2600	920	2300	2140	1590	1700	1790
Appendix IV Parameters																															
Antimony	0.006	0.006	mg/L	0.00035 J	0.00039 J	0.00035 J	0.00028 J	0.002 U	0.002 U	0.002 U	0.002 U			0.002 U		0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0013 J	0.0016 J	0.0018 J	0.0028 J	0.005 U	0.0028 J	0.0025 J	0.0016 J			0.005 U		0.0012 J	0.0019 J	0.0011 J	0.001 U	0.001 U	0.001 U	0.001 U	0.0012	0.0013	0.0028 J	0.0015 J	0.0019 J	0.0017 J	0.0023	0.0021	0.0022	0.0022
Barium	2	2	mg/L	0.052	0.055	0.056	0.042	0.05	0.05	0.059	0.059			0.056		0.064	0.053	0.043	0.041	0.04	0.057	0.046	0.053	0.052	0.072	0.063	0.053	0.043	0.044	0.036	0.041	0.037
Beryllium	0.004	0.004	mg/L	0.00011 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0003 J	0.00022 J			0.001 U		0.00047 J	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.00047 J	0.00046 J	0.002 U	0.002 U	0.002 U	0.002 U			0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.0056	0.0077	0.0055	0.0038	0.0044	0.0063	0.01	0.0095			0.006		0.01	0.0074	0.0049	0.0063	0.0064	0.0074	0.0056	0.0061	0.006	0.00074 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0011	0.001 U
Fluoride	4	4	mg/L	0.72 J+	0.91 J	0.8 J	0.85 J	0.66 J	0.76 J	0.79 J	0.66 J	1.1 J	0.93 J	0.58 J	0.57 J	0.73	0.97	0.88	0.64	0.64	0.88	0.66	0.85	0.85	10 U	1.5	1.3	1.2	1.2	1.2	0.79	0.95
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0007 J			0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0034 J	0.008 U	0.008 U	0.0035 J	0.0031 J	0.0041 J	0.0037 J	0.0038 J			0.0024 J		0.0054 J	0.0041 J	0.0033 J	0.008 U	0.008 U	0.008 U	0.008 U	0.0091	0.0088	0.0043 J	0.0045 J	0.004 J	0.0035 J	0.008 U	0.008 U	0.008 U	0.013
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ			0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.0084 J	0.0098 J	0.0095 J	0.01 U	0.01 U	0.0083 J	0.0081 J	0.007 J			0.0066 J		0.0087 J	0.0097 J	0.0087 J	0.0073	0.0073	0.0094	0.0078	0.01	0.01	0.015	0.017	0.025	0.026	0.026	0.036	0.029	0.023
Radium 226 + 228	5		pCi/L	1.59	0.696	0.548	0.412 U	0.42 U	0.371 U	0.45	0.588			0.749 J+		0.823 J+	0.37 U		1.62	2.01 U		1.29 U			2.63	2.6 J+	2.31		1.92 U		2.16	
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.003 J	0.003 J	0.005 U	0.008	0.0054	0.005			0.0028 J		0.0016 J	0.0045 J	0.0019 J	0.0017	0.0018	0.0013	0.0069	0.0044	0.0039	0.0012 J	0.005 U	0.005 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	0.002	0.002	mg/L	0.00011 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.00024 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																															
Dissolved Oxygen			mg/L	0.6	1.81	0.59	0.52	0.51	1.96	1.02	0.84		0.48	0.8	3.52	2.64	0.81	0.38		0.34	0.47	0.39		0.25	0.13	0.67	0.19	0.2	0.1	0.32	0.23	0.26
Oxidation Reduction Potential			millivolts	111.2	64.2	-6.4	71.3	65.3	76.9	291.1	8.5		95.4	-55	-98.7	-233.3	135.1	-131.8		115.2	259.4	55.5		0.1	-197.6	-230.2	34.9	-196.7	-128.6	-73.9	-124.1	0.224
pH			SU	7.03	7.27	7.04	7.15	7.2	7.17	6.57	7.2		7.1	7.28	7.35	5.71	7.2	7.44		7.3	6.98	7.14		7.14	8.29	6.78	7.58	7.13	7.73	8.26	7.94	7.58
Specific Conductivity			uS/cm	966	1072	1106	928	832	1121	1151	1157		1273	760	1060	1240	975	828		1223	1250	1064		123	5178	3237	2357	1686	2722	2055	1970	222.4
Temperature			deg C	14.4	19.2	16.7	12.9	10.63	11.8	14.6	16.5		18	10	10	16.95	10.3	15.3		10.5	15.5	11.06		17	15.03	13.86	12.4	12.9	12.7	13.3	12.2	14.7
Turbidity			NTU	4.6	4.51	1.26	3.2	4.76	2.17	2.87	0.9		0.49	1.3	1.75	1.08	2.72	4.58		3.2	1.51	3.4		2.65	4.48	3.01	2.86	1.11	3.48	8.02	2.6	4.84

Notes:
IDEM RCG= Indiana Department of Environmental Management
Remediation Closure Guidance Table A-6 Screening Levels - 2021
Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW08																		GAMW-08B							
				2016-07-13	2016-09-08	2016-11-09	2017-01-10	2017-03-02	2017-04-27	2017-06-29	2017-08-23	2017-10-04	2018-03-14	2018-04-23	2018-10-26	2019-05-08	2019-11-07	2020-04-24	2020-10-26	2021-04-22	2021-09-24	2018-09-0	2018-10-26	2019-05-03	2019-11-07	2020-04-2	2020-10-23	2021-04-22	2021-09-24
				N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Appendix III Parameters																													
Boron		4	mg/L	3.5	3.9	3.2	3.4	3.3	3.2	2.9	2.2	3.7		2.4	1.8	1.4	2.5	3	0.52	0.89	1.1	18	15	14	13	20.4	7	7.7	8.4
Calcium			mg/L	310	310	300	260	270	310	340	270	290		360	230	250	280	309	168	266	260	380	370	350	340	355	203	198	235
Chloride			mg/L	88	71	89	99	110	86	83	39	87		64	56	49	66	67	26.4	50	14.9	240	180	160	180	220	134	178	179
Fluoride	4	4	mg/L	1 J+	1.2 J	0.73 J	0.87 J	0.94 J	0.92 J	1.3 J	2 J	0.68 J	1.2 J	1.3 J-	1.6	2.2	1.9	1.1 J-	0.71	0.97	0.44	1.6 J	1.5	1.9	1.7	1.5 J-	0.93	0.9	0.73
pH			SU	6.92	7.03	6.85	7.02	7.09	6.93	7	7.27	6.89	7.41	7.41	6.99	7.37	7.5	7.35	6.87	7.04	7.04	7.7	7.45	7.57	7.85	7.89	7.95	7.49	7.44
Sulfate			mg/L	770 J-	690	680	610	630	770	800	640	670		800	460	540	670	719	229	477	841	1500	1500	1400	1300	1280	769	751	1060
Total Dissolved Solids			mg/L	1600	1500	1600	1300	1400	1700	2000	1400	1500		1700	1100	1300	1300	1550	636	1120	2380	1900 J+	2300	2300	2200	2560	1250	1620	2040
Appendix IV Parameters																													
Antimony	0.006	0.006	mg/L	0.00073 J	0.00069 J	0.0014 J	0.00041 J	0.00043 J	0.002 U	0.00059 J	0.00075 J		0.002 U		0.00082 J	0.00076 J	0.00077 J	0.001 U	0.001 U	0.001 U	0.001 U	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0018 J	0.0019 J	0.0018 J	0.0027 J	0.0016 J	0.0031 J	0.0027 J	0.0023 J		0.005 U		0.0011 J	0.0015 J	0.0016 J	0.0012	0.001 U	0.001 U	0.0013	0.005 U	0.005 U	0.005 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U
Barium	2	2	mg/L	0.068	0.065	0.065	0.05	0.055	0.064	0.074	0.077		0.066	0.069	0.053	0.058	0.066	0.061	0.056	0.07	0.076	0.042	0.03	0.025	0.023	0.028	0.031	0.039	0.046
Beryllium	0.004	0.004	mg/L	0.00017 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.0004 J	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	0.005	0.005	mg/L	7.4E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.00037 J	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.00022	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.002 U	0.00029 J	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.036	0.034	0.059	0.047	0.05	0.037	0.047	0.02		0.022	0.027	0.011	0.0079	0.011	0.022	0.037	0.017	0.015	0.00066 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	4	4	mg/L	1 J+	1.2 J	0.73 J	0.87 J	0.94 J	0.92 J	1.3 J	2 J	0.68 J	1.2 J	1.3 J-	1.6	2.2	1.9	1.1 J-	0.71	0.97	0.44	1.6 J	1.5	1.9	1.7	1.5 J-	0.93	0.9	0.73
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0098	0.012	0.009	0.0098	0.0093	0.012	0.011	0.012		0.0089	0.009	0.011	0.015	0.0091	0.0087	0.008 U	0.012	0.015	0.0098	0.0073 J	0.0063 J	0.0058 J	0.008 U	0.008 U	0.012	0.014
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.034	0.036	0.024	0.02	0.019	0.038	0.049	0.083		0.058	0.058	0.059	0.08	0.068	0.048	0.013	0.034	0.043	0.037	0.039	0.057	0.044	0.05	0.0096	0.011	0.011
Radium 226 + 228	5		pCi/L	1.07	1.08	1.09	0.581	0.777	0.632	1.11	0.762		1.13 J+	0.99	1 J+	0.473		1.25 U		1.57		1.67 J+	1.02 J+	0.704		1.67 U		2.53	
Selenium	0.05	0.05	mg/L	0.005 U	0.0065	0.0033 J	0.0014 J	0.0032 J	0.011	0.0088	0.0081		0.024	0.022	0.0021 J	0.016	0.0036 J	0.0062	0.0011	0.01	0.005	0.0014 J	0.005 U	0.005 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.00045 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																													
Dissolved Oxygen			mg/L	1.9	0.38	1.62	1.27	0.96	0.63	1.96	0.93	0.21	0.97	5.09	0.21	0.44	4.2	0.34	0.44	1	0.35	0.42	0.12	0.13	2.61	0.12	0.33	0.29	0.27
Oxidation Reduction Potential			millivolts	159.7	64.6	-8	58.4	49.9	60.4	242.5	61.9	-15.9	110.1	-106.4	27.7	62.2	44.1	52.5	300	22	19.3	-185.5	-67	7.9	-67	-142.2	-51.2	-120.1	0.218
pH			SU	6.92	7.03	6.85	7.02	7.09	6.93	7	7.27	6.89	7.41	7.41	6.99	7.37	7.5	7.35	6.87	7.04	7.04	7.7	7.45	7.57	7.85	7.89	7.95	7.49	7.44
Specific Conductivity			uS/cm	1925	1807	1664	1517	1494	2098	1834	1713	1840	1121	1732	1440	1102	1322	2009	1040	1432	167.2	2538	2375	2190	1896	3391	1917	2151	286.3
Temperature			deg C	15.5	18.78	17.75	12.2	10.06	11.1	15.8	18.5	18.3	9.6	10.2	17.2	11	10.84	10.5	16.3	11.2	18.8	14.6	14.5	12.8	8.05	13	14	13	15.2
Turbidity			NTU	2.3	3.22	0.58	1.26	1.56	1.1	2.41	0.68	4.38	1.11	1.54	1.4	1.81	0.31	2.5	2.39	1.99	1.48	3.4	1.63	1.72	2.89	2.91	3.85	2.78	3.9

Notes:
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Remediation Closure Guidance Table A-6 Screening Levels - 2021
Revision

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"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
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"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW09																				
				2016-07-13	2016-09-08	2016-11-09	2017-01-10	2017-03-01		2017-04-26		2017-06-28	2017-08-23	2017-10-03	2018-03-14	2018-04-23	2018-10-25	2019-05-02		2019-11-07	2020-04-24	2020-10-23	2021-04-20	2021-09-23
				N	N	N	N	FD	N	FD	N	N	N	N	N	N	N	FD	N	N	N	N	N	N
Appendix III Parameters																								
Boron		4	mg/L	5.7	4.7	7.3	5.3	7.7	7.6	5.9	6.1	4.9	7.9	7.3		4.9	6.3	3	3	2.7	3.3	3.7	3.5	3.8
Calcium			mg/L	320	240	210	210	200	200	220	240	270	280	220		220	220	200	200	150	178	192	168	227
Chloride			mg/L	63	55	58	58	75	73	71	67	53	39	64		58	82	46	46	39	54.4	59.8	41.6	54.7
Fluoride	4	4	mg/L	0.15 J+	10 U	10 U	0.22 J	0.13 J	0.14 J	0.16 J	0.13 J	0.18 J	2 JO	0.21 J	5 U	0.26 J-	0.28	0.27	0.27	0.33	0.3 J-	0.31	0.26	0.34
pH			SU	7.27	7.25	7.12	6.68		7.44		7.15	7.25	7.31	7.3	7.28	6.87	6.88		7.1	7.06	7.15	7.92	8.48 O	7.51
Sulfate			mg/L	910 J-	570	360	500	440	420	460	460	600	740	540		510	510 J-	530	530	380	390	397	418	509
Total Dissolved Solids			mg/L	1500	1100	880	980	1000	990	1000	960	1300	1400	1100		930	1100	970	980	770	772	796	659	1040
Appendix IV Parameters																								
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0015 J	0.0013 J	0.00076 J	0.0031 J	0.005 U	0.005 U	0.0028 J	0.0029 J	0.002 J	0.0027 J		0.005 U		0.005 U	0.005 U	0.005 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U
Barium	2	2	mg/L	0.059	0.043	0.036	0.039	0.035	0.037	0.039	0.042	0.047	0.054		0.041	0.039	0.039	0.041	0.041	0.036	0.032	0.046	0.037	0.053
Beryllium	0.004	0.004	mg/L	0.00012 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00036 J	0.001 U	0.001 U	0.001 U		0.001 UO		0.00092 J	0.00058 J	0.00052 J	0.00049 J	0.00039	0.0002 U	0.0002 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.00033 J	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.0036	0.002 U	0.00062 J	0.0013 J	0.002 U	0.002 U	0.002 U	0.002 U	0.0011 J	0.0015 J		0.0016 J		0.002 U	0.0012 J	0.0012 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.001 U	0.00018 J	0.0002 J	0.0002 J	0.001 U	0.001 U	0.00029 J	0.00025 J	0.001 U	0.001 U		0.001 U		0.00038 J	0.00049 J	0.00055 J	0.00035 J	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	4	4	mg/L	0.15 J+	10 U	10 U	0.22 J	0.13 J	0.14 J	0.16 J	0.13 J	0.18 J	2 JO	0.21 J	5 U	0.26 J-	0.28	0.27	0.27	0.33	0.3 J-	0.31	0.26	0.34
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0019 J	0.008 U	0.008 U	0.0016 J	0.0011 J	0.0012 J	0.008 U	0.008 U	0.0017 J	0.0018 J		0.008 U		0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.02	0.017	0.029	0.023	0.027	0.027	0.021	0.021	0.028	0.032		0.025	0.035	0.04	0.043	0.043	0.035	0.052	0.051	0.04	0.058
Radium 226 + 228	5		pCi/L	1.5	0.568	0.477 U	0.467 U	0.55	0.469	0.593	0.414	0.707	0.803		1.45 J+	0.096	0.679	0.505	0.427 U		1.47 U		0.649 U	
Selenium	0.05	0.05	mg/L	0.014	0.0091	0.0049 J	0.011	0.014	0.014	0.019	0.02	0.013	0.027		0.0082	0.011	0.0098	0.012	0.012	0.0077	0.0096	0.0082	0.0053	0.0079
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																								
Dissolved Oxygen			mg/L	3.59	6.69	1.98	6.1		3.41		3.92	5.27	3.24	5.98	6.71	5.43	0.22		5.82	5.54	3.14	3.43	3.42	6.2
Oxidation Reduction Potential			millivolts	-1.4	75.7	27.6	236		90.5		152.6	280.8	58.9	139.5	-116.3	-90.8	-48.8		53.6	-25.7	44	337.2	-20.6	0.2
pH			SU	7.27	7.25	7.12	6.68		7.44		7.15	7.25	7.31	7.3	7.28	6.87	6.88		7.1	7.06	7.15	7.92	8.48	7.51
Specific Conductivity			uS/cm	1671	736	1110	822		1041		1209	702	1542	1331	600	1156	1274		888	685	774	1218	970	138.4
Temperature			deg C	14.4	18.4	16.9	11.9		10.75		11.9	14.7	17.2	18.2	10.2	10.6	17.9		11.4	15.9	10.3	17.8	10.6	18.7
Turbidity			NTU	1.59	3.92	1.15	1.34		3.12		1.88	1.91	0.91	0.39	0.82	2.44	2.41		3.41	1.55	2.37	4	1.02	2.95

Notes:
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Remediation Closure Guidance Table A-6 Screening Levels - 2021
Revision

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"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
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"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW09B																							
				2016-07-13		2016-09-08	2016-11-09	2017-01-10	2017-03-01	2017-04-26	2017-06-28	2017-08-23		2017-10-03	2018-03-14	2018-04-23	2018-09-06	2018-10-26	2019-05-08		2019-11-07	2020-04-27	2020-10-23	2021-04-20		2021-09-23
				FD	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	FD	N	N	N	N	N	FD	N	N
Appendix III Parameters																											
Boron		4	mg/L	24	25	25	16	11	11	11	12	16	16	16		14	12	12	14	14	8	6.1	6.3	6.1	6.2	6.7
Calcium			mg/L	260	280	270	190	200	170	170	180	180	180	160		160	150	180	150	150	150	148	162	169	171	163
Chloride			mg/L	210	180	190	130	110	120	130	150	170	160	140		150	180	150	140	140	110	117	107	102	94	113
Fluoride	4	4	mg/L	0.54 J+	0.55 J+	0.67 J	0.68 J	0.1 J	1.3 J	1.2 J	1.4 J	1.2 J	0.37 J	1.5 J	1.4 J	1.6 J	1.8 J	1.6	1.6	1.6	1.5	1.3	1.4	1.4	1.4	1.4	1.3
pH			SU		7.08	7.15	6.96	7.36	7.44	7.29	7.36		7.46	7.36	7.56	7.43	7.32	7.46		7.49	7.56	7.65	8		10.49 O	7.56
Sulfate			mg/L	970 J-	1000 J-	960	740	670 J+	550	570	640	630	650	550		430	570	580	510	520	440	387	540	582 J	1040 J	773
Total Dissolved Solids			mg/L	2100	2000	2100	1700	1300	1200	1200	1500	1500	1500	1300		990	1300	1200	1200	1200	990	906	1010	1030	982	1430
Appendix IV Parameters																											
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0024 J	0.0026 J	0.002 J	0.0014 J	0.0027 J	0.005 U	0.004 J	0.004 J	0.0031 J	0.0031 J		0.0054	0.0064	0.0044 J	0.004 J	0.0052	0.0057	0.0042 J	0.0049	0.0034	0.0033	0.0034	0.0031
Barium	2	2	mg/L	0.069	0.071	0.076	0.062	0.048	0.04	0.046	0.055	0.062	0.058		0.045	0.04	0.049	0.047	0.042	0.041	0.029	0.034	0.039	0.036	0.035	0.059
Beryllium	0.004	0.004	mg/L	0.00012 J	9.1E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.00027 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.001 U	0.001 U	0.00069 J	0.00028 J	0.00045 J	0.001 U	0.00028 J	0.00045 J	0.00041 J	0.00041 J		0.001 U		0.00058 J	0.00028 J	0.00022 J	0.00025 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	4	4	mg/L	0.54 J+	0.55 J+	0.67 J	0.68 J	0.1 J	1.3 J	1.2 J	1.4 J	1.2 J	0.37 J	1.5 J	1.4 J	1.6 J	1.8 J	1.6	1.6	1.6	1.5	1.3	1.4	1.4	1.4	1.4	1.3
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.00017 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0055 J	0.0065 J	0.008 U	0.008 U	0.0049 J	0.0045 J	0.0056 J	0.0054 J	0.0047 J	0.0042 J		0.0031 J		0.0037 J	0.0052 J	0.0053 J	0.0055 J	0.0033 J	0.008 U	0.008 U	0.008 U	0.008 U	0.0095
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.01 U	0.0079 J	0.0075 J	0.0097 J	0.013	0.015	0.015	0.013	0.0094 J	0.01		0.014	0.012	0.01	0.011	0.012	0.012	0.0096 J	0.013	0.011	0.012	0.012	0.015
Radium 226 + 228	5		pCi/L	1.12	1.86	1.65	1.14	0.453	1.09	0.774	1.85	1.01	1.27		1.18 J+	0.868	1.04	1.24 J+	1.03	1.01		1.28 U		0.924 U	1.67 U	
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.002 J	0.005 U	0.0014 J	0.001 J	0.0015 J	0.0016 J		0.005 U		0.002 J	0.0019 J	0.005 U	0.005 U	0.0011 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	0.002	0.002	mg/L	0.0003 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.0002 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																											
Dissolved Oxygen			mg/L		0.44	1.06	0.43	0.38	0.44	0.61	0.71		0.57	0.45	0.1	0.04	0.61	0.28		0.04	0.35	0.17	0.34		0.2	0.31
Oxidation Reduction Potential			millivolts		-57.7	67.3	-76.4	-100.1	-80.6	-102.6	68.2		19.7	-46.8	-121.6	-130.5	-100.5	-101.1		-16.8	-131.8	-106	-29.9		-113.1	0.204
pH			SU		7.08	7.15	6.96	7.36	7.44	7.29	7.36		7.46	7.36	7.56	7.43	7.32	7.46		7.49	7.56	7.65	8		10.49	7.56
Specific Conductivity			uS/cm		2356	2435	2088	1559	1352	1592	1561		1922	1722	1053	1301	1556	1693		1165	9.24	1419	1513		1459	201.2
Temperature			deg C		14.1	14.7	15.1	13.6	13.45	14.5	14.8		15.5	16	14	14.4	16.1	16		14.2	14.4	13.3	15.4		13.4	16.4
Turbidity			NTU		3.48	4.29	2.17	0.99	2.58	1.88	1.69		2.54	1.96	4.18	4.11	2.96	1.39		4.7	3.36	4.8	2.76		4.26	3.02

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Remediation Closure Guidance Table A-6 Screening Levels - 2021
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"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW15																		
				2016-07-13	2016-09-08		2016-11-09	2017-01-11	2017-03-02	2017-04-27	2017-06-29	2017-08-23	2017-10-03	2018-03-15	2018-04-24	2018-10-26	2019-05-06	2019-11-08	2020-04-27	2020-10-27	2021-04-16	2021-09-22
				N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Appendix III Parameters																						
Boron		4	mg/L	0.75	0.45 J	1 J	1.1	0.6	0.44	0.45	0.87	0.91	0.66		0.72	0.76	0.71	0.73	0.68	0.47 O	8 O	3.5
Calcium			mg/L	100	130	120	100	82	81	95	160	150	77		170	120	140	100	128	122 O	160 O	136
Chloride			mg/L	28	31	31	27	28	27	27	27	25	19		24	21	22	28	25.2	95.7 O	99.3 O	49.8
Fluoride	4	4	mg/L	1.2 J+	0.85 J	0.85 J	0.74 J	0.8 J	0.77 J	0.74 J	0.82 J	0.82 J	0.93 J	0.67 J	0.76 J	0.69	0.52	0.73	0.6	0.85 O	0.76 O	0.77 J-
pH			SU	6.88		6.98	6.83	6.96	6.99	6.76	6.61	6.96	6.88	6.95	6.89	5.2	7.1	7.34	7.34	7.02 O	7.1 O	7.12
Sulfate			mg/L	160 J-	260	260	150	140	140	160	300	330	260		410	240	380	260	227	153 O	371 O	265
Total Dissolved Solids			mg/L	570	660	630	520	400	400	420	780	750	660		790	5900 O	740	640	572	556 O	770 O	675
Appendix IV Parameters																						
Antimony	0.006	0.006	mg/L	0.002 U	0.00041 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.001 U	0.001 UO	0.001 UO	0.001 U
Arsenic	0.01	0.01	mg/L	0.056	0.072	0.069	0.078	0.076	0.054	0.062	0.059	0.066		0.058		0.091	0.081	0.075	0.061	0.078 O	0.046 O	0.09
Barium	2	2	mg/L	0.044	0.053	0.053	0.039	0.032	0.031	0.034	0.054	0.058		0.047		0.046	0.047	0.037	0.039	0.053 O	0.058 O	0.05
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 UO	0.0002 UO	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 UO	0.0002 UO	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.002 U	0.00027 J	0.00028 J	0.00029 J	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 UO	0.002 UO	0.002 U
Cobalt		0.006	mg/L	0.0019	0.0022	0.0022	0.0021	0.0019	0.0018	0.0022	0.0029	0.0027		0.0025		0.0023	0.0035	0.0017	0.0018	0.0019 O	0.003 O	0.0021
Fluoride	4	4	mg/L	1.2 J+	0.85 J	0.85 J	0.74 J	0.8 J	0.77 J	0.74 J	0.82 J	0.82 J	0.93 J	0.67 J	0.76 J	0.69	0.52	0.73	0.6	0.85 O	0.76 O	0.77 J-
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 UO	0.001 UO	0.001 U
Lithium		0.04	mg/L	0.0053 J	0.008 U	0.008 U	0.008 U	0.004 J	0.0024 J	0.0041 J	0.0058 J	0.005 J		0.0023 J		0.0054 J	0.0053 J	0.0027 J	0.008 U	0.008 UO	0.008 UO	0.01
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UO	0.0002 UO	0.0002 U
Molybdenum		0.1	mg/L	0.02	0.027	0.026	0.023	0.022	0.022	0.026	0.017	0.019		0.029		0.016	0.017	0.029	0.031	0.031 O	0.028 O	0.027
Radium 226 + 228	5		pCi/L	5 U	0.479	0.513	0.646 U	0.555 J+	0.339 U	0.463 U	0.335	0.342 U		0.657 J+		0.858 J+	0.476 U		1.72 U		0.191 UO	
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U		0.005 U		0.005 U	0.005 U	0.005 U	0.001 U	0.001 UO	0.0036 O	0.001 U
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 UO	0.001 UO	0.001 U
Field Parameters																						
Dissolved Oxygen			mg/L	0.48		0.48	0.14	0.25	0.16	0.19	1	0.32	0.29	0.06	0.02	1.97	0.15	0.12	0.09	0.3	0.2	0.28
Oxidation Reduction Potential			millivolts	-79.2		-60.1	-111	-114.3	-104.1	-104.4	-46.9	-43.7	-13.8	-56.8	-99.1	-254.7	-27.5	-100	-103.9	-45.8	-64.1	0.193
pH			SU	6.88		6.98	6.83	6.96	6.99	6.76	6.61	6.96	6.88	6.95	6.89	5.2	7.1	7.34	7.34	7.02	7.1	7.12
Specific Conductivity			uS/cm	779		909	733	594	584	674	9.32	1004	901	581	933	855	730	598	950	941	1153	104.8
Temperature			deg C	15.3		20.3	19.9	14.6	12.1	11.6	14.6	16.6	18.1	10.8	10.6	17.1	8.3	15.8	11.5	22.3	14.38	19.2
Turbidity			NTU	4.48		2.96	3.41	3.98	4.4	4.92	4.2	3.1	4.11	3.98	4.29	3.1	4.9	6.9	4.51	4.15	9.82	6.36

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NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW15B																						
				2016-07-13	2016-09-08	2016-11-09	2017-01-11	2017-03-02	2017-04-27	2017-06-29	2017-08-24	2017-10-03	2018-03-15	2018-04-24	2018-09-06		2018-10-26	2019-05-08	2019-11-08		2020-04-27	2020-10-27	2021-04-16		2021-09-22
				N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	FD	N	N	N	FD	N	N	N
Appendix III Parameters																										
Boron		4	mg/L	1.1	1.7	2	3.7	3.3	3.6	3.1	2.1	2.1		4.4		4.1	4.9	10		6.2	7.9	42.5 O	32.7 O	32.5 O	28.1
Calcium			mg/L	160	160	160	180	160	170	190	170	73		230		200	210	280		280	273	446 O	335 O	321 O	352
Chloride			mg/L	52	58	62	81	64	65	71	64	64		87		89	93	110		80	104	613 O	372 O	396 O	269
Fluoride	4	4	mg/L	0.65 J+	0.62 J	0.46 J	0.74 J	0.77 J	0.75 J	0.72 J	0.61 J	0.5 J	0.69 J	0.79 J		0.6 J	0.6	0.84 J+		0.89	0.84	0.41 O	0.37 O	0.35 O	0.44 J-
pH			SU	7.81	7.49	7.04	7.52	7.48	7.11	7.26	7.37	7.42	7.45	7.36		7.8	6.74	7.43		7.57	7.56	6.6 O		7.15 O	7.08
Sulfate			mg/L	380 J-	390	340	500	390	460	530	540	500		790		720	770	1300		940	912	468 O	596 O	643 O	900
Total Dissolved Solids			mg/L	830	800	840	1000	890	980	1200	1100	1100		1400		1400	1400	2100		1600	1720	2170 O	1740 O	1870 O	2030
Appendix IV Parameters																										
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U			0.002 U	0.002 U	0.002 U		0.002 U	0.001 U	0.001 UO	0.001 UO	0.001 UO	0.001 U
Arsenic	0.01	0.01	mg/L	0.003 J	0.0011 J	0.0014 J	0.0022 J	0.0011 J	0.00098 J	0.00084 J	0.00081 J		0.005 U			0.005 U	0.005 U	0.00088 J		0.005 U	0.001 U	0.001 UO	0.001 UO	0.001 UO	0.001 U
Barium	2	2	mg/L	0.054	0.053	0.056	0.056	0.051	0.052	0.064	0.069		0.068			0.07	0.064	0.081		0.054	0.054	0.21 O	0.18 O	0.18 O	0.17
Beryllium	0.004	0.004	mg/L	7.8E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U			0.001 U	0.001 U	0.001 U		0.001 U	0.0002 U	0.0002 UO	0.0002 UO	0.0002 UO	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U			0.001 U	0.001 U	0.001 U		0.001 U	0.0002 U	0.0002 UO	0.0002 UO	0.0002 UO	0.0002 U
Chromium	0.1	0.1	mg/L	0.00062 J	0.002 U	0.002 U	0.00033 J	0.00034 J	0.002 U	0.002 U	0.002 U		0.002 U			0.002 U	0.002 U	0.002 U		0.002 U	0.002 U	0.002 UO	0.002 UO	0.002 UO	0.002 U
Cobalt		0.006	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.00016 J	0.001 U	0.001 U	0.001 U		0.00029 J			0.00037 J	0.001 U	0.001 U		0.001 U	0.001 U	0.001 UO	0.0011 O	0.001 O	0.001 U
Fluoride	4	4	mg/L	0.65 J+	0.62 J	0.46 J	0.74 J	0.77 J	0.75 J	0.72 J	0.61 J	0.5 J	0.69 J	0.79 J		0.6 J	0.6	0.84 J+		0.89	0.84	0.41 O	0.37 O	0.35 O	0.44 J-
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.00023 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U			0.001 U	0.001 U	0.001 U		0.001 U	0.001 U	0.001 UO	0.001 UO	0.001 UO	0.001 U
Lithium		0.04	mg/L	0.0069 J	0.008 U	0.008 U	0.0077 J	0.0053 J	0.0082	0.0082	0.0077 J		0.007 J			0.008	0.0096	0.012		0.0085	0.0086	0.015 O	0.011 O	0.012 O	0.026
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U			0.0002 U	0.0002 U	0.0002 U		0.0002 U	0.0002 U	0.0002 UO	0.0002 UO	0.0002 UO	0.0002 U
Molybdenum		0.1	mg/L	0.011	0.013	0.01	0.012	0.015	0.014	0.014	0.012		0.011			0.01	0.011	0.012		0.01	0.012	0.001 UO	0.0012 O	0.0012 O	0.0029
Radium 226 + 228	5		pCi/L	1.26	0.594	0.61	1.14 J+	0.876	0.687	0.789	0.872		1.69 J+			1.31	1.51 J+	1.61			1.63 U		2.96 O	2.15 O	
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U		0.005 U			0.0017 J	0.005 U	0.005 U		0.005 U	0.001 U	0.001 UO	0.001 UO	0.001 UO	0.001 U
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U			0.001 U	0.001 U	0.0003 J		0.001 U	0.001 U	0.001 UO	0.001 UO	0.001 UO	0.001 U
Field Parameters																										
Dissolved Oxygen			mg/L	0.22	0.91	0.56	0.22	0.46	0.3	0.43	0.64	0.23	0.08	0.04		0.29	2.06	0.23		0.16	0.16	0.36		0.26	0.32
Oxidation Reduction Potential			millivolts	-129.7	-21.6	-94.6	-132.6	-81.7	-79.6	-21.3	-36.5	-42.6	-64	-102.4		-91.2	-256.1	46.3		-189.2	-98.1	-7.2		-65.7	0.164
pH			SU	7.81	7.49	7.04	7.52	7.48	7.11	7.26	7.37	7.42	7.45	7.36		7.8	6.74	7.43		7.57	7.56	6.6		7.15	7.08
Specific Conductivity			uS/cm	834	1049	1060	1237	940	1096	1099	1110	1294	1255	1612		2757	1889	1798		1384	2359	3077		2491	286.6
Temperature			deg C	12.71	15.9	16.1	13.9	13.6	13	13.8	14.2	14.5	13.3	13		14.13	13.6	8.1		13.8	13.9	19.8		17.6	17
Turbidity			NTU	4.72	1.56	1.48	3.8	2.23	3.65	3.16	1.78	0.4	4.59	4.88		3.59	1.35	3.56		1.49	4.3	2.06		1.1	1.7

Notes:
IDEM RCG= Indiana Department of Environmental Management
Remediation Closure Guidance Table A-6 Screening Levels - 2021
Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW16																GAMW16R			
				2016-07-13	2016-09-08	2016-11-09	2017-01-11	2017-03-02	2017-04-27	2017-06-29	2017-08-24	2017-10-04	2018-03-15	2018-04-24	2018-10-29		2019-05-03	2019-11-08	2020-04-23	2020-10-29		2021-04-22	2021-09-21
				N	N	N	N	N	N	N	N	N	N	N	FD	N	N	FD	N	FD	N	N	N
Appendix III Parameters																							
Boron		4	mg/L	1.1	1.8	1.6	1.2	0.89	1.3	1	1.4	1.1		1.4	1.4	1.4	1.6		1.9	1.1	9.6 O	9.7 O	3.6 O	4.1
Calcium			mg/L	230	180	170	120	160	210	220	240	57		220	160	160	210		210	302	312 O	313 O	410 O	275
Chloride			mg/L	53	37	30	28	24	25	28	31	42		58	36	36	28		59	21.9	155 O	155 O	81.1 O	112
Fluoride	4	4	mg/L	1.4 J+	1.6 J	1.3 J	1.5	1.3 J	1.3 J	1.2 J	1.3 J	1.5 J	1 J	1.2 J	1.1	1.1	0.99		1.1	0.88	0.5 O	0.5 O	0.39 O	0.57
pH			SU	7.92	7.18	7.48	7.5	7.58	7.17	7.36	7.06	7.62	7.41	7.67		7.28	7.46		7.8	7.79		7.21 O	7.16 O	7.1
Sulfate			mg/L	530 J-	400	320	47 O	300	500	480	630	520		530	340	350	570		530	757	720 O	698 O	1060 O	633
Total Dissolved Solids			mg/L	1100	810	790	570	670	930	1000	1100	980		1100	740	730	1100		1100	1290	1600 O	1540 O	1850 O	1370
Appendix IV Parameters																							
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.00028 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U		0.002 U	0.001 U	0.001 UO	0.001 UO	0.001 UO	0.001 U
Arsenic	0.01	0.01	mg/L	0.011	0.0077	0.012	0.0084	0.0079	0.006	0.008	0.0096		0.002 J	0.0065	0.01	0.0098	0.005		0.0082	0.009	0.0059 O	0.0058 O	0.0042 O	0.0088
Barium	2	2	mg/L	0.049	0.042	0.035	0.024	0.029	0.043	0.044	0.054		0.057	0.045	0.035	0.035	0.034		0.034	0.046	0.097 O	0.097 O	0.074 O	0.06
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U		0.001 U	0.0002 U	0.0002 U	0.0002 UO	0.0002 UO	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U		0.001 U	0.0002 U	0.0002 U	0.0002 UO	0.0002 UO	0.0002 U
Chromium	0.1	0.1	mg/L	0.00062 J	0.002 U	0.002 U	0.0031	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U		0.002 U	0.002 U	0.002 UO	0.002 UO	0.002 UO	0.002 U
Cobalt		0.006	mg/L	0.001 U	0.00068 J	0.00051 J	0.00046 J	0.00055 J	0.00092 J	0.00094 J	0.0011		0.0013		0.00059 J	0.00061 J	0.00066 J		0.00061 J	0.0012	0.0039 O	0.004 O	0.0064 O	0.0038
Fluoride	4	4	mg/L	1.4 J+	1.6 J	1.3 J	1.5	1.3 J	1.3 J	1.2 J	1.3 J	1.5 J	1 J	1.2 J	1.1	1.1	0.99		1.1	0.88	0.5 O	0.5 O	0.39 O	0.57
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U		0.001 U	0.001 U	0.001 UO	0.001 UO	0.001 UO	0.001 U
Lithium		0.04	mg/L	0.00043 J	0.008 U	0.008 U	0.00023 J	0.008 U	0.008 U	0.008 U	0.008 U		0.008 U		0.008 U	0.008 U	0.008 U		0.008 U	0.008 U	0.008 UO	0.008 UO	0.008 UO	0.011
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 UO	0.0002 UO	0.0002 U
Molybdenum		0.1	mg/L	0.024	0.036	0.045	0.044	0.03	0.027	0.023	0.024		0.027	0.031	0.033	0.033	0.027		0.028	0.022	0.019 O	0.019 O	0.027 O	0.019
Radium 226 + 228	5		pCi/L	1.68	0.543	0.527 U	0.629 U	0.648	0.392 U	0.339 U	0.429		0.862 J+	0.29	0.862 J+	1.32 J+	0.685 U			1.69 U			0.968 UO	
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.0005 J	0.0005 J	0.005 U	0.0012 J	0.005 U	0.005 U		0.0015 J		0.005 U	0.005 U	0.005 U		0.0015 J	0.001 U	0.042 O	0.043 O	0.001 UO	0.001 U
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U		0.001 U	0.001 U	0.001 UO	0.001 UO	0.001 UO	0.001 U
Field Parameters																							
Dissolved Oxygen			mg/L	0.16	0.27	0.48	0.31	0.36	0.14	0.5	0.14	0.06	0.22	0.22		1.27	0.29		4.02	0.19		0.48	0.27	0.29
Oxidation Reduction Potential			millivolts	-18.06	711.6	-124.8	-78.8	-136.9	-73.6	-114.2	9.6	-158.4	-55.9	-106.5		-216.8	8		-2	-124.3		39.1	-78.9	0.208
pH			SU	7.92	7.18	7.48	7.5	7.58	7.17	7.36	7.06	7.62	7.41	7.67		7.28	7.46		7.8	7.79		7.21	7.16	7.1
Specific Conductivity			uS/cm	1331	1112	927	751	821	1257	1123	1406	1254	1029	1239		1046	1001		1014	1680		2098	2025	185
Temperature			deg C	15.02	18.8	18.15	12.1	9.72	10.6	15.41	18	17.8	8.71	9.2		17.81	10.5		17.52	10.3		20.4	15.08	25
Turbidity			NTU	3.89	2.16	1.93	3.16	4.14	3.25	4.33	2.45	4.95	4.62	12.81		3.64	4.65		3.98	8.11		2.69	4.65	1.79

Notes:
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Remediation Closure Guidance Table A-6 Screening Levels - 2021
Revision

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mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW16B																		GAMW16BR		
				2016-07-13	2016-09-08	2016-11-09		2017-01-11	2017-03-02	2017-04-27	2017-06-29	2017-08-24	2017-10-04	2018-03-15	2018-04-24	2018-09-07	2018-10-29	2019-05-06	2019-11-08		2020-04-24	2020-10-26	2021-04-22	2021-09-21
				N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N
Appendix III Parameters																								
Boron		4	mg/L	1.8	1.6	1.4	1.4	1.4	1.4	1.1	3.4	6.5	2.9		4.1	7.6	9.7	12	11	10	8.2	41 O	24.8 O	25.3
Calcium			mg/L	230	190	180	180	210	210	270	220	260	100		250	310	350	350	300	280	230	439 O	380 O	265
Chloride			mg/L	63	56	57	55	57	47	71	71	120	78		140	160	150	190	220	210	122	566 O	331 O	516
Fluoride	4	4	mg/L	1.1 J+	1.1 J	0.84 J	0.73 J	0.99 J	0.87 J	0.83 J	0.76 J	0.78 J	1 J	0.8 J	0.76 J	0.73 J	0.64	0.76	1	1	0.78 J-	0.68 O	0.41 O	2.6
pH			SU	7.76	7.47		7.41	7.57	7.55	7.3	7.51	7.28	7.54	7.6	7.65	7.97	7.02	7.49		7.85	7.73	7.2 O	7.21 O	7.5
Sulfate			mg/L	580 J-	480	500	440	50 O	470	730	720	640	580		690	760	890	940	1500	1500	884	570 O	723 O	2970
Total Dissolved Solids			mg/L	1100	1000	1000	1000	1000	1000	1300	1200	1400	1200		1400	20 UO	1600	1800	2400	2400	1860	2170 O	2080 O	5970
Appendix IV Parameters																								
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.00057 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.00095 J		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.001 UO	0.001 UO	0.001 U
Arsenic	0.01	0.01	mg/L	0.0068	0.0064	0.011	0.011	0.012	0.0095	0.012	0.0096	0.0081		0.0099	0.0097	0.011	0.0088	0.0071	0.0079	0.0076	0.008	0.001 UO	0.001 UO	0.0042
Barium	2	2	mg/L	0.072	0.04	0.036	0.035	0.038	0.039	0.055	0.043	0.046		0.053	0.058	0.068	0.071	0.079	0.055	0.054	0.043	0.091 O	0.073 O	0.041
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 UO	0.0002 UO	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.00022 J		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 UO	0.0002 UO	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.00029 J	0.002 U	0.00026 J	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 UO	0.002 UO	0.0023
Cobalt		0.006	mg/L	0.001 U	0.00016 J	0.00019 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.0003 J		0.00054 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 UO	0.001 UO	0.001 U
Fluoride	4	4	mg/L	1.1 J+	1.1 J	0.84 J	0.73 J	0.99 J	0.87 J	0.83 J	0.76 J	0.78 J	1 J	0.8 J	0.76 J	0.73 J	0.64	0.76	1	1	0.78 J-	0.68 O	0.41 O	2.6
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 UO	0.001 UO	0.001 U
Lithium		0.04	mg/L	0.0055 J	0.008 U	0.0032 J	0.0022 J	0.0058 J	0.0035 J	0.0072 J	0.006 J	0.0061 J		0.007 J		0.0059 J	0.0059 J	0.007 J	0.0054 J	0.0055 J	0.008 U	0.013 O	0.033 O	0.031
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UO	0.0002 UO	0.0002 U
Molybdenum		0.1	mg/L	0.013	0.012	0.012	0.012	0.012	0.013	0.023	0.016	0.013		0.016	0.015	0.012	0.011	0.014	0.02	0.019	0.017	0.001 UO	0.001 UO	0.043
Radium 226 + 228	5		pCi/L	1.31	1.05	0.866	0.794	0.998 J+	0.577	1.23	0.795	1.21		1.11 J+	0.99	1.17 J+	1.64 J+	0.984			1.5 U		2.06 O	
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.00061 J	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U		0.005 U		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.001 U	0.001 UO	0.001 UO	0.0013
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 UO	0.001 UO	0.001 U
Field Parameters																								
Dissolved Oxygen			mg/L	1.23	1.63		0.39	0.3	0.21	0.12	0.32	0.16	0.15	0.28	0.25	1.02	4.23	0.33		3.41	0.14	0.47	0.28	0.31
Oxidation Reduction Potential			millivolts	-122.6	-89		-126.3	-148.5	-132.2	-130.2	-123.1	-32.7	-135.8	-75.5	-117.8	-101.5	-166.8	21.2		-99.5	-129.6	-21.2	-95.1	0.212
pH			SU	7.76	7.47		7.41	7.57	7.55	7.3	7.51	7.28	7.54	7.6	7.65	7.97	7.02	7.49		7.85	7.73	7.2	7.21	7.5
Specific Conductivity			uS/cm	1147	1297		1158	1230	1192	1645	1333	1665	1461	1142	1653	3104	2098	1692		2340	2595	3281	2510	795.5
Temperature			deg C	13.04	14.44		15.27	14.3	13.37	12.3	13.48	14.3	15	12.6	12.3	15	17.7	11.2		14.65	13	17.5	16.38	19.5
Turbidity			NTU	4.1	3.99		1.8	2.76	4.21	4.58	3.27	2.48	3.9	4.08	4.2	4.99	3.49	3.72		2.81	6.61	8.93	7.82	20.19

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"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW17																		
				2016-07-14	2016-09-08	2016-11-09	2017-01-10	2017-03-02	2017-04-27	2017-06-29	2017-08-24	2017-10-04	2018-03-14		2018-04-23		2018-10-29	2019-05-09	2019-11-08	2020-04-24	2020-10-26	2021-04-14	2021-09-22
				N	N	N	N	N	N	N	N	N	FD	N	FD	N	N	N	N	N	N	N	N
Appendix III Parameters																							
Boron		4	mg/L	12	12	11	11	11	8.9	7.6	12	12			5.8	5.8	16	7.7	4.9	7.6	4.6	4.3	12.5
Calcium			mg/L	150	160	170	180	200	180	120	150	64			110	110	200	130	120	198	144	139	346
Chloride			mg/L	110	100	130	150	140	81	170	130	160			40	38	150	90	92	106	79.4	79	175
Fluoride	4	4	mg/L	1.8 J+	2.2 J	2 J	1.9 J	1.6 J	1.6 J	0.79 J	1.9 J	2.4 J	5 U	1.7 J	1.9 J	1.9 J-	1.7	1.6	1.7	1.2 J-	1.5	1.2	1.3 J-
pH			SU	7.56	7.27	7.21	7.33	7.54	7.23	7.4	7.16	7.22		7.62		7.82	6.85	7.53	7.75	7.34	7.38	7.3	7.16
Sulfate			mg/L	330 J-	330	360	390	390	390	520	250	350			240	220	430	300	290	459	396	358	964
Total Dissolved Solids			mg/L	940	920	940	1000	1100	950	1400	890	1000			630	620	1100	800	860	1120	726	806	1890
Appendix IV Parameters																							
Antimony	0.006	0.006	mg/L	0.00034 J	0.00032 J	0.00032 J	0.002 U	0.00028 J	0.002 U	0.002 U	0.002 U		0.002 U	0.002 U			0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0054	0.0056	0.0042 J	0.0069	0.0055	0.0054	0.0035 J	0.0028 J		0.005 U	0.0027 J			0.004 J	0.0021 J	0.0028 J	0.0023	0.0027	0.0024	0.0027
Barium	2	2	mg/L	0.047	0.056	0.054	0.05	0.054	0.048	0.044	0.06		0.041	0.058		0.029	0.073	0.041	0.052	0.067	0.071	0.059	0.17
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.00076 J	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.0015 J	0.002 U	0.0011 J	0.0011 J	0.0012 J	0.0012 J	0.002 U	0.002 U		0.0017 J	0.0014 J			0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	6.3E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0012	0.001 U
Fluoride	4	4	mg/L	1.8 J+	2.2 J	2 J	1.9 J	1.6 J	1.6 J	0.79 J	1.9 J	2.4 J	5 U	1.7 J	1.9 J	1.9 J-	1.7	1.6	1.7	1.2 J-	1.5	1.2	1.3 J-
Lead	0.015	0.015	mg/L	0.00018 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0047 J	0.008 U	0.0036 J	0.0047 J	0.0024 J	0.0045 J	0.0058 J	0.0076 J		0.008 U	0.0035 J			0.0066 J	0.0035 J	0.0052 J	0.008 U	0.008 U	0.008 U	0.021
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U	0.0002 U			0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.015	0.012	0.011	0.01 U	0.01	0.011	0.018	0.024		0.024	0.024		0.02	0.017	0.017	0.012	0.03	0.013	0.012	0.01
Radium 226 + 228	5		pCi/L	0.569	0.451 U	0.447 U	0.553 U	0.428	0.477	0.403 U	0.71		0.816 J+	0.384 U		0.205	1.1 J+	0.518 U		1.58 U		1.05 U	
Selenium	0.05	0.05	mg/L	0.019	0.03	0.018	0.023	0.028	0.026	0.0081	0.0032 J		0.0074	0.021		0.015	0.022	0.004 J	0.011	0.0011	0.0047	0.01	0.0036
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.00063 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																							
Dissolved Oxygen			mg/L	5.78	1.7	1.8	1.01	2.35	7.33	3.18	4.33	3.3		4.99		9	1.78	5.75	6.47	3.15	1.21	2.52	3.75
Oxidation Reduction Potential			millivolts	45.8	825.9	6.1	82.3	6.6	67.9	23.3	8	57.9		-90.2		-90.2	-237	53.1	35	25.2	234.5	29.8	10.2
pH			SU	7.56	7.27	7.21	7.33	7.54	7.23	7.4	7.16	7.22		7.62		7.82	6.85	7.53	7.75	7.34	7.38	7.3	7.16
Specific Conductivity			uS/cm	1059	1287	1141	1272	1541	1290	902	1151	1357		832		675	1513	894	798	1017	1188	1152	236.5
Temperature			deg C	17.23	20.6	18.63	13.6	10.95	11.8	17.71	24.4	22.3		10.9		11.4	20	12.1	17.23	9.31	20.4	11.95	21.8
Turbidity			NTU	1.56	1.09	0.58	2.58	0.44	2.21	1.02	1.5	2.51		0.54		1.19	0.45	0.44	0.86	0.73	3.85	1.25	1.47

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"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW17B																	
				2016-07-13	2016-09-08	2016-11-09	2017-01-10	2017-03-02	2017-04-27	2017-06-29	2017-08-23	2017-10-04	2018-03-14	2018-04-23	2018-09-06	2018-10-29	2019-05-09	2019-11-08	2020-04-24	2020-10-26	2021-04-14	2021-09-22
				N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Appendix III Parameters																						
Boron		4	mg/L	18	19	19	21	22	20	16	13	11		13	10	12	12	9.4	8.7	7.8	10.2	7.3
Calcium			mg/L	230	250	240	250	270	250	240	160	57		180	150	150	180	150	141	152	164	155
Chloride			mg/L	180	170	180	190	200	200	71	99	130		140	120	110	130	110	111	118	135	105
Fluoride	4	4	mg/L	0.9 J+	0.98 J	0.68 J	0.58 J	0.6 J	0.6 J	2.1 J	1.3 J	1.1 J	0.55 J	0.58 J	0.84 J	0.71	0.62	0.67	0.68 J-	0.53	0.3	0.49 J-
pH			SU	7.43	7.37	7.1	7.24	7.44	7.02	7.25	7.19	7.38	7.48	7.39	7.63	7.4	7.15	7.66	7.22	8.21	7.84	7.6
Sulfate			mg/L	710 J-	680	710	740	710	680	300	380	420		520	350	350	270	350	314	404	549	365
Total Dissolved Solids			mg/L	1500	1400	1400	1500	1700	1500	660	1000	960		1100	940	950	980	990	835	866	1250	928
Appendix IV Parameters																						
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0024 J	0.0021 J	0.0024 J	0.0035 J	0.0023 J	0.0022 J	0.0023 J	0.0026 J		0.0011 J		0.0017 J	0.0023 J	0.0022 J	0.0019 J	0.0015	0.0022	0.0012	0.0021
Barium	2	2	mg/L	0.078	0.079	0.086	0.092	0.1	0.089	0.065	0.06		0.085	0.069	0.066	0.073	0.11	0.074	0.065	0.061	0.094	0.053
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.00033 J	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.0003 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0015	0.001 U
Fluoride	4	4	mg/L	0.9 J+	0.98 J	0.68 J	0.58 J	0.6 J	0.6 J	2.1 J	1.3 J	1.1 J	0.55 J	0.58 J	0.84 J	0.71	0.62	0.67	0.68 J-	0.53	0.3	0.49 J-
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0017 J	0.008 U	0.008 U	0.0019 J	0.00046 J	0.0021 J	0.0019 J	0.008 U		0.008 U		0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.024	0.021	0.013	0.011	0.012	0.011	0.017	0.021		0.017	0.016	0.01	0.011	0.0073 J	0.01	0.014	0.0082	0.0058	0.012
Radium 226 + 228	5		pCi/L	1.79	1.84	2.53	2.58	1.25	1.94	1.03	2.4		1.64 J+	1.21	1.47	2.48 J+	1.71		1.74		1.47 U	
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.005 U	0.00053 J	0.00051 J	0.005 U	0.005 U	0.005 U		0.005 U		0.0011 J	0.005 U	0.005 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.00022 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																						
Dissolved Oxygen			mg/L	0.33	0.24	0.67	0.36	0.13	0.13	0.18	0.14	0.09	0.16	0.11	0.2	0.88	0.23	4.2	0.2	0.4	0.21	0.29
Oxidation Reduction Potential			millivolts	-115	654	-100.8	-119.6	-91.8	102.3	-98.6	-51.1	-129.4	-95.2	-131.9	-91.9	-244.5	11.8	-3.6	-94.1	-55.5	-117.5	0.215
pH			SU	7.43	7.37	7.1	7.24	7.44	7.02	7.25	7.19	7.38	7.48	7.39	7.63	7.4	7.15	7.66	7.22	8.21	7.84	7.6
Specific Conductivity			uS/cm	1525	1734	1568	171.9	2251	1950	1488	1244	1337	1235	1463	2077	1380	1060	890	920	1396	1778	138.8
Temperature			deg C	15.29	16.16	15.77	15	14.8	14.4	15.62	16.5	16.6	15.2	15.2	16.55	16.1	13.6	15.05	13.12	16.9	15.19	16.7
Turbidity			NTU	4.09	2.48	0.62	0.92	0.58	2.11	2.35	1.86	3.45	3.76	3.88	3.55	4.86	3.61	2.68	4.58	4	1.44	4.22

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"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW18																				
				2016-07-13	2016-09-08	2016-11-09		2017-01-10	2017-03-01	2017-04-26	2017-07-12		2017-08-23	2017-10-03		2018-03-14	2018-04-23	2018-10-25	2019-04-29	2019-11-07	2020-04-23	2020-10-23	2021-04-20	2021-09-16
				N	N	FD	N	N	N	N	FD	N	N	FD	N	N	N	N	N	N	N	N	N	N	N
Appendix III Parameters																								
Boron		4	mg/L	1.8	3.5	1.9	1.8	1.3	1	0.77	1.2	1.2	1.5	1.9	1.9		1.2	1.7	0.95	1.7	1.2	3.6	3.1	5.9
Calcium			mg/L	320	610 O	370	360	330	280	210	280	290	300	380 J	64 J		320	230	320	360	294	341	436	456
Chloride			mg/L	17	39	17	17	9.3	5	4.3	10	10	11	23	23		7.3	22	12	27	16.7	54.8	40.3	97
Fluoride	4	4	mg/L	0.047 J+	0.036 J	10 U	10 U	5 U	5 U	2 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	0.057	0.074	0.15	0.17	0.19	0.16	0.16 J-
pH			SU	6.95	6.83		6.7	6.88	7.11	6.6		6.96	7.02		6.91	7.2	7.21	6.54	6.71	7.18	6.96	7.1	10.36 O	7.1
Sulfate			mg/L	760 J-	1400	850	830	640	540	370	600	610	690	960	950		670	550	780	920	679	765	1310	1160
Total Dissolved Solids			mg/L	1300	2200	1500	1500	1200	1000	730	1100	1100	1300	1600	1500		2400	1100	1400	1500	1130	1450	1440	2020
Appendix IV Parameters																								
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.00096 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U			0.002 U		0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0014 J	0.0023 J	0.0014 J	0.00091 J	0.0014 J	0.005 U	0.0015 J	0.0021 J	0.0021 J	0.0011 J			0.005 U		0.005 U	0.00079 J	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U
Barium	2	2	mg/L	0.038	0.047	0.041	0.039	0.037	0.024	0.021	0.051	0.052	0.055			0.048	0.035	0.037	0.039	0.05	0.033	0.053	0.044	0.057
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	0.005	0.005	mg/L	8.1E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.00067 J	0.00046 J	0.0005 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U			0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.001 U	0.00023 J	0.00047 J	0.0002 J	0.00024 J	0.001 U	0.00023 J	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.00028 J	0.001 U	0.001 U	0.001 U	0.001 U	0.0011
Fluoride	4	4	mg/L	0.047 J+	0.036 J	10 U	10 U	5 U	5 U	2 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	0.057	0.074	0.15	0.17	0.19	0.16	0.16 J-
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.00051 J	0.00025 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.00067 J		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.00096 J	0.008 U	0.008 U	0.008 U	0.00042 J	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U			0.008 U		0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.011
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ			0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.11	0.18 O	0.14 O	0.13 O	0.094	0.1	0.1	0.1	0.11	0.1			0.097	0.085	0.057	0.062	0.076	0.071	0.079	0.082	0.14
Radium 226 + 228	5		pCi/L	5 U	0.803	0.474	0.449	0.581 U	0.398 U	0.384 U	0.493	0.337 U	0.629			0.373 U	0.259	0.477	0.365 U		1.74 U		0.538 U	
Selenium	0.05	0.05	mg/L	0.01	0.018	0.0065	0.0052	0.0099	0.011	0.0053	0.012	0.012	0.006			0.009	0.0084	0.015	0.015	0.012	0.018	0.034	0.042	0.028
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																								
Dissolved Oxygen			mg/L	4.83	4.77		5.93	7.52	8.86	7.79		6.04	4.52		5.32	6.5	8.49	3.78	7.01	2.95	5.6	6.58	6.82	5.39
Oxidation Reduction Potential			millivolts	98.9	76.8		28.7	106.8	97.9	209.2		203.2	24.7		121.9	-129.6	-51.6	-36.6	129.2	-41.1	241.3	320.6	-64.3	56.8
pH			SU	6.95	6.83		6.7	6.88	7.11	6.6		6.96	7.02		6.91	7.2	7.21	6.54	6.71	7.18	6.96	7.1	10.36	7.1
Specific Conductivity			uS/cm	1474	2362		1740	1255	986	970		1299	1414		1760	905	1170	1230	1060	1338	995	1921	1699	245.9
Temperature			deg C	16.3	20.1		16.6	9.65	8.47	11.2		17.9	19.8		19.3	8.1	8.9	17.4	8.8	14.2	9.18	17.4	10.29	21.4
Turbidity			NTU	3.32	1.63		2.38	3.05	4.44	2.48		1.71	1.03		4.16	4.59	0.71	1.29	4.55	2.04	1.33	2.84	2.84	3.74

Notes:
IDEM RCG= Indiana Department of Environmental Management
Remediation Closure Guidance Table A-6 Screening Levels - 2021
Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW18B										GAMW46											
				2018-09-10	2018-10-25		2019-04-29	2019-11-07	2020-04-23	2020-10-23	2021-04-21	2021-09-17		2018-06-13	2019-03-01	2019-04-17	2019-06-06	2019-07-18	2019-08-26	2019-10-04	2019-11-19	2020-04-21	2020-10-19	2021-04-27	2021-09-15
				N	FD	N	N	N	N	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Appendix III Parameters																									
Boron		4	mg/L	13	12	13	14	11	10.9	9	8.4	8.2	8.2	0.055 JO	0.1 U	0.033 J	0.1 U	0.032 J	0.053 J	0.043 J	0.049 J	0.1 U	0.1 U	0.1 U	0.1 U
Calcium			mg/L	260	200	220	240	180	299	301	317	325	323	56 O	14	28	25 J-	25	25	23	27	24.5	22.7	29.1	29.3
Chloride			mg/L	150	140	140	170	140	117	114	112	85.8	86.3	8.4 O	2.4	1.9		1.8	1.6	1.6	1.6	1.6	1.3	2.1	2.1
Fluoride	4	4	mg/L	0.77 J	0.74	0.73	0.88	0.99	0.91	0.8	0.35	0.6	0.6	0.052 JO	0.068	0.063		0.065	0.06	0.079 J+	0.062	0.062	0.05 U	0.078	0.11
pH			SU	7.73		6.86	7.15	7.68	7.21	7.43	7.51		7.34	7.93	8.17	8.23	7.52	8.15	7.9	7.81	7.77	8.64	8.67	8.36	8.16
Sulfate			mg/L	1100	1000	1100	1100	840	1220	1240	1260	1100	1120	55 O	34	30		28	29	30	27	24.7	23.9	33 J+	31.8
Total Dissolved Solids			mg/L	2100	2000	2000	2100	1500	2060	1830	3340	1930	2010	260 O	160	150		130	150	140 J+	140	101	85	112	137
Appendix IV Parameters																									
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002 UO	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0018 J	0.0026 J	0.0028 J	0.0037 J	0.0041 J	0.0029	0.0025	0.0025	0.0028	0.0027	0.0014 JO	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.00086 J	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U
Barium	2	2	mg/L	0.048	0.035	0.039	0.039	0.024	0.041	0.032	0.041	0.028	0.029	0.027 O	0.0028 J	0.0059	0.0065	0.0054	0.0054	0.0049 J	0.0059	0.0053	0.0046	0.005	0.0044
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 UO	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00054 J	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 UO	0.002 U	0.002 U	0.002 U	0.002 U	0.0014 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.00027 J	0.00026 J	0.00028 J	0.00024 J	0.00024 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 JO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	4	4	mg/L	0.77 J	0.74	0.73	0.88	0.99	0.91	0.8	0.35	0.6	0.6	0.052 JO	0.068	0.063		0.065	0.06	0.079 J+	0.062	0.062	0.05 U	0.078	0.11
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.025	0.015	0.016	0.023	0.015	0.026	0.03	0.037	0.031	0.028	0.008 UO	0.04 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UO	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.024	0.014	0.015	0.026	0.011	0.039	0.05	0.074	0.03	0.031	0.0031 JO	0.01	0.01 U	0.01 U	0.01 U	0.01 U	0.0015 J	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U
Radium 226 + 228	5		pCi/L	1.7	1.28	1.46			1.7 U		2.14			0.384 UO	0.486 U	0.33 U		0.427 U	0.505 U	0.566		1.7 U		1.28 U	
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 JO	0.025 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00059 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																									
Dissolved Oxygen			mg/L	0.24		0.29	0.92	0.36	0.18	0.35	0.25		0.19	0.12	1.85	4.18	6.44	6.58	4.03	2.44	3.36	3.42	4.78	1.59	1.26
Oxidation Reduction Potential			millivolts	-140.7		-103.4	109.2	-144.8	-77.7	15.9	-104.5		0.192	-171.4	1.9	7.7	157.6	25.5	40.6	9.16	-141.1	125.6	127	109.8	-130
pH			SU	7.73		6.86	7.15	7.68	7.21	7.43	7.51		7.34	7.93	8.17	8.23	7.52	8.15	7.9	7.81	7.77	8.64	8.67	8.36	8.16
Specific Conductivity			uS/cm	3311		2147	1902	1475	1897	2646	2494		247.3	367	155	161	179	153	153	152	132	208	175.1	238.2	238
Temperature			deg C	15.39		14.9	11.8	13.7	12.1	15.2	12.15		15.8	11.4	8	9.1	11.1	13.2	14.2	14.8	11.7	8.3	13.5	10.7	15.1
Turbidity			NTU	2.78		3.58	3.21	3.14	2.35	3.28	4.19		4.59	3.96	1.91	1.33	0.51	0.82	0.69	0.89	0.66	2.18	3.02	1.73	3.21

Notes:
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Remediation Closure Guidance Table A-6 Screening Levels - 2021
Revision

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"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
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"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW46B												GAMW52							
				2018-06-13	2019-03-04	2019-04-17	2019-06-07	2019-07-18	2019-08-26	2019-10-04	2019-11-19	2020-04-21	2020-10-19	2021-04-27	2021-09-15	2018-09-10	2018-10-31	2019-05-09	2019-11-1	2020-04-30	2020-10-22	2021-04-16	2021-09-30
				N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Appendix III Parameters																							
Boron		4	mg/L	0.05 JO	0.05 J	0.037 J	0.047 J	0.03 J	0.05 J	0.047 J	0.046 J	0.1 U	0.1 U	0.1 U	0.1 U	0.34	0.17	0.077 J	0.13	0.1 U	0.1	0.1	0.1
Calcium			mg/L	25 O	58	58	56	52	58	49	56	53.8	51	54.3	51	75	59	52	72	48.3	71.4	59.9	62.5
Chloride			mg/L	3 O	7.9	7.9		7.2	8	7.1	6.9	5.5	4.6	5.5	5.4	34	9.1	5.5	37	8.2	49.1	18.7	15.9
Fluoride	4	4	mg/L	0.048 JO	0.066	0.076		0.072	0.069	0.073 J+	0.072	0.084	0.058	0.077	0.12	0.36 J	0.3	0.25 J+	0.3	0.29	0.26	0.22	0.31
pH			SU	8.2	7.11	7.99	7.58	8.18	7.62	7.44	7.47	8.08	7.97	7.69	7.73	7.5	7.06	7.17	7.59	7.98	7.82	7.5	7.6
Sulfate			mg/L	29 O	64	64		64	68	65	64	58.8	60.5	61.6 J+	55.3	86	39	24	67	21.6	58.6	55.8	50.1
Total Dissolved Solids			mg/L	150 O	260	290		240	220 J	250	240	209	197	190	243	400	250	240	350	205	336	269	276
Appendix IV Parameters																							
Antimony	0.006	0.006	mg/L	0.002 UO	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0015 JO	0.0012 J	0.00076 J	0.005 U	0.00091 J	0.00095 J	0.0013 J	0.001 J	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.005 U	0.005 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U
Barium	2	2	mg/L	0.0086 O	0.027	0.026	0.025	0.023	0.024	0.021	0.025	0.025	0.023	0.025	0.023	0.039	0.019	0.015	0.02	0.013	0.014	0.011	0.014
Beryllium	0.004	0.004	mg/L	0.001 UO	0.0011	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0011	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.00024 J	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.0021 O	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.00034 JO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00058 J	0.00031 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	4	4	mg/L	0.048 JO	0.066	0.076		0.072	0.069	0.073 J+	0.072	0.084	0.058	0.077	0.12	0.36 J	0.3	0.25 J+	0.3	0.29	0.26	0.22	0.31
Lead	0.015	0.015	mg/L	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.008 UO	0.0017 J	0.008 U	0.008 U	0.002 J	0.008 U	0.008 U	0.003 J	0.008 U	0.008 U	0.008 U	0.008 U	0.0017 J	0.008 U	0.008 U	0.0025 J	0.008 U	0.008 U	0.008 U	0.008 U
Mercury	0.002	0.002	mg/L	0.0002 UO	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.0018 JO	0.0024 J	0.0022 J	0.0025 J	0.0028 J	0.0028 J	0.0025 J	0.003 J	0.0021	0.0022	0.0018	0.0018	0.005 J	0.0035 J	0.0016 J	0.0017 J	0.0012	0.0022	0.0021	0.0025
Radium 226 + 228	5		pCi/L	0.392 UO	0.402 U	0.308 U		0.427 U	0.609 U	0.408 U		1.68 U		1.65 U		0.796	1 J+	0.53 U		1.64 U		0.23 U	
Selenium	0.05	0.05	mg/L	0.0017 JO	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0014 J	0.0017 J	0.0014 J	0.0011 J	0.001 U	0.0011	0.0011	0.001 U
Thallium	0.002	0.002	mg/L	0.001 UO	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00068 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																							
Dissolved Oxygen			mg/L	3.59	0.08	1.9	0.3	1.4	1.25	0.31	0.3	0.17	1.1	0.64	0.2	0.48	0.21	6.42	2.2	6.9	0.35	0.91	0.56
Oxidation Reduction Potential			millivolts	-29.4	111.9	-111.1	-133.1	-93.9	-119.9	33.7	-229.6	-137.1	-40.5	-101.3	-241	-30.3	85.1	108.2	-43.2	165.6	227.8	-23.1	0.38
pH			SU	8.2	7.11	7.99	7.58	8.18	7.62	7.44	7.47	8.08	7.97	7.69	7.73	7.5	7.06	7.17	7.59	7.98	7.82	7.5	7.6
Specific Conductivity			uS/cm	211	268	294	282	274	284	260	242	405	358.9	351	388	0.896	448	308	320	389	641	545	501
Temperature			deg C	11.3	9.6	10.8	11	11.9	12.3	12.3	11.3	10	11.7	11.37	12.2	19.97	17.6	14.2	15.3	10.9	19	12	20
Turbidity			NTU	3.45	3.26	4.3	3.25	3.11	1.15	4.16	2.84	4.02	4.69	4.58	4.3	0.45	0.83	0.42	0.74	1.57	1.09	1.79	1.39

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"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
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"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW52B								GAMW53								
				2018-09-11	2018-10-31	2019-05-09	2019-11-14	2020-04-30	2020-10-23	2021-04-16	2021-09-30	2018-09-11	2018-10-30	2019-04-30	2019-11-14	2020-05-01	2020-10-23		2021-04-16	2021-09-30
				N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N
Appendix III Parameters																				
Boron		4	mg/L	0.75	0.8	1	1.3	0.77	1.7	1.2	0.64	0.19	0.25	0.056 J	0.13	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Calcium			mg/L	160	160	110	130	129	142	94.9	120	45	53	17	25	32	16.9	17	17.5	28.3
Chloride			mg/L	530	470	380	370	496	248	131	135	4.9	4.6	1.9	3.6	4.3	1.8	2	2.4	2.7
Fluoride	4	4	mg/L	10 U	0.18	0.21 J+	0.23	0.26	0.26	0.24	0.38	0.17 J	0.17	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
pH			SU	8.3	7.1	7.42	7.34	7.6	7.29	7.46	7.57	6	6.47	5.93	6.21	6.42		5.88	5.76	6.17
Sulfate			mg/L	210	190	220	290	216	259	181	156	51	56	37	36	32.6	26.6	28.2	35.2	49.4
Total Dissolved Solids			mg/L	1500	1300	1100	1100	1260	982	673	667	240	250	130	160	161	89	99	97	147
Appendix IV Parameters																				
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002 U	0.002 U	0.002 U	0.00061 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0013 J	0.0016 J	0.00083 J	0.0012 J	0.0011	0.001 U	0.0011	0.0011	0.013	0.015	0.00097 J	0.0018 J	0.0015	0.0014	0.0014	0.0012	0.0012
Barium	2	2	mg/L	0.32	0.31	0.25	0.28	0.29	0.23	0.15	0.14	0.027	0.028	0.019	0.026	0.023	0.022	0.023	0.027	0.033
Beryllium	0.004	0.004	mg/L	0.001 U	0.00042 J	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.00029 J	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.0019 J	0.0018 J	0.0012 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.001 U	0.00032 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00084 J	0.00099 J	0.0005 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	4	4	mg/L	10 U	0.18	0.21 J+	0.23	0.26	0.26	0.24	0.38	0.17 J	0.17	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0014	0.00089 J	0.00057 J	0.00063 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0041 J	0.0031 J	0.0033 J	0.0071 J	0.0086	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.0021 J	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.014	0.015	0.0095 J	0.0086 J	0.016	0.015	0.013	0.011	0.012	0.015	0.0051 J	0.011	0.0068	0.0066	0.0066	0.0052	0.0097
Radium 226 + 228	5		pCi/L	3.52	5.55 J+	2.63		2.44		1.05 U		0.547 U	1.45 J+	0.344 U		1.9 U			0 U	
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.005 U	0.005 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0019
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																				
Dissolved Oxygen			mg/L	0.44	0.1	0.15	0.19	0.09	1.02	0.42	0.28	0.53	0.86	3.11	0.84	1.39		1.16	1.99	0.92
Oxidation Reduction Potential			millivolts	-214.9	-103.5	6.31	-102.9	-104.2	-141.6	-123.5	0.241	-24.6	-199.5	43.7	-54.8	168		122.8	111.7	94.9
pH			SU	8.3	7.1	7.42	7.34	7.6	7.29	7.46	7.57	6	6.47	5.93	6.21	6.42		5.88	5.76	6.17
Specific Conductivity			uS/cm	1934	2005	1652	1353	2424	1400	1159	110.4	307	400	125	155	260		144	173	204
Temperature			deg C	17.26	16.6	15.3	16.1	15.3	17.1	15.8	18	21.3	20.1	11.4	17.5	13.3		19	13	20.4
Turbidity			NTU	1.6	0.88	2.35	1.01	4.92	2.36	3.9	1.27	9.93	5.17	4.76	4.8	4.8		2.19	4.56	4.51

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"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW53B								GAMW54							
				2018-09-11	2018-10-30	2019-04-30	2019-11-14	2020-05-01	2020-10-23	2021-04-16	2021-09-30	2018-09-10	2018-10-31	2019-04-30	2019-11-14	2020-05-04	2020-10-23	2021-04-19	2021-10-01
				N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Appendix III Parameters																			
Boron		4	mg/L	2.5	3.1	2.2	0.73	3.3	2.5	1.9	2.7	0.84	0.77	0.39	0.37	0.42	0.72	0.5	0.63
Calcium			mg/L	180	190	150	140	180	136	142	128	93	88	93	81	131	154	164	114
Chloride			mg/L	90	85	81	74	107	84.6	84.8	66.4	15	10	10	4	12.3	50.3	53.9	24.6
Fluoride	4	4	mg/L	0.52 J	0.46	0.51	0.7	0.46	0.58	0.4	0.46	0.18 J	0.17	0.14	0.28	0.18	0.28	0.2	0.3
pH			SU	7.3	7.35	7.41	7.52	7.48	7.39	7.28	7.48	6.24	7.92	6.82	7.08	6.74	6.21	6.52	6.82
Sulfate			mg/L	430	510	340	320	488	327	304	295	190	150	190	76	284	341	492	191
Total Dissolved Solids			mg/L	1100	1100	900	770	1060	730	748	802	500	400	470	350	618	689	735	506
Appendix IV Parameters																			
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0011 J	0.00074 J	0.00078 J	0.001 J	0.001 U	0.0011	0.001 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.00079 J	0.00083 J	0.001 J	0.0016 J	0.0028	0.001 U	0.001 U	0.0014	0.0024 J	0.0028 J	0.0022 J	0.0045 J	0.0045	0.0038	0.0075	0.024
Barium	2	2	mg/L	0.052	0.054	0.044	0.072	0.099	0.061	0.067	0.051	0.043	0.039	0.031	0.031	0.052	0.068	0.071	0.048
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.00059 J	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00053 J	0.00052 J	0.00062 J	0.001 U	0.001 U	0.001 U	0.0011	0.001 U
Fluoride	4	4	mg/L	0.52 J	0.46	0.51	0.7	0.46	0.58	0.4	0.46	0.18 J	0.17	0.14	0.28	0.18	0.28	0.2	0.3
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0042 J	0.0052 J	0.005 J	0.0066 J	0.011	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.0023 J	0.008 U	0.008 U	0.008 U	0.008 U
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.0083 J	0.0075 J	0.0098 J	0.02	0.016	0.011	0.015	0.011	0.043	0.044	0.023	0.03	0.014	0.023	0.011	0.025
Radium 226 + 228	5		pCi/L	1.69	0.48 J+	1.26		1.73		1.21 U		0.5	1.08 J+	0.393 U		1.51 U		0.694 U	
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0017 J	0.0012 J	0.0043 J	0.0035 J	0.0043	0.0029	0.0044	0.001 U
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.00049 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																			
Dissolved Oxygen			mg/L	0.26	0.8	0.36	0.09	0.12	0.65	0.39	0.24	0.61	1.41	0.72	0.26	0.65	1.04	0.68	0.29
Oxidation Reduction Potential			millivolts	-183.2	-168	27.7	-75.3	-118.9	-111.8	-104	-232.6	107.8	-294.7	48.4	-69.5	24.5	67.5	81.2	-153.9
pH			SU	7.3	7.35	7.41	7.52	7.48	7.39	7.28	7.48	6.24	7.92	6.82	7.08	6.74	6.21	6.52	6.82
Specific Conductivity			uS/cm	1354	1620	1160	870	1634	1091	1227	125.6	675	630	493	374	960	875	1097	782
Temperature			deg C	20.89	20.4	18.7	19.7	20.2	19.5	17.6	20	21.2	18.53	10.5	15.3	11.4	17	11.8	20.1
Turbidity			NTU	2.43	3	3.45	2.5	7.86	4.03	3.27	3.62	2.03	1	3.24	2.31	4.9	2.45	6.79	3.79

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"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
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"J+" = Indicates the result is estimated and may be biased high.

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"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW54B								GAMW55				GAMW55R				
				2018-09-10	2018-10-3	2019-05-01	2019-11-15	2020-05-0	2020-10-23	2021-04-19	2021-10-01	2018-09-10		2018-10-29		2019-11-15	2020-05-05	2020-10-28	2021-04-20	2021-10-01
				N	N	N	N	N	N	N	N	FD	N	FD	N	N	N	N	N	N
Appendix III Parameters																				
Boron		4	mg/L	5.6	6.5	5.9	6	2.7	2.2	3.1	3.1	1.9	1.9	1.8	1.8	1.1	0.96	0.95	0.87	1.7
Calcium			mg/L	210	220	200	240	214	195	236	190	260	250	270	260	180	169	170	237	197
Chloride			mg/L	100	95	110	120	68.3	49.2	83.9	70.4	58	59	69	70	61	46.3	48.2 J-	51.4	44.1
Fluoride	4	4	mg/L	0.41 J	0.52	0.59	0.58	0.54	0.59	0.53	0.52	0.51 J	0.52 J	0.47	0.47	0.62	0.52	0.63	0.46	0.51
pH			SU	6.95	8.71	7.27	7.2	7.43	6.97	7.3	7.36		6.77		7.04	7.31	7.51	7.45	7.6	7.27
Sulfate			mg/L	750	730	710	720	470	438	891	501	590	600	630	620	480	345	351	867	389
Total Dissolved Solids			mg/L	1600	1400	1500	1400	1000	878	1120	1030	1200	1300	1300	1300	950	846	789	842	948
Appendix IV Parameters																				
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0025 J	0.0032 J	0.0045 J	0.005	0.0042	0.0042	0.0044	0.004	0.00083 J	0.005 U	0.005 U	0.005 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U
Barium	2	2	mg/L	0.098	0.093	0.08	0.084	0.06	0.054	0.063	0.056	0.099	0.097	0.068	0.069	0.035	0.046	0.038	0.032	0.038
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0065	0.0058	0.0044	0.0044	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	4	4	mg/L	0.41 J	0.52	0.59	0.58	0.54	0.59	0.53	0.52	0.51 J	0.52 J	0.47	0.47	0.62	0.52	0.63	0.46	0.51
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0048 J	0.0036 J	0.0048 J	0.0074 J	0.008 U	0.008 U	0.008 U	0.008 U	0.0021 J	0.0017 J	0.008 U	0.008 U	0.0035 J	0.008 U	0.008 U	0.008 U	0.01
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.018	0.019	0.0085 J	0.012	0.018	0.029	0.017	0.025	0.03	0.028	0.026	0.026	0.024	0.02	0.025	0.013	0.017
Radium 226 + 228	5		pCi/L	2.03	2.7 J+	1.82		1.41 U		1.43		1.4	0.802	0.922 J+	1.24 J+		1.58 U		1.47 R	
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0037 J	0.0031 J	0.0027 J	0.0027 J	0.0046 J	0.0045	0.0028	0.0029	0.0046
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00021 J	0.001 U	0.00023 J	0.00022 J	0.00022 J	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																				
Dissolved Oxygen			mg/L	0.42	2.12	0.42	0.31	0.1	0.72	0.45	0.26		1.73		0.33	0.72	1.95	2.5	1.19	0.47
Oxidation Reduction Potential			millivolts	-123.4	-315.7	-23.1	-43.3	117.5	-143.2	-105.3	-211.7		21.6		-69.4	-28.9	148.6	12.8	32.3	-16.8
pH			SU	6.95	8.71	7.27	7.2	7.43	6.97	7.3	7.36		6.77		7.04	7.31	7.51	7.45	7.6	7.27
Specific Conductivity			uS/cm	1816	1983	1636	1310	0.63	1105	1626	149.4		1493		1574	1017	1270	994	1319	139.1
Temperature			deg C	17.6	17.29	15.5	15.8	15.6	16.2	14.3	17.3		21.1		19.4	16.7	12.8	17.6	11.3	20.6
Turbidity			NTU	4.2	1.64	4.49	1.67	4.31	4.6	6.74	3.54		1.74		0.66	2.26	2.4	1.2	2.35	1.59

Notes:
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Remediation Closure Guidance Table A-6 Screening Levels - 2021
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pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW55B										GAMW56							
				2018-09-11		2018-10-29	2019-05-01	2019-11-15	2020-05-05		2020-10-28	2021-04-20	2021-10-01	2018-09-11	2018-10-26	2019-04-29	2019-11-15	2020-05-0	2020-10-28	2021-04-20	2021-10-04
				FD	N	N	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N
Appendix III Parameters																					
Boron		4	mg/L	7.1	7.4	8.2	9.1	11	0.21 J	10.9 J	10.8	9.9	8.3	0.26	0.28	0.21	0.2	0.22	0.3	0.23	0.19
Calcium			mg/L	250	250	260	210	210	116 J	219 J	226	254	205	130	110	91	120	115	111	130	108
Chloride			mg/L	220	220	190	170	150	119	119	120 J-	120	79.4	3.1	2.4	3.2	2.1	2.8	3.2 J-	2.9	1.7
Fluoride	4	4	mg/L	0.29 J	10 U	0.25	0.31	0.31	0.33	0.32	0.28	0.3	0.3	1.2 J	0.99	0.53	0.71	0.66	0.83	0.05 U	1
pH			SU		7.07	7.19	7.31	7.46		7.45	7.56	7.7	7.44	6.82	7.17	6.83	7.06	7.05	7.07	7.05	7.09
Sulfate			mg/L	820	820	910	790	750	676	674	720	985	496	57	63	54	56	56.3	49.6	57.6	64.8
Total Dissolved Solids			mg/L	1800	1900	1800	1700	1400	1400	1420	1380	1370	1120	470	480	420	440	456	390	480	379
Appendix IV Parameters																					
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0014 J	0.0011 J	0.005 U	0.005 U	0.005 U	0.0079 J	0.001 UJ	0.001 U	0.001 U	0.001 U	0.019	0.022	0.011	0.0097	0.0076	0.0059	0.007	0.0018
Barium	2	2	mg/L	0.14	0.14	0.12	0.074	0.067	0.045 J	0.067 J	0.06	0.061	0.05	0.068	0.049	0.044	0.04	0.047	0.044	0.042	0.04
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.00034 J	0.00028 J	0.001 U	0.001 U	0.001 U	0.0087 J	0.001 UJ	0.001 U	0.001 U	0.001 U	0.0017	0.0053	0.0084	0.0081	0.0092	0.01	0.016	0.0045
Fluoride	4	4	mg/L	0.29 J	10 U	0.25	0.31	0.31	0.33	0.32	0.28	0.3	0.3	1.2 J	0.99	0.53	0.71	0.66	0.83	0.05 U	1
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0064 J	0.0064 J	0.0054 J	0.0055 J	0.0078 J	0.008 U	0.013	0.008 U	0.008 U	0.012	0.0034 J	0.0039 J	0.0023 J	0.0053 J	0.008 U	0.008 U	0.008 U	0.008 U
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.0057 J	0.0055 J	0.0055 J	0.0046 J	0.005 J	0.009 J	0.0053 J	0.0062	0.0068	0.0058	0.013	0.0094 J	0.0072 J	0.0079 J	0.0093	0.0093	0.0083	0.011
Radium 226 + 228	5		pCi/L	3.35	3.18	3.66 J+	2.08		3.06	3.02		1.49 U		0.728	0.698 J+			1.24 U		0.222 U	
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.002	0.001 U	0.001 U	0.001 U	0.001 U	0.005 U	0.005 U	0.005 U	0.005 U	0.0022	0.001 U	0.0011	0.001 U
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																					
Dissolved Oxygen			mg/L		0.37	0.17	0.11	0.17		0.1	1.37	0.65	0.26	0.99	0.28	1.3	0.34	0.21	1.88	1	0.37
Oxidation Reduction Potential			millivolts		-129.5	-115.9	-57.5	-137.9		-101.9	-130.1	-97.3	-213.9	-97.4	-95.4	64	-86.6	-42.1	-64.4	65.9	-133.7
pH			SU		7.07	7.19	7.31	7.46		7.45	7.56	7.7	7.44	6.82	7.17	6.83	7.06	7.05	7.07	7.05	7.09
Specific Conductivity			uS/cm		2109	2201	1967	1491		2018	1588	1896	162.3	749	835	460	466	782	560	740	655
Temperature			deg C		19.2	18.5	18.1	17.9		17.1	17.2	15.3	18.7	17	15.7	8.7	14	9.6	14.7	9	17.2
Turbidity			NTU		4.38	1.74	4.77	3.92		4.11	3.22	4.78	4.48	2.91	2.99	2.31	2.01	2.4	0.83	2.67	3.48

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"O" = Indicates te result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW56B							
				2018-09-11	2018-10-29	2019-04-29	2019-11-15	2020-05-05	2020-10-28	2021-04-21	2021-10-04
				N	N	N	N	N	N	N	N
Appendix III Parameters											
Boron		4	mg/L	1.2	1.2	2.3	3.2	2.1	2	1.6	1.4
Calcium			mg/L	140	140	150	150	141	138	157	160
Chloride			mg/L	50	36	55	64	50.8	45.7 J-	70.8	73.7
Fluoride	4	4	mg/L	0.41 J	0.33	0.4	0.44	0.55	0.51	0.41	0.46
pH			SU	6.95	6.91	7.08	7.21	7.52	7.47	7.55	7.34
Sulfate			mg/L	170	130	260	360	280	275	277	268
Total Dissolved Solids			mg/L	740	690	830	860	753	696	738	802
Appendix IV Parameters											
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.002	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.005 U	0.005 U	0.005	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U
Barium	2	2	mg/L	0.076	0.072	0.082	0.076	0.071	0.066	0.071	0.081
Beryllium	0.004	0.004	mg/L	0.001 U	0.001 U	0.001	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001	0.001 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.002	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.001 U	0.001 U	0.001	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	4	4	mg/L	0.41 J	0.33	0.4	0.44	0.55	0.51	0.41	0.46
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0051 J	0.0035 J	0.0044	0.0062 J	0.0082	0.008 U	0.008 U	0.0091
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.004 J	0.003 J	0.0031	0.0064 J	0.0086	0.0075	0.0074	0.0062
Radium 226 + 228	5		pCi/L	1.26	1.28 J+			2.11		2.97	
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.005	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters											
Dissolved Oxygen			mg/L	0.29	0.26	0.79	0.18	0.09	1.48	0.23	0.29
Oxidation Reduction Potential			millivolts	-102.8	-44.4	31.8	-105.7	-105.5	-123.9	-110.5	-214.1
pH			SU	6.95	6.91	7.08	7.21	7.52	7.47	7.55	7.34
Specific Conductivity			uS/cm	928	1036	856	741	1179	772	1100	124.4
Temperature			deg C	13.9	13.8	11.6	12.9	11.8	12.9	12	14.3
Turbidity			NTU	2.96	1.45	4.77	1.4	4.56	2.39	6.72	4.65

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"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
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Prepared by: SLG
Checked by: DFSC
Reviewed by: MAH

Table 3: General Groundwater Response Actions
CCR Unit Schahfer MSRB, MCWB, and DA
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

General Response Action	Comments	Corrective Measure Area	
		Below CCR Unit	Downgradient of CCR Unit
Limited Action	Access Restrictions Institutional Controls Use Restrictions Environmental Monitoring Monitored Natural Attenuation	X	X
Containment	Physical	X	
Removal	Extraction	X	X
Treatment	In-Situ Ex-Situ	X	X
On-Site Disposal	Surface Water Discharge Groundwater Discharge POTW Discharge	X	X
Off-Site Disposal	Permitted Disposal Facility	X	X

Notes:
X - General Response Action Selected for further screening at the indicated Corrective Measure Area

Prepared by: DFS
Checked by: KMC
Reviewed by: MAH

Table 4: Initial Screening of Corrective Measure Alternatives / Process Options for Groundwater
CCR Unit Schahfer MSRB, MCWB, and DA
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

General Response Action	Remedial Technology	Process Option	Description	Screening Comments	Retained for Further Evaluation
Limited Action	Institutional Controls	Permitting and Notices	Administrative controls to restrict groundwater use.	Potentially implementable.	Yes
		Access Restrictions	Physical restrictions or structures that prevent access by unauthorized persons.	Potentially implementable.	Yes
	Monitoring	Groundwater Monitoring	Periodic sampling and analyses of groundwater as a means of detecting unacceptable changes in constituent concentrations.	Potentially implementable.	Yes
	Use Restriction	Deed Restrictions	Administrative controls to provide future land use	Potentially implementable.	Yes
	Monitored Natural Attenuation	Monitored Natural Attenuation	Long-term monitoring of natural attenuation, including advection/dispersion/adsorption and biotic and abiotic degradation/transformation, of the inorganic constituents dissolved in groundwater; advection/dispersion/adsorption of inorganics.	Potentially implementable.	Yes
Containment	Physical Containment	Capping	Low-permeable cap covering the source area.	Potentially implementable, minimizes stormwater infiltration reducing the potential for plume migration.	No
		Vertical Barriers	Vertical barriers including slurry walls and sheet piling placed around the area of contamination to contain groundwater.	Potentially implementable, reduces potential for plume migration.	No
Removal	Extraction	Extraction Wells	Use of extraction wells to extract contaminated groundwater and control groundwater movement within capture zone.	Potentially implementable, results in physical removal of dissolved constituents of concern and reduces potential for plume migration.	Yes
		Extraction Trench	Removal of groundwater by pumping from extraction trenches.	Potentially implementable, results in physical removal of dissolved constituents of concern and reduces potential for plume migration.	Yes
In Situ Treatment	Stabilization/ Solidification	Solidification	Blending soil with grout to contain and immobilize contaminated groundwater.	Potentially implementable. Reduces potential for plume migration.	Yes
	Permeable Reactive Barrier	Vertical Reactive Barrier	Construction of vertical reactive barrier (e.g., zero-valent iron or carbon wall) to treat groundwater as it flows through the treatment zone.	Potentially implementable, results in physical removal of dissolved constituents of concern by treatment media changeout and reduces potential for plume migration.	Yes
In Situ Treatment	Chemical Addition/ Treatment	Chemical Precipitation	Increasing inorganic precipitation through chemical injection, either by changing site geochemical conditions (i.e., pH, Eh, or ionic strength) or the addition of a co-precipitate that reacts with or acts as an adsorbent for the COC.	Non-permanent - does not remove contaminant mass.	No
		Chemical Reduction	Injection of a reducing agent such as nanoscale or microscale zero valent iron into groundwater. Reduction reactions chemically convert constituents to non-hazardous or less toxic compounds that are more stable, less mobile, and/or inert.	Non-permanent - does not remove contaminant mass.	No
	Biological Treatment	Bioremediation	Use of microorganisms to oxidize/reduce metal contaminants directly or by the production of chemical oxidizing/reducing agents.	Not effective on all Site COCs.	No
Ex Situ Treatment	On-Site Treatment Facility	On-Site, Various Physical/chemical Process Options	Extracted groundwater is pumped to the on-Site treatment facility (physical/chemical treatment).	Potentially implementable to treat extracted contaminated groundwater. Treatment processes that could remediate the Site COCs include chemical/physical precipitation, activated carbon, and reverse osmosis.	Yes
Disposal	On-Site Discharge	On-Site Discharge to Surface Water	Treated groundwater discharged to local water body pursuant to updated NPDES permit.	Potentially implementable. Treated landfill leachate is currently discharged to a local water body pursuant to a NPDES permit.	Yes
		On-Site Discharge to Groundwater	Treated groundwater discharged to groundwater within the Station Area.	Potentially implementable.	Yes
		POTW Discharge	Discharge of treated groundwater to POTW under a discharge authorization.	No access to POTW.	No
	Off-Site Treatment	Off-Site Disposal/Treatment of Collected Groundwater	Transport and treatment of extracted groundwater at off-Site treatment facility.	Not retained due to higher safety concerns and much higher disposal costs.	No

Notes
COC- constituent of concern
NPDES- National Pollutant Discharge Elimination System
POTW- publicly owned treatment works
NA- not applicable

Prepared by DFS
Checked by: KMC
Reviewed by: MAH

**Table 5: Summary of Groundwater Corrective Measure Alternatives
For Multi-Cell Unit (MSRB, MCWB, and DA)
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana**

Alternative		Key Components
A	Monitored natural attenuation	Permitting Implementation of deed restrictions Environmental monitoring
B	Vertical barrier/hydraulic controls and monitored natural attenuation	Permitting Implementation of deed restrictions Installation of hydraulic controls within existing vertical barrier wall *Ex situ* treatment of pumped groundwater by an on-Site treatment facility Disposal of treated groundwater to on-Site surface water or groundwater NPDES permit or installation of injection wells and UIC permit Long-term maintenance Environmental monitoring
C	Pump-and-treat and monitored natural attenuation	Permitting Implementation of deed restrictions Installation of monitoring wells or extraction trench immediately downgradient of the slurry wall *Ex situ* treatment of pumped groundwater by an on-Site treatment facility Disposal of treated groundwater to on-Site surface water or groundwater NPDES permit or of injection wells and UIC permit Long-term maintenance Environmental monitoring
D	Vertical barrier and monitored natural attenuation	Permitting Implementation of deed restrictions Installation of permeable reactive barrier – simple trench or funnel and gate Long-term maintenance Environmental monitoring
E	In-Situ Stabilization and monitored natural attenuation	Permitting Implementation of deed restrictions Stabilization of plume area using Portland cement, pozzolans, and/or bentonite Environmental monitoring

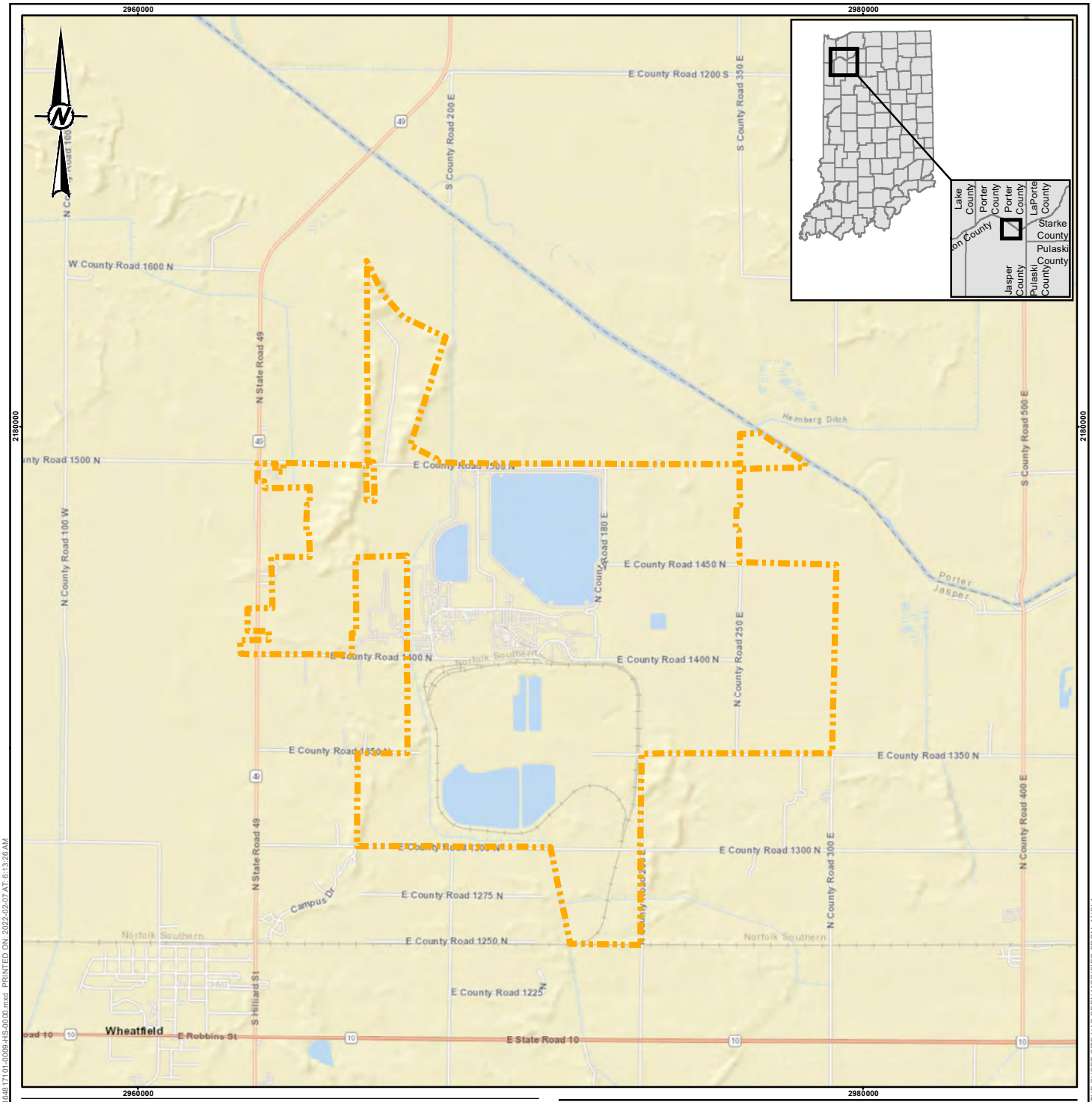
Note:
All alternatives also include impoundment closure by removal with associated dewatering

Prepared by: JBG
Checked by: CMJ
Reviewed by: JBG

Table 6: Evaluation of Groundwater Corrective Measure Alternatives
For Multi-Cell Unit (MSRB, MCWB, and DA)
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

	Corrective Measure Alternatives				
	Alternative A	**Alternative B**	**Alternative C**	**Alternative D**	**Alternative E**
Evaluation Criteria	**Monitored natural attenuation**	**Vertical barrier/hydraulic controls and monitored natural attenuation**	**Pump-and-treat and monitored natural attenuation**	**Permeable reactive barrier and monitored natural attenuation**	**In-situ stabilization and monitored natural attenuation**
Performance	Initial review of site conditions indicates plume stability and confirmation of attenuation and immobilization, therefore, monitored natural attenuation could be effective in reducing the COC concentrations and mobility. Relative short-term effectiveness varies depending on success of excavation to remove the source material and the low-permeability cap to reduce the mobility of residual COCs and potential for plume migration. Minimally effective short-term. Relatively effective long-term. Functions through physical and chemical mechanisms. Contaminant mass is removed from groundwater through adsorption and co-precipitation, but is not removed from the environment and could be remobilized following changes to groundwater geochemistry.	Hydraulic controls generating an inward gradient within the existing vertical barrier (slurry wall) are an effective means of containing the source area and reducing/eliminating downgradient migration of cobalt-contaminated groundwater from the MCU. Relatively effective both short-term and long-term.	Groundwater extraction of contaminated groundwater would be effective in reducing contaminant mass, volume, and mobility of dissolved COCs in groundwater. Relatively effective both short-term and long-term.	A permeable reactive barrier installed with an appropriate treatment media placed downgradient of the MCU in the path of the cobalt groundwater plume would be effective at removing contaminant mass and preventing further downgradient migration. Contaminant mass is removed from the environment through media changeout. Relatively effective both short-term and long-term.	In-situ stabilization of the groundwater plume would be effective at reducing mobility of contaminants. Contaminant mass is not removed, but is effectively permanently sequestered from the environment. Relatively effective both short-term and long-term.
Reliability	Moderate to High. No O&M required, but long-term changes to geochemistry may impact attenuation.	Moderate. Some O&M required and potential treatment replacement.	Moderate, some O&M required and potential treatment replacement.	Moderate, some O&M required and potential treatment replacement.	High, no O&M required apart from monitoring.
Ease of Implementation	Already occurring.	Technology is common; some installation challenges expected based on existing slurry walls and proposed cap.	Technology is common, some installation and drilling challenges expected.	Technology is common; installation would be extremely challenging due to the high density of subsurface utilities to the north of the MCU.	Technology is common; installation would be extremely challenging due to the high density of subsurface utilities to the north of the MCU.
Potential Impacts	Minimal potential for impacts to surface water and off-site groundwater.	Hydraulic controls within an existing vertical barrier control cross media impacts outside of the wall. Some safety concerns related to drilling wells and operating treatment plant (e.g., regenerating resin).	Groundwater collection and treatment will reduce long-term downgradient cross media impacts. Some safety concerns related to drilling wells and operating treatment plant (e.g., regenerating resin).	Groundwater treatment will reduce long-term downgradient cross media impacts. Safety concerns related to excavation for construction.	Subsurface agitation during installation could mobilize sorbed contaminants. Potential high pH conditions due to cement/bentonite required for stabilization.
Time Requirements	Relatively long, no active remediation.	Moderate, should be shorter than MNA alone.	Moderate, should be shorter than MNA alone.	Moderate, should be shorter than MNA alone, but longer than pump-and-treat as the PRB uses the natural groundwater gradient as a driving force compared to the higher induced gradient from the extraction wells.	Installation would be longer than any of the other alternatives, but implementation would then be substantially complete save for long-term monitoring.
Institutional Requirements	Low permitting requirements	May require NPDES permit modifications or UIC permit, overall low permitting requirements	May require NPDES permit modifications or UIC permit, overall low permitting requirements	May require Underground Injection Control permit.	Low permitting requirements

Prepared by: JBG
Checked by: CMJ
Reviewed by: JBG



LEGEND

Approximate Property Line

0 0.75 1.5

1 " = 0.75 miles Miles

REFERENCE(S)

SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

SITE LOCATION MAP

CONSULTANT

GOLDER
MEMBER OF WSP

YYYY-MM-DD	2/7/2022
DESIGNED	DFS
PREPARED	SHL
REVIEWED	JSP
APPROVED	MAH

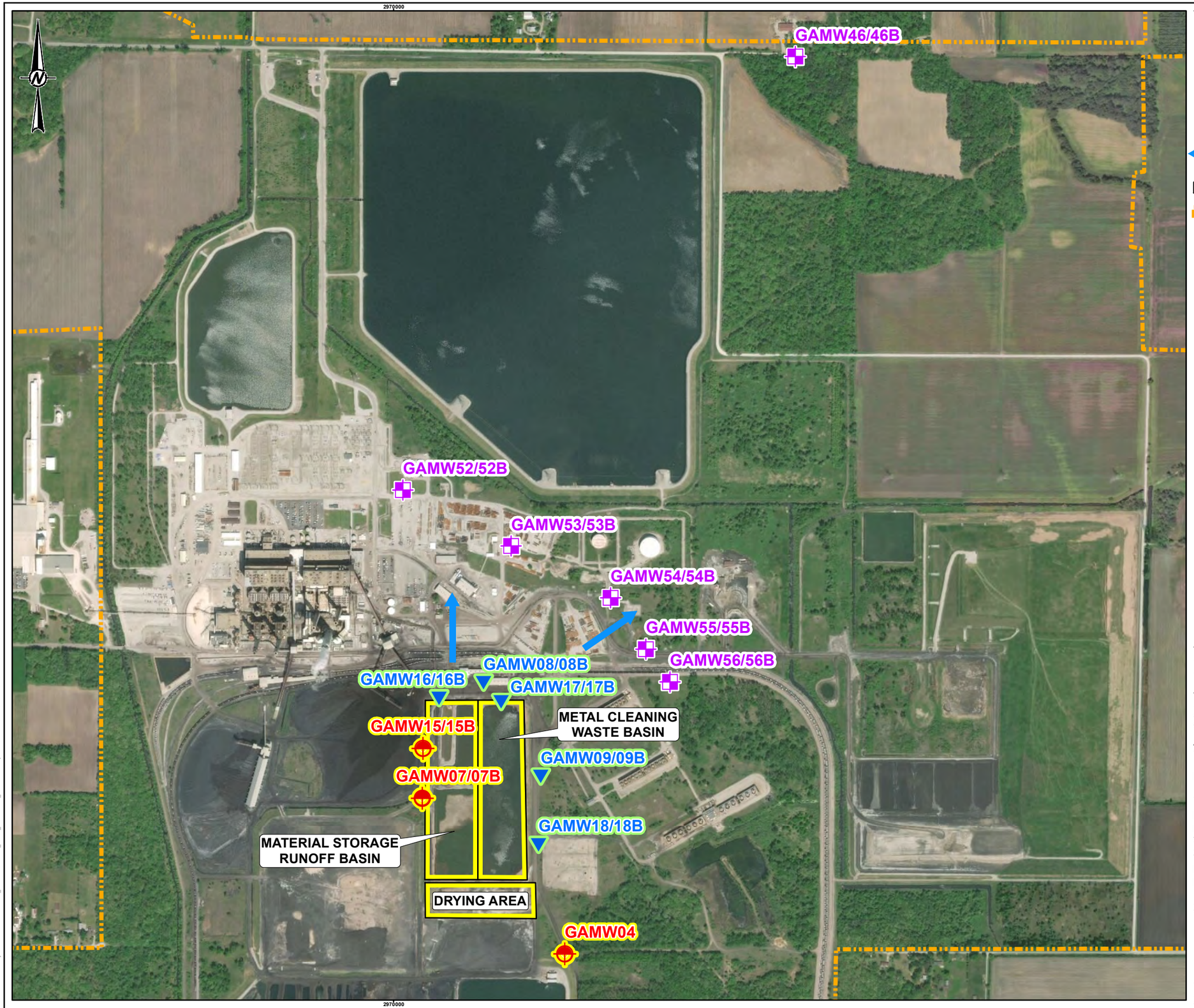
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1 in

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LEGEND

- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- Generalized Groundwater Flow Direction
- CCR Units
- Approximate Property Line

0 850 1,700

1 " = 850 feet Feet

NOTE(S)

1. THIS FIGURE DEPICTS THE GENERALIZED GROUNDWATER FLOW DIRECTION WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER.

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY

PROJECT

NORTHERN INDIANA PUBLIC SERVICE COMPANY
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

MONITORING WELL LOCATIONS
DRYING AREA, MSRB, AND MCWB

CONSULTANT

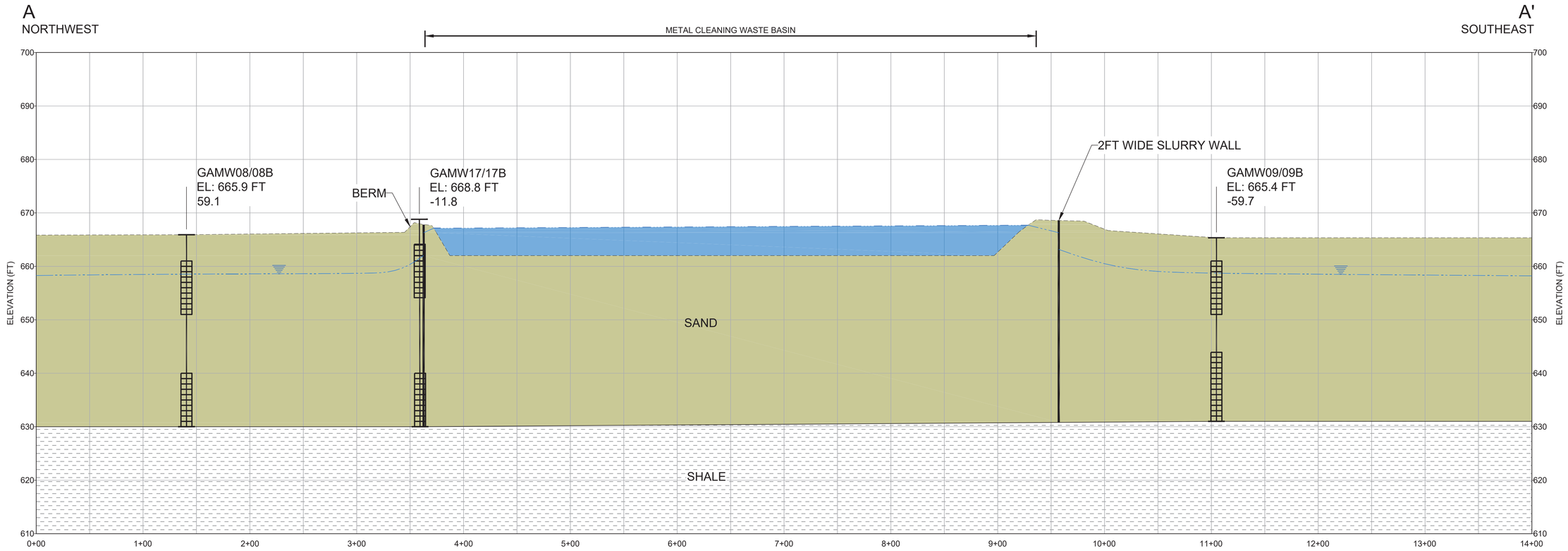
GOLDER
MEMBER OF WSP

YYYY-MM-DD	1/31/2019
DESIGNED	DFS
PREPARED	SHL
REVIEWED	MAH
APPROVED	MAH

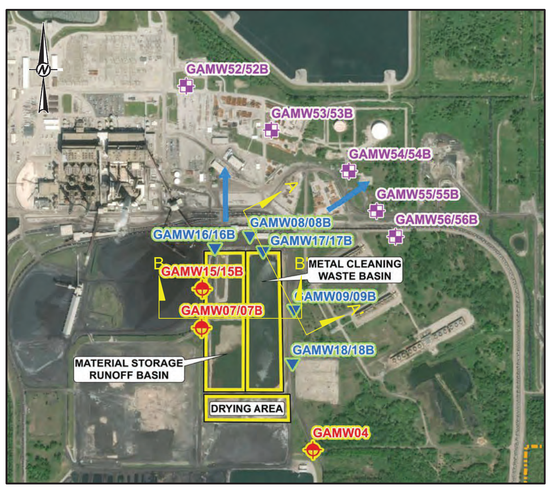
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



A-A'



VERTICAL SCALE: 0 10 20 — 1" = 10' FEET

HORIZONTAL SCALE: 0 50 100 — 1" = 50' FEET

LEGEND

GAMW-08/08B = WELL I.D.
EL: 665.9 = GROUND SURFACE ELEVATION
59.1 = OFFSET DISTANCE C/L = CENTERLINE

= GROUNDWATER ELEVATION
= WELL SCREEN
= END OF BORING LOCATION
IMPOUNDMENT WATER
SAND
SHALE

NOTE(S)

1. GEOLOGIC CONTACTS ILLUSTRATED BETWEEN AND BELOW BORINGS ARE INFERRED AND SHOULD NOT BE INTERPRETED AS EXACT INDICATORS OF GEOLOGIC CONDITIONS AT, BETWEEN, OR BELOW BORINGS.

CLIENT
NORTHERN INDIANA PUBLIC SERVICE COMPANY

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-02-07
DESIGNED	RWC
PREPARED	RWC
REVIEWED	JBG
APPROVED	MAH

PROJECT
NORTHERN INDIANA PUBLIC SERVICE COMPANY
ROLLIN M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

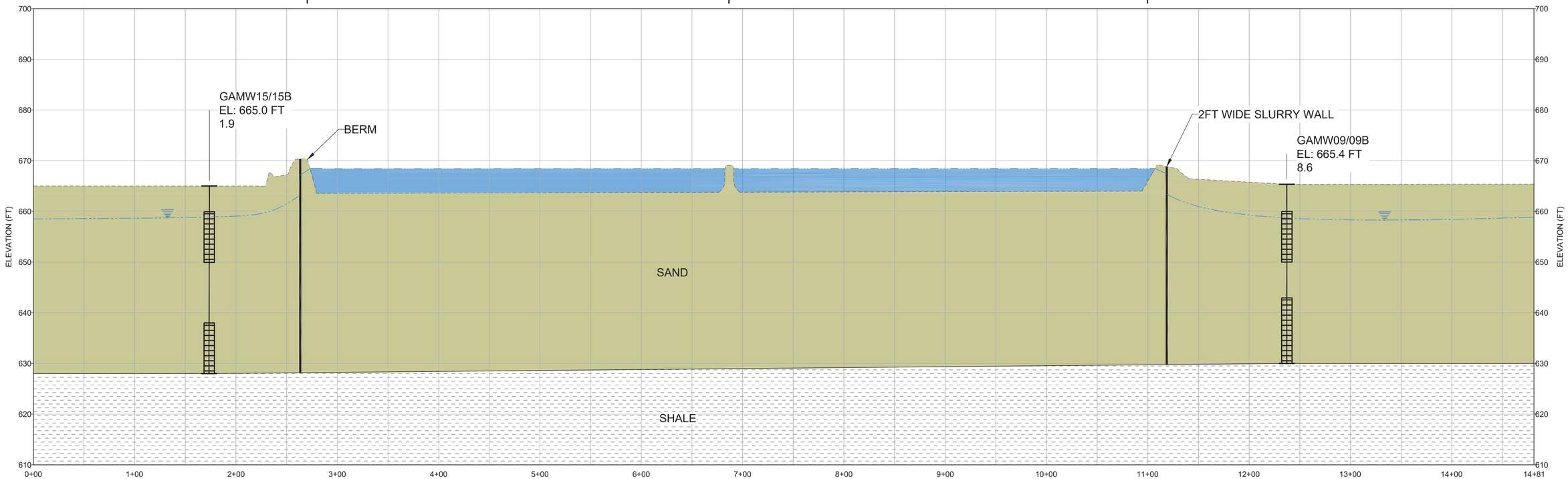
TITLE
GEOLOGIC INTERPRETATION
CROSS SECTION A-A'

PROJECT NO.	CONTROL	REV.	FIGURE
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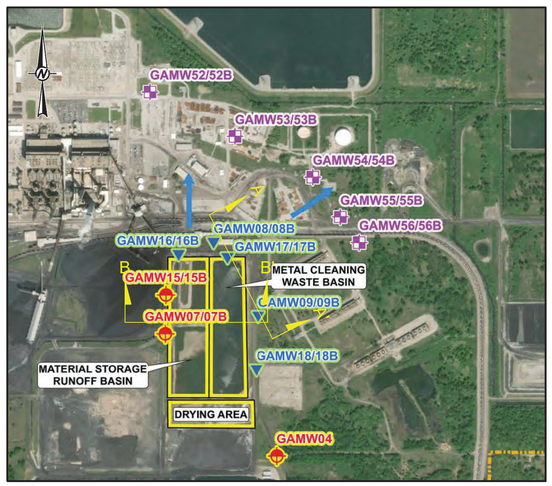
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 1 in

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B-B'



VERTICAL SCALE: 0 10 20 — 1" = 10' FEET

HORIZONTAL SCALE: 0 50 100 — 1" = 50' FEET

LEGEND

GAMW-15/15B	=	WELL I.D.
EL: 665.14	=	GROUND SURFACE ELEVATION
1.9	=	OFFSET DISTANCE C/L = CENTERLINE
	=	GROUNDWATER ELEVATION
	=	WELL SCREEN
	=	END OF BORING LOCATION
		IMPOUNDMENT WATER
		SAND
		SHALE

NOTE(S)

1. GEOLOGIC CONTACTS ILLUSTRATED BETWEEN AND BELOW BORINGS ARE INFERRED AND SHOULD NOT BE INTERPRETED AS EXACT INDICATORS OF GEOLOGIC CONDITIONS AT, BETWEEN, OR BELOW BORINGS.

CLIENT
NORTHERN INDIANA PUBLIC SERVICE COMPANY

CONSULTANT
GOLDER
MEMBER OF WSP

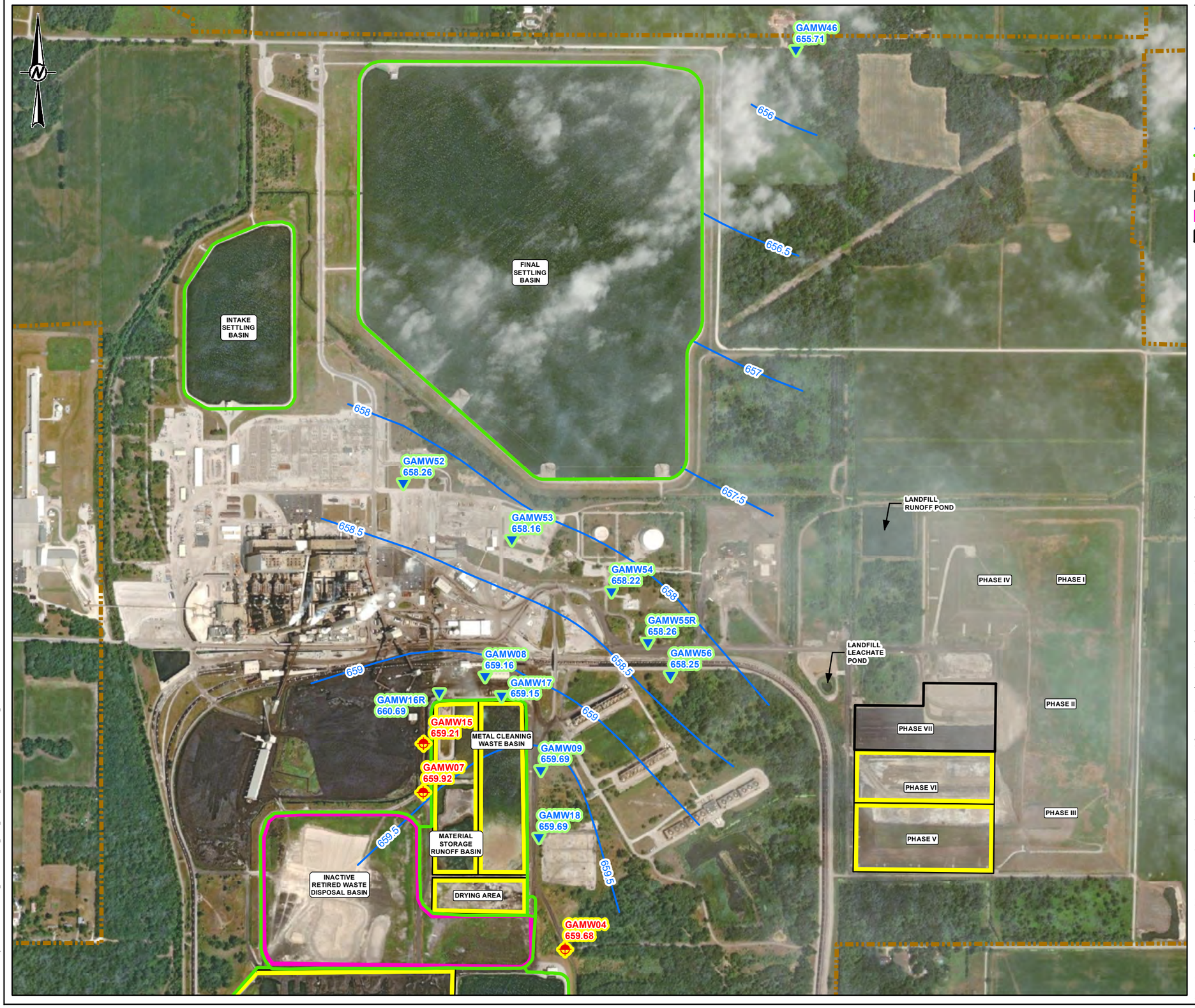
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DESIGNED	RWC
PREPARED	RWC
REVIEWED	JBG
APPROVED	MAH

PROJECT
NORTHERN INDIANA PUBLIC SERVICE COMPANY
ROLLIN M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE
GEOLOGIC INTERPRETATION
CROSS SECTION B-B'

PROJECT NO.	CONTROL	REV.	FIGURE
20447130	03	0	4

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LEGEND

- Background Monitoring Well
- Downgradient Monitoring Well
- Non-CCR Well
- Surface Water Location
- September 2021 Groundwater Elevation Contour (0.5 ft interval)
- Slurry Wall
- Approximate Property Line
- CCR Units
- Inactive Retired Waste Disposal Basin
- Phase VII

0 850 1,700

1 " = 850 feet Feet

FIGURE NARRATIVE

THIS FIGURE DEPICTS THE GROUNDWATER ELEVATION, AS MEASURED IN 77 MONITORING WELLS SCREENED WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER, AND IS INTENDED TO REPRESENT THE APPROXIMATE ELEVATION OF THE GROUNDWATER POTENTIOMETRIC SURFACE. THE POSTED DATA WERE CALCULATED FROM DEPTH TO WATER MEASUREMENTS MADE BY GOLDER ON SEPTEMBER 9, 2021.

THE DIRECTION OF HORIZONTALGROUNDWATER FLOW AT AND NEAR THE POTENTIOMETRIC SURFACE CAN BE GENERALLY INTERPRETED AS BEING PERPENDICULAR TO THE GROUNDWATER ELEVATION CONTOURS. GOLDER INFERRED THE ELEVATION CONTOURS BASED ON THE DATA ILLUSTRATED.

THE ACTUAL ELEVATION OF THE POTENTIOMETRIC SURFACE IS LIKELY MORE HETEROGENEOUS THAN SHOWN AND ACTUAL CONDITIONS WILL VARY. OTHER INTERPRETATIONS ARE POSSIBLE. THE DEPTH TO GROUNDWATER IS KNOWN TO VARY WITH TIME.

NOTE(S)

1. NS INDICATES LOCATION WAS NOT SAMPLED.
2. * INDICATES NOT USED IN CONTOURING

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATION CONTOURS (SEPTEMBER 2021)

CONSULTANT

GOLDER
MEMBER OF WSP

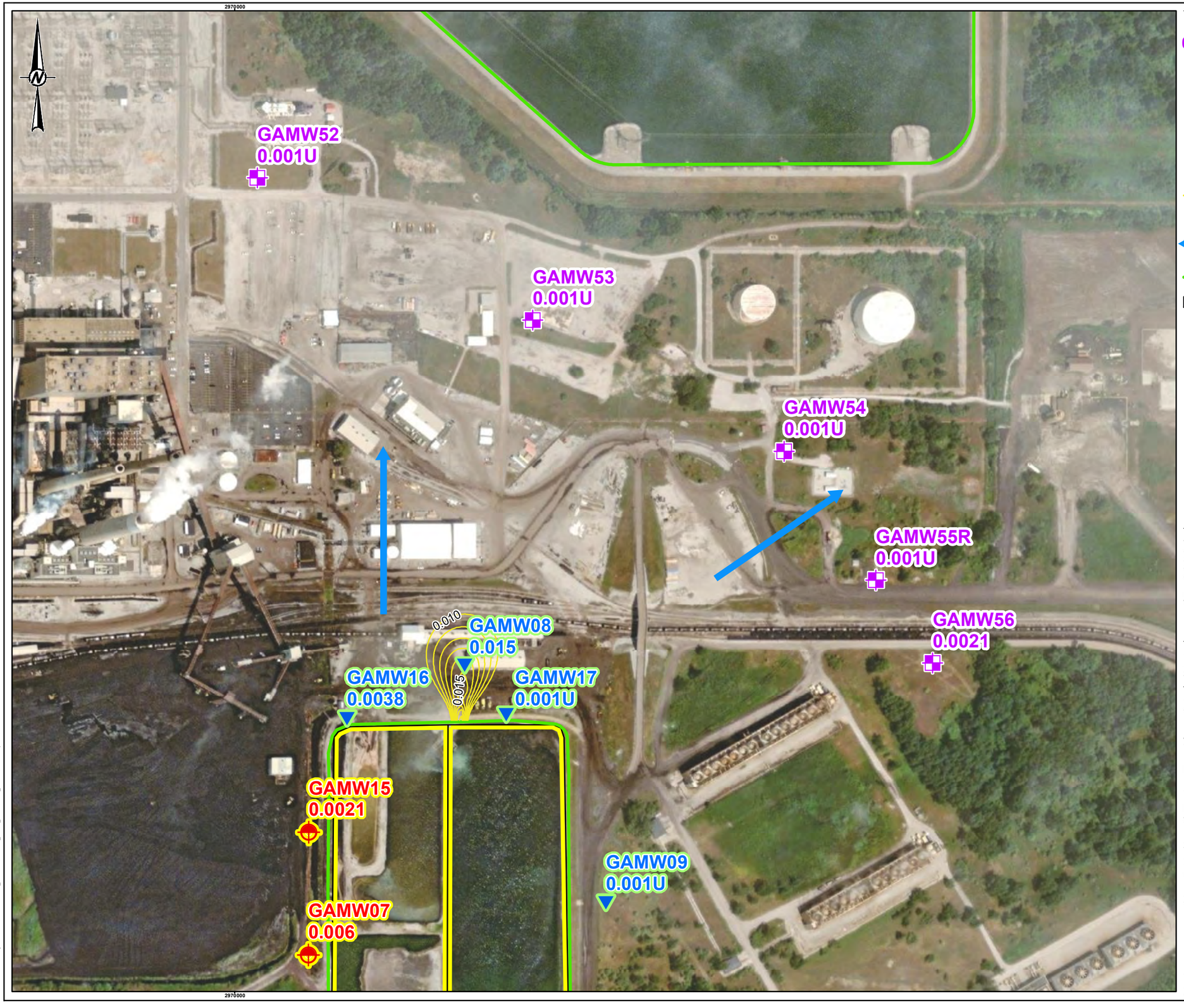
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DESIGNED	DFS
PREPARED	TBH
REVIEWED	JBG
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 1in



LEGEND

- 0.015 September 2021 Cobalt Concentration (mg/L)
- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- Septemeber 2021 Shallow Cobalt Contour (mg/L)
- Generalized Groundwater Flow Direction
- Slurry Wall
- CCR Units

0 340 680

1 " = 333 feet Feet

FIGURE NARRATIVE

THIS FIGURE SHOWS THE INTERPRETED COBALT ISOCONCENTRATION CONTOURS BASED ON GROUNDWATER ANALYTICAL DATA FROM THE SEPTEMBER 2021 SAMPLING EVENT FOR SHALLOW WELLS SCREENED IN THE SURFICIAL AQUIFER. THE ISOCONCENTRATION CONTOURS ARE INTENDED TO DEPICT THE INFERRED DISTRIBUTION OF COBALT IN GROUNDWATER ON THE BASIS OF THE DATA ILLUSTRATED. THE DISTRIBUTION IS LIKELY MORE HETEROGENEOUS THAN SHOWN, AND THE ACTUAL CONDITIONS WILL VARY. OTHER INTERPRETATIONS ARE POSSIBLE. COBALT DISTRIBUTION IN GROUNDWATER IS KNOWN TO VARY WITH TIME.

NOTE(S)

1. THIS FIGURE DEPICTS THE GENERALIZED GROUNDWATER FLOW DIRECTION WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER.
2. ALL VALUES SHOWN ARE IN MILLIGRAMS PER LITER (MG/L)

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

COBALT ISOCONCENTRATION CONTOUR MAP SEPTEMBER 2021 (SHALLOW)

CONSULTANT

GOLDER
MEMBER OF WSP

YYYY-MM-DD	2/21/2022
DESIGNED	CMJ
PREPARED	DTD
REVIEWED	CMJ
APPROVED	JBG

PROJECT NO.	CONTROL	REV.	FIGURE
20447130	A	0	6

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1in
0

APPENDIX A

Volume Calculations

Contaminant Mass Within Cobalt Plume

Assumptions:

Plume extents are as shown on Figure 6.

Plume extends from average depth to water in September 2021 in nearby monitoring wells (GAMW-08, GAMW-17, etc…) at 8.50 feet bgs, to top of screened interval of deep wells (GAMW-08B, GAMW-17B, etc…) at 27.5 feet bgs for a asturated thickness of 18.37 feet.

Soil porosity estimated at 0.16 to 0.42.

Only the mass of contaminants in portions of the plume exceeding the GWPS (10 μg/l) estimated

1 cubic foot = 28.32 liters

Contour areas calculated by Surfer.

Volume calculation: Volume = Area between contours * saturated thickness * porosity

Mass calculation: Mass = volume * concentration * 28.32 liters/cubic foot * 1x10-9 kg/μg

Contour Value (μg/l)	Area between contours (ft^2)	Volume at Porosity 0.16 (ft^3)	Volume at Porosity 0.42 (ft^3)	Cobalt Mass at Porosity 0.16 (kg)	Cobalt Mass at Porosity 0.42 (kg)
10	19071	56052	147137	0.017	0.046
11	14287	41994	110233	0.014	0.037
12	10726	31527	82757	0.012	0.030
13	8256	24265	63695	0.010	0.025
14	7753	22788	59819	0.010	0.025
15	3611	10613	27858	0.005	0.013
16	536	1576	4137	0.001	0.002
17	472	1389	3645	0.001	0.002
18	75	221	581	-	-
			Total	**0.07**	**0.18**

Volume of impacted material below the CCR Unit

Assumptions:

Entire remaining volume of water within the slurry walls after excavation is impacting.
Area is estimated by the combined area of the three impoundments (Figure 6).
Depth is estimated by the approximate saturated thickness outside the slurry walls (Figure 3).

Area	36.2	acre	(A)	(Wood 2019)
Saturated depth	32	feet	(D)	(Golder 2017)

Estimated volume of impacted material was calculated using the following formula:

$Volume = A*D = V_1$ 1 acre= 43560 ft^2

V_1	1158	acre-ft
V_1	5.0E+07	ft^3

Volume of impacted material downgradient of the CCR Unit

Assumptions:

The volume is estimated by the volume with boron concentrations greater than 4 mg/L.
Plume areas are calculated based on the 4 mg/L contours displayed on Figure 6 and Figure 7.

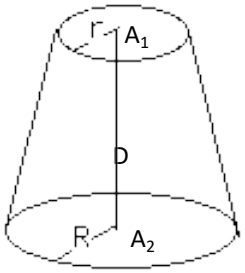
Shallow plume area	21.75	acre		
	9.474E+05	ft^2	(A1)	
Deep plume area	87.40	acre		
	3.807E+06	ft^2	(A2)	
Saturated depth	32	feet	(D)	(Golder 2017)
Assumed effective porosity	0.3		(n)	(Golder 2017)

The plume area were approximated as circles, and the volume of impacted material was estimated as a frustrum using the following formula:

$Volume = \pi*D/3*(R^2 + Rr + r^2) = V_2$

$r = (A_1/\pi)^{1/2}$, $R = (A_2/\pi)^{1/2}$

r	549.2	ft
R	1101	ft
V_2	7.10E+07	ft^3
V_2	1629	acre-ft



Estimated volume of impacted groundwater was calculated using the following forumula:

$Volume = V_2*n = V_{water}$

V_{water}	2.13E+07	ft^3
V_{water}	1.59E+08	gallons

Prepared by: DFS
Checked by: BPC
Reviewed by: JBG

Golder Associates, Groundwater Monitoring Program Implementation Manual, October 2017
Wood, 2019. Multi-Cell Unit Surface Impoundments (CCR Final Rule) Draft Closure Application. March 8, 2019.

APPENDIX B

Slug Test Data and Calculations

Appendix B
HYDRAULIC CONDUCTIVITY TESTING RESULTS

Well	Date	Screened Interval	Type	Test Duration	Test Number	Hvorslev Method		Bouwer and Rice Method		van der Kamp Method		Hvorslev/Bouwer and Rice Arithmetic Mean	
						cm/sec	ft/day	cm/sec	ft/day	cm/sec	ft/day	cm/sec	ft/day
GAMW03	7/7/2016	5-15	Transducer (Rising)	<2 min	1	7.44E-03	2.11E+01	4.99E-03	1.42E+01	n/a	n/a	6.22E-03	1.77E+01
					2	7.45E-03	2.11E+01	5.22E-03	1.48E+01	n/a	n/a	6.34E-03	1.80E+01
GAMW13	7/7/2016	5-15	Transducer (Rising)	<2 min	1	5.75E-02	1.63E+02	3.91E-02	1.11E+02	n/a	n/a	4.83E-02	1.37E+02
					2	6.50E-02	1.84E+02	4.81E-02	1.36E+02	n/a	n/a	5.66E-02	1.60E+02
GAMW15	7/7/2016	5-15	Transducer (Rising)	<2 min	1	2.59E-02	7.34E+01	1.63E-02	4.63E+01	n/a	n/a	2.11E-02	5.99E+01
					2	1.11E-02	3.15E+01	1.08E-02	3.05E+01	n/a	n/a	1.10E-02	3.10E+01
GAMW19	7/7/2016	6-16	Transducer (Rising)	<2 min	1	3.70E-02	1.05E+02	2.25E-02	6.38E+01	n/a	n/a	2.98E-02	8.44E+01
					2	1.01E-01	2.87E+02	6.85E-02	1.94E+02	n/a	n/a	8.48E-02	2.41E+02
Average Shallow (515 ftbgs)						**3.90E-02**	**1.11E+02**	**2.69E-02**	**7.63E+01**	**n/a**	**n/a**	**3.30E-02**	**9.35E+01**
GAMW03B	7/8/2016	27-37	Transducer (Falling)	<2 min	1	6.78E-03	1.92E+01	5.81E-03	1.65E+01	n/a	n/a	6.30E-03	1.79E+01
					2	4.30E-03	1.22E+01	4.79E-03	1.36E+01	n/a	n/a	4.55E-03	1.29E+01
			Transducer (Rising)	<2 min	1	5.65E-03	1.60E+01	6.42E-03	1.82E+01	n/a	n/a	6.04E-03	1.71E+01
					2	1.47E-02	4.16E+01	1.25E-02	3.55E+01	1.49E-02	4.22E+01	1.36E-02	3.86E+01
GAMW13B	7/7/2016	25-35	Transducer (Falling)	<2 min	1	8.48E-03	2.40E+01	9.27E-03	2.63E+01	n/a	n/a	8.88E-03	2.52E+01
					2	8.09E-03	2.29E+01	9.27E-03	2.63E+01	n/a	n/a	8.68E-03	2.46E+01
			Transducer (Rising)	<2 min	1	1.11E-02	3.15E+01	1.16E-02	3.30E+01	2.73E-02	7.74E+01	1.14E-02	3.23E+01
					2	1.06E-02	3.00E+01	1.08E-02	3.06E+01	1.06E-02	3.01E+01	1.07E-02	3.03E+01
GAMW15B	7/7/2016	27.7-37.7	Transducer (Falling)	<2 min	1	4.50E-03	1.28E+01	3.45E-03	9.79E+00	n/a	n/a	3.98E-03	1.13E+01
					2	1.03E-02	2.91E+01	8.75E-03	2.48E+01	9.53E-03	2.70E+01	9.53E-03	2.70E+01
			Transducer (Rising)	<2 min	1	1.17E-02	3.32E+01	1.06E-02	3.02E+01	1.24E-02	3.50E+01	1.12E-02	3.17E+01
					2	1.06E-02	3.02E+01	9.79E-03	2.77E+01	1.69E-02	4.80E+01	1.02E-02	2.90E+01
GAMW19B	7/7/2016	23-33	Transducer (Falling)	<2 min	1	1.37E-02	3.88E+01	1.44E-02	4.09E+01	n/a	n/a	1.41E-02	3.99E+01
					2	6.82E-03	1.93E+01	6.31E-03	1.79E+01	n/a	n/a	6.57E-03	1.86E+01
			Transducer (Rising)	<2 min	1	1.84E-02	5.21E+01	1.83E-02	5.18E+01	1.29E-02	3.67E+01	1.84E-02	5.20E+01
					2	1.21E-02	3.43E+01	1.03E-02	2.91E+01	1.21E-02	3.43E+01	1.12E-02	3.17E+01
Average Deep (2535 ftbgs)						**9.86E-03**	**2.80E+01**	**9.52E-03**	**2.70E+01**	**1.46E-02**	**4.13E+01**	**9.69E-03**	**2.75E+01**

Notes:
ft/day = feet per day
cm/sec = centimeters per second
n/a = not analyzed

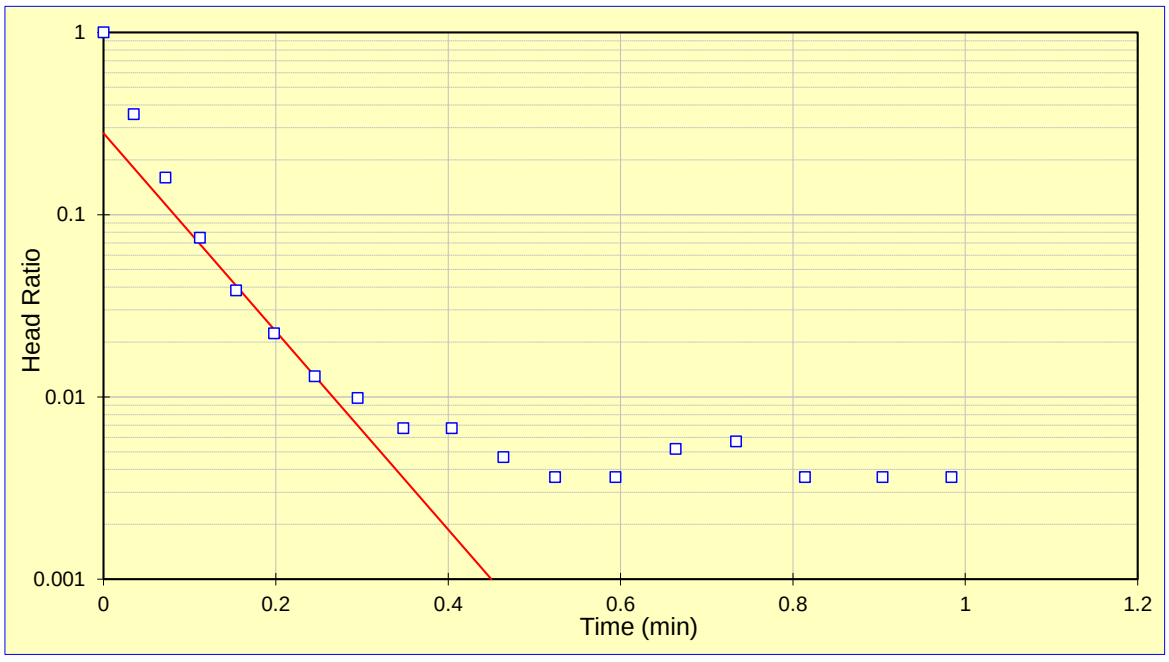
Prepared by: DFS
Checked by: KMC
Reviewed by: MAH

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left|\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right| 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	7.44E-03	cm/sec
t_1 =	0	K=	2.11E+01	ft/day
t_2 =	0.45			
h_1/h_0 =	0.28			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/25/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

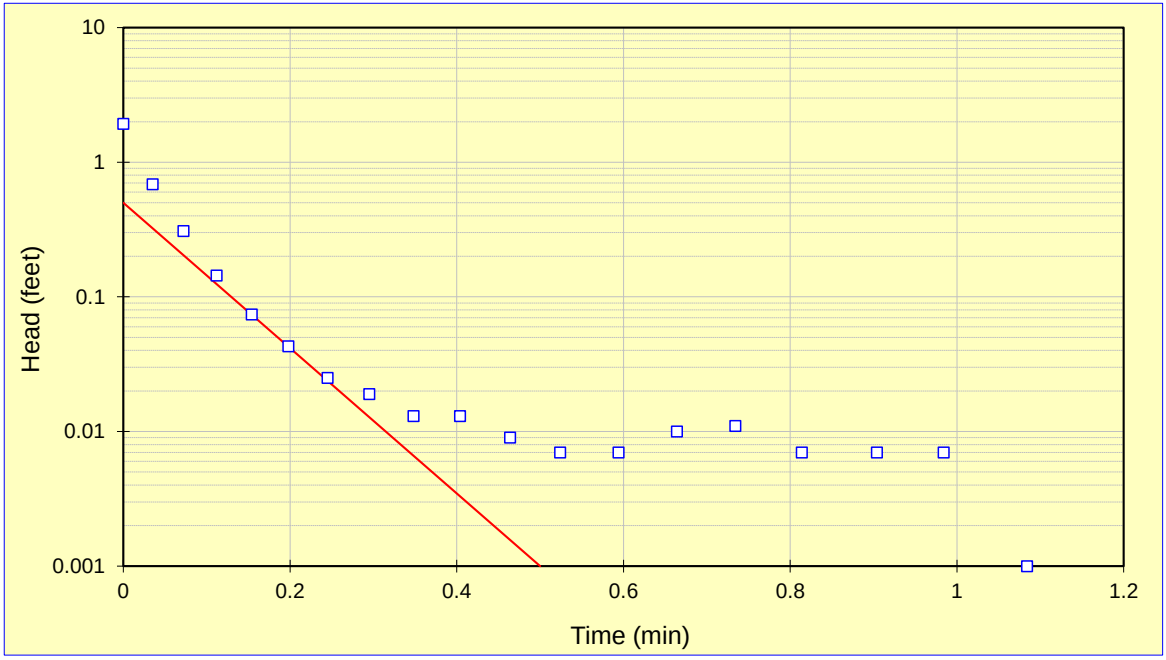
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.28
y_0 =	0.50
y_t =	0.001
t =	0.5

RESULTS

K=	4.99E-03	cm/sec
K=	1.42E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

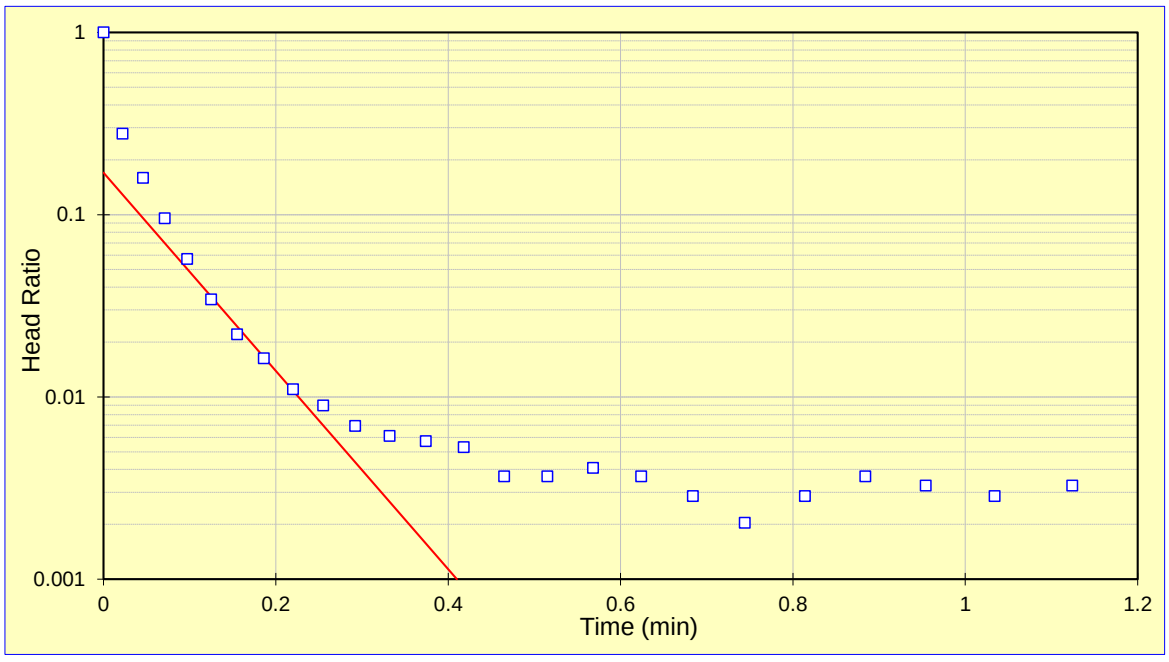
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	7.45E-03	cm/sec
t_1 =	0	K=	2.11E+01	ft/day
t_2 =	0.41			
h_1/h_0 =	0.17			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

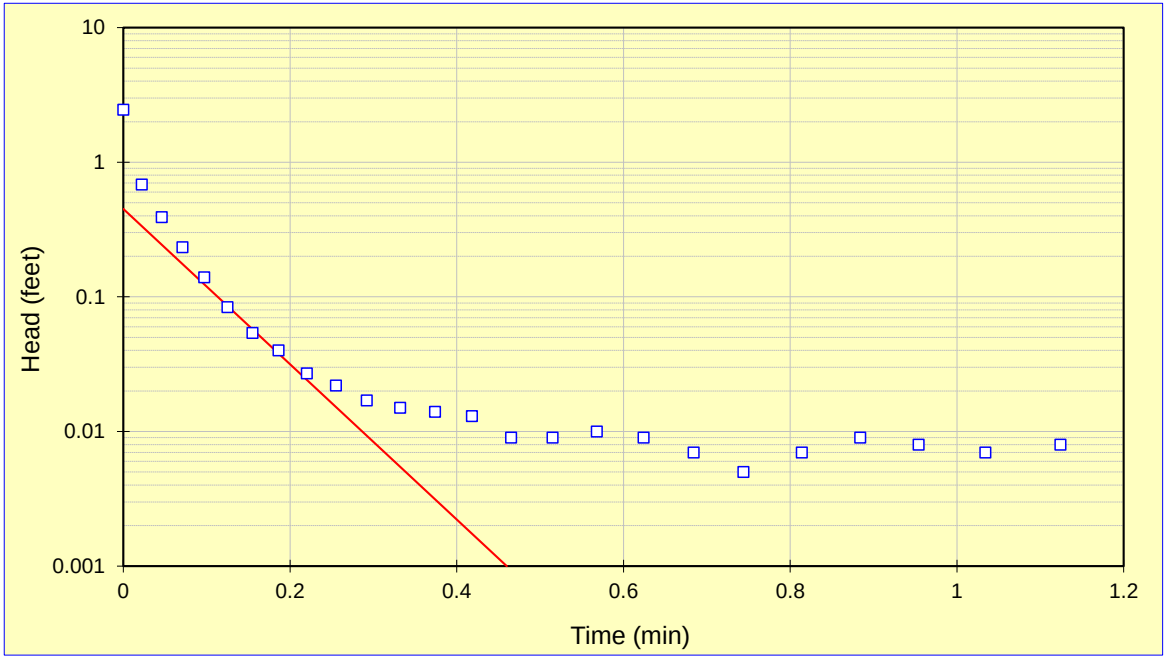
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.23
y_0 =	0.45
y_t =	0.001
t =	0.5

RESULTS

K=	5.22E-03	cm/sec
K=	1.48E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

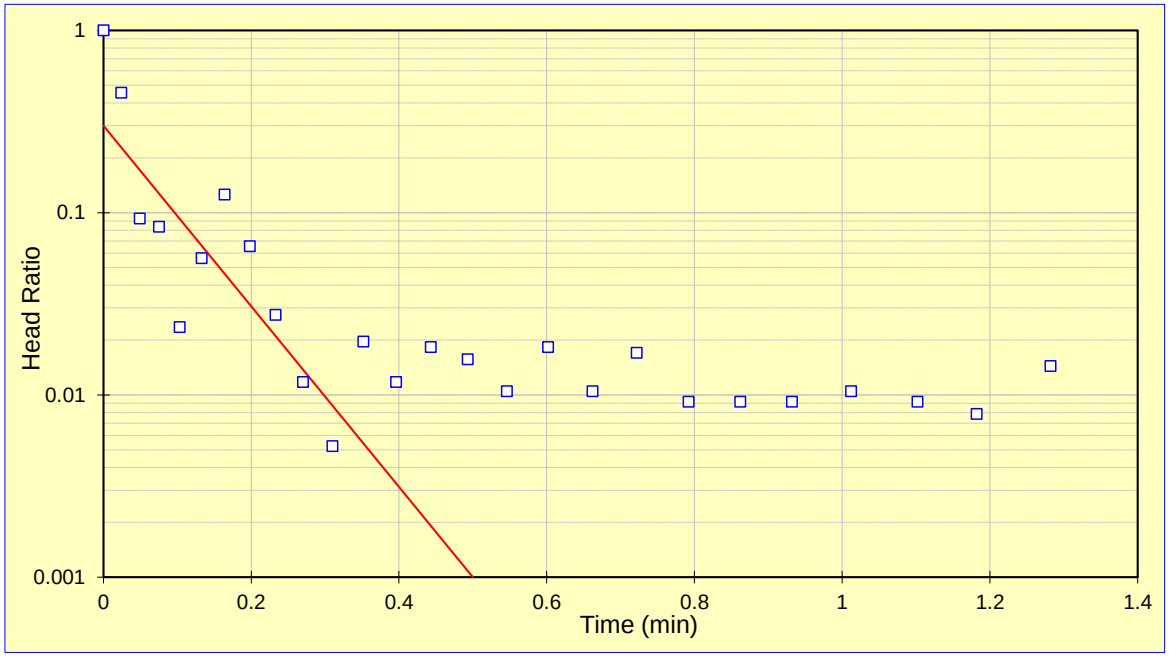
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	6.78E-03	cm/sec
t_1 =	0	K=	1.92E+01	ft/day
t_2 =	0.5			
h_1/h_0 =	0.30			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

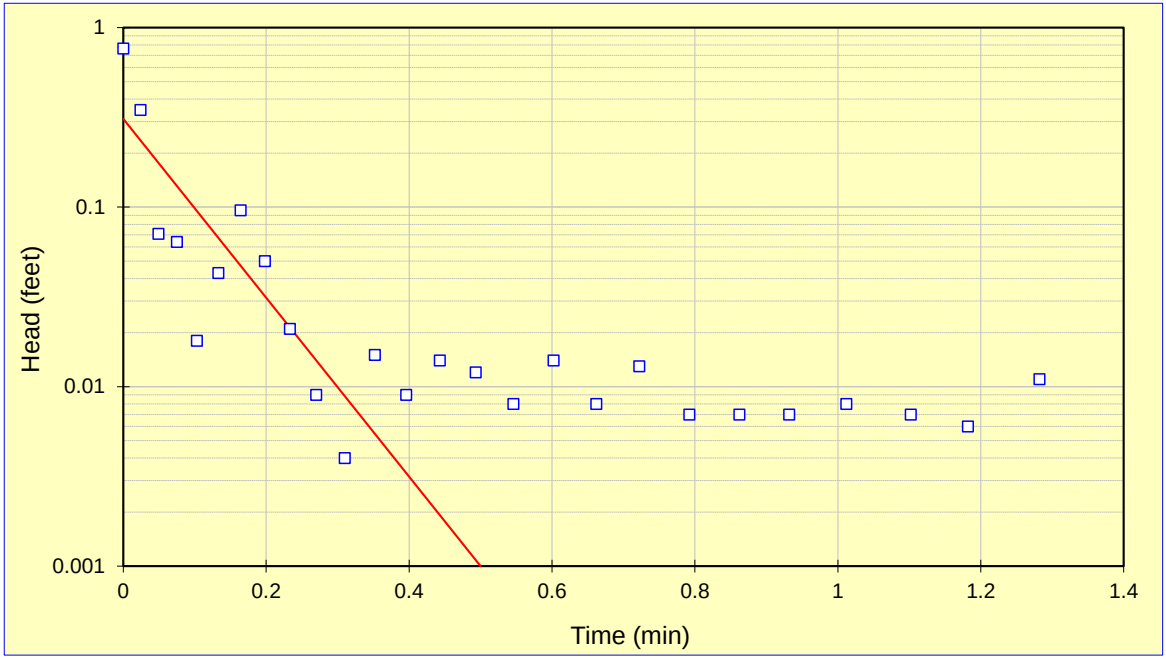
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.87
y_0 =	0.31
y_t =	0.001
t =	0.5

RESULTS

K=	5.81E-03	cm/sec
K=	1.65E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

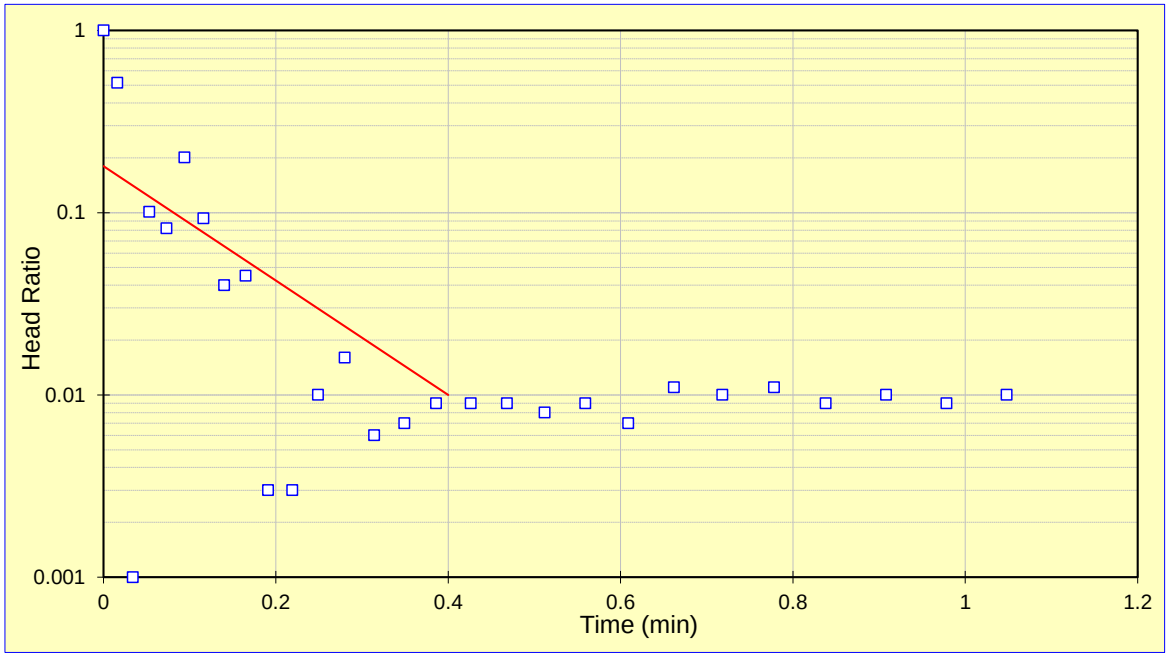
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-03B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	4.30E-03	cm/sec
t_1 =	0	K=	1.22E+01	ft/day
t_2 =	0.4			
h_1/h_0 =	0.18			
h_2/h_0 =	0.01			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-03B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

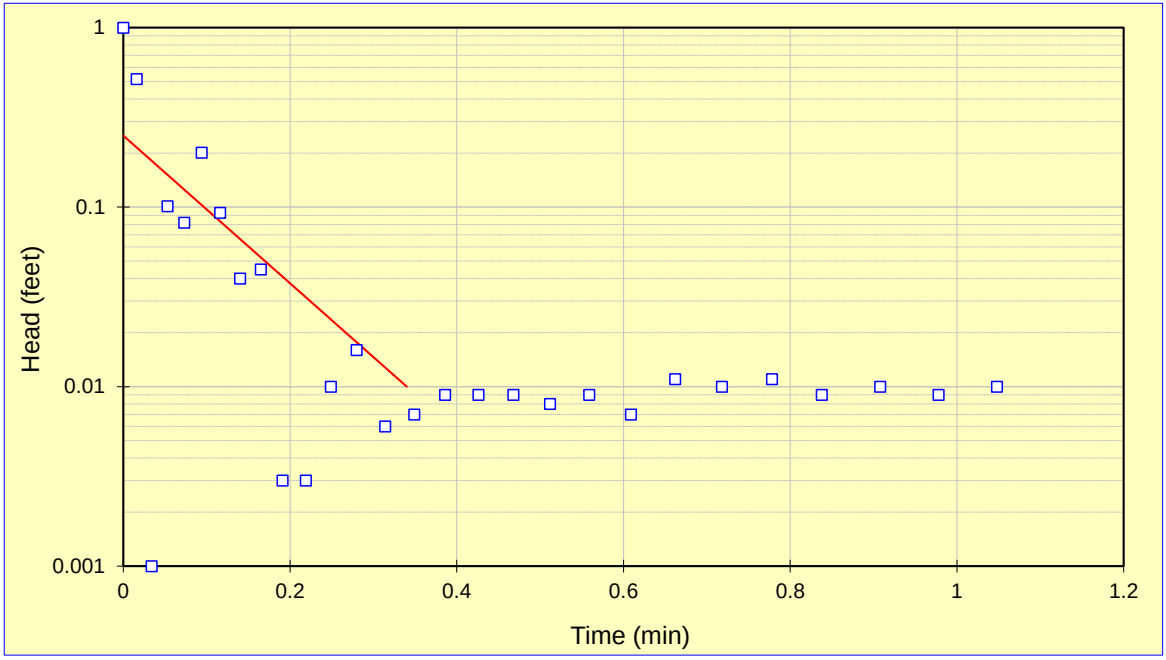
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.87
y_0 =	0.25
y_t =	0.010
t =	0.3

RESULTS

K=	4.79E-03	cm/sec
K=	1.36E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

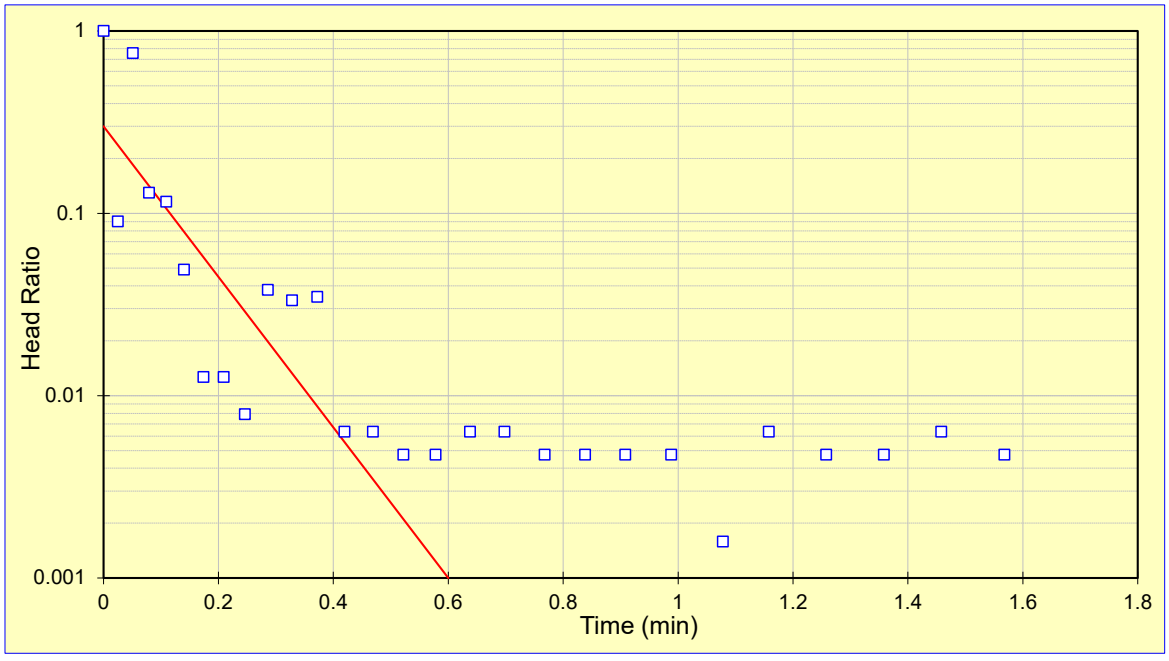
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	5.65E-03	cm/sec
t_1 =	0	K=	1.60E+01	ft/day
t_2 =	0.6			
h_1/h_0 =	0.30			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

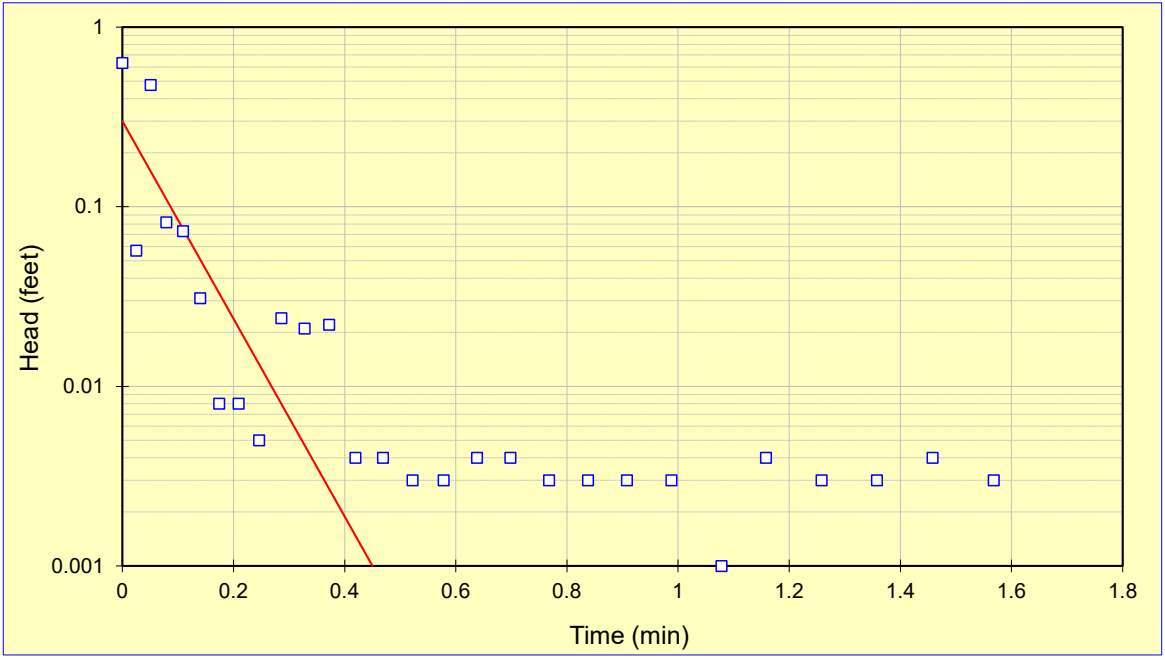
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.87
y_0 =	0.30
y_t =	0.001
t =	0.5

RESULTS

K=	6.42E-03	cm/sec
K=	1.82E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-03B (TEST 2)

$$T = b + a\ln T$$

where:

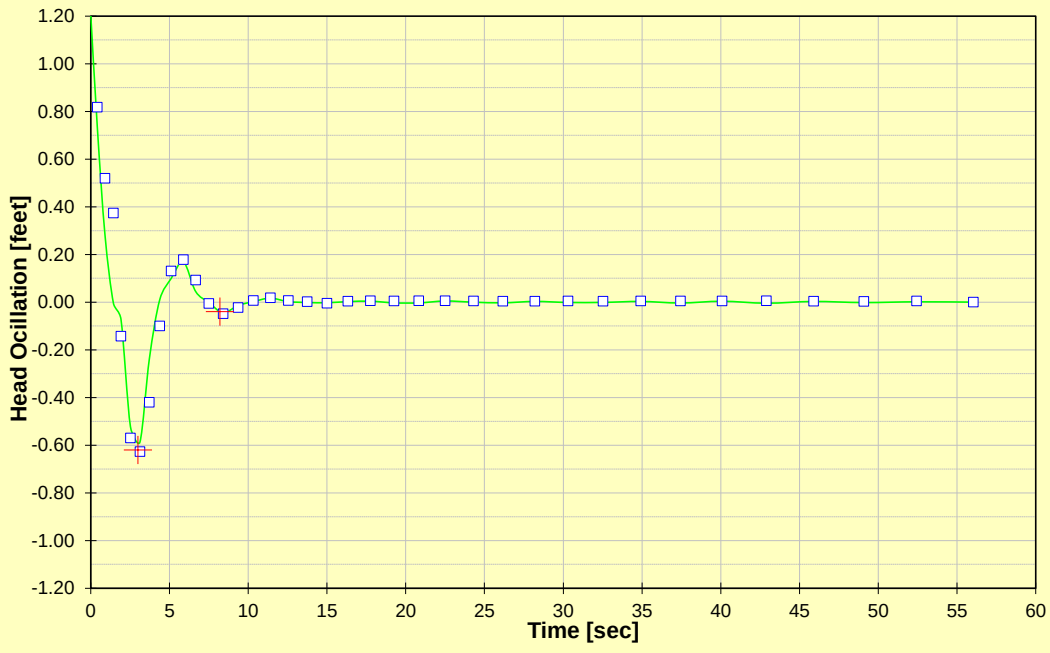
$$b = -a\ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g / L^{1/2}\right) / 8d$$
$$d = \gamma / \left(g / L\right)^{1/2}$$
$$L = g / \left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.31826	ft^2
r_s =	0.08	ft	d =	0.3998	ft^{-1}
L_c =	19.62	ft	a =	0.00286	ft^3
L_s =	10.00	ft	t_1 =	3.00	sec
ω =	1.2083	ft^{-1}	t_2 =	8.20	sec
γ =	0.5271	ft^{-1}	$h(t_1)$ =	0.62	ft
L =	18.52	ft^3/sec^2	$h(t_2)$ =	0.04	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	2.73E-02	ft^2/sec	α < 0.1?	YES
T =	1.53E-02	ft^2/sec	d < 0.7?	YES
T =	1.32E+03	ft^2/day	L_1 =	18.52
K =	4.22E+01	ft/day	L_2 =	24.62
K =	1.49E-02	cm/sec	L_1:L_2 Diff <20% ?	NO



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/08/16

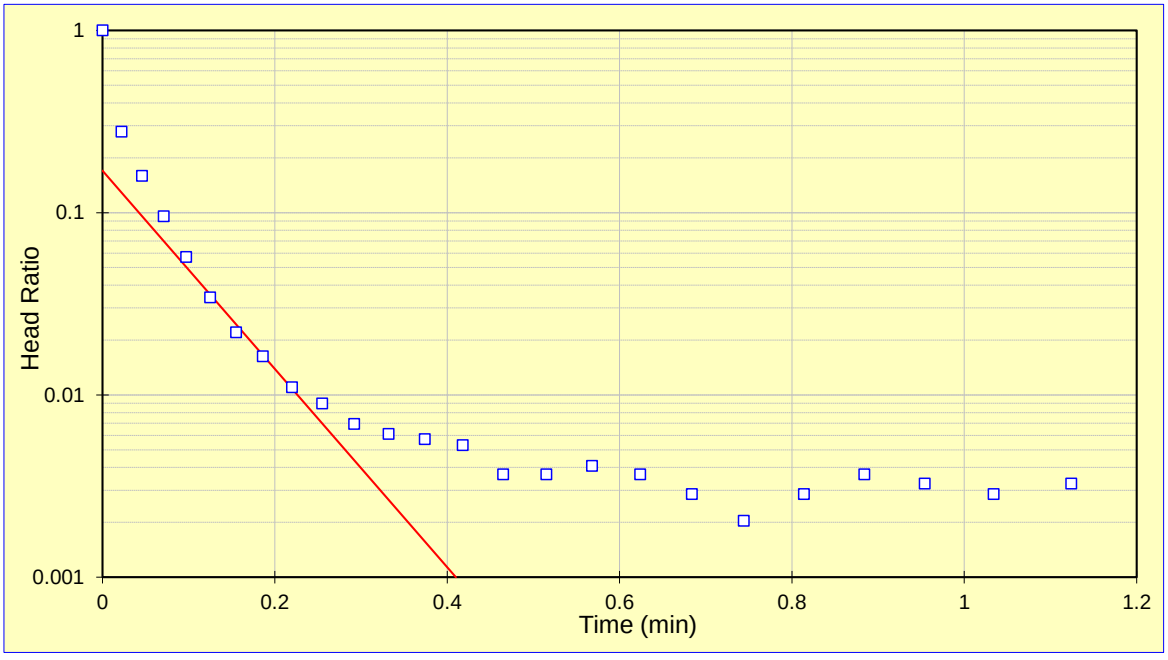
Analysis By: DFS
Checked By: JRS
Analysis Date: 8/8/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	7.45E-03	cm/sec
t_1 =	0	K=	2.11E+01	ft/day
t_2 =	0.41			
h_1/h_0 =	0.17			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

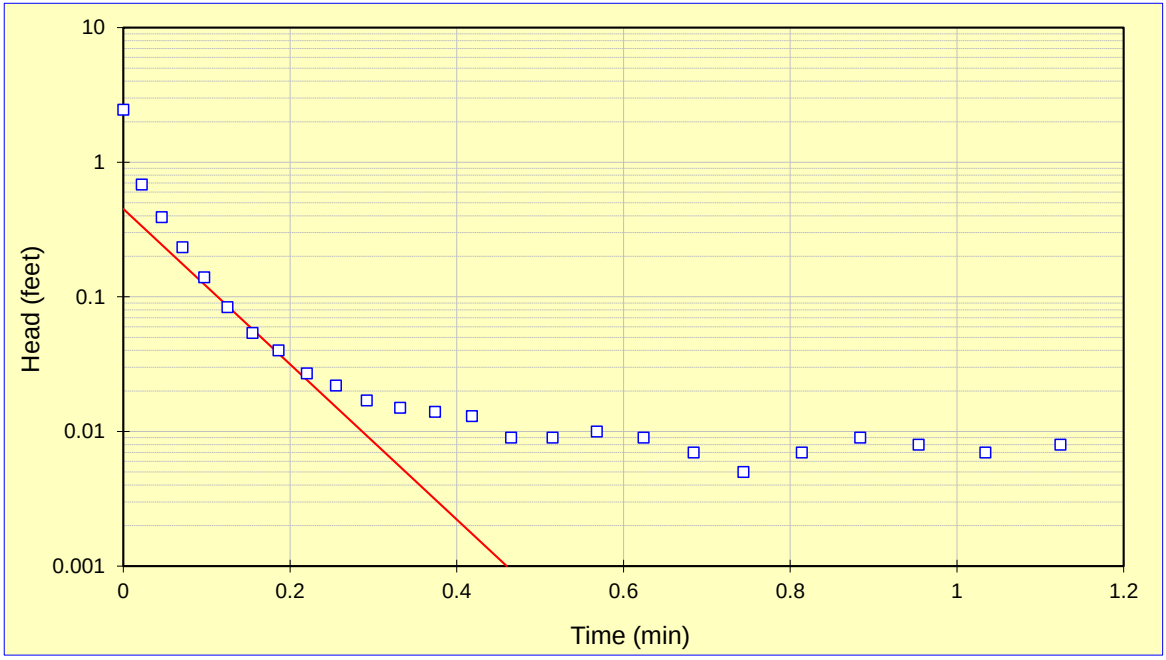
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.23
y_0 =	0.45
y_t =	0.001
t =	0.5

RESULTS

K=	5.22E-03	cm/sec
K=	1.48E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 1)

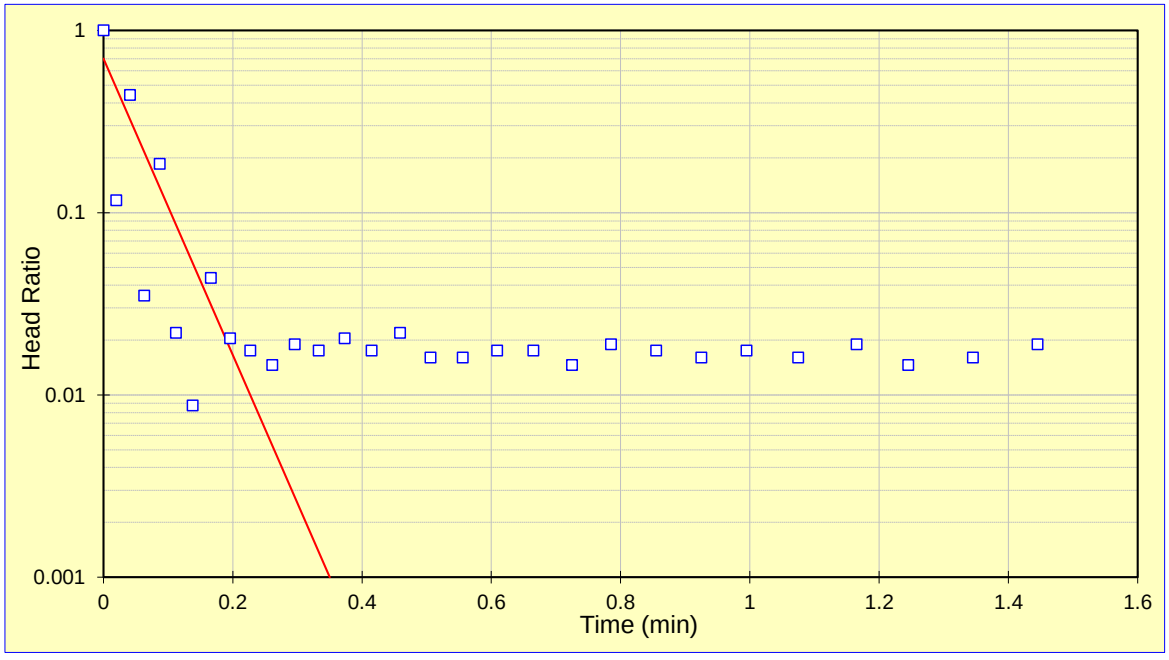
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	10
t_1 =	0
t_2 =	0.35
h_1/h_0 =	0.70
h_2/h_0 =	0.00

RESULTS

K=	1.11E-02	cm/sec
K=	3.15E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

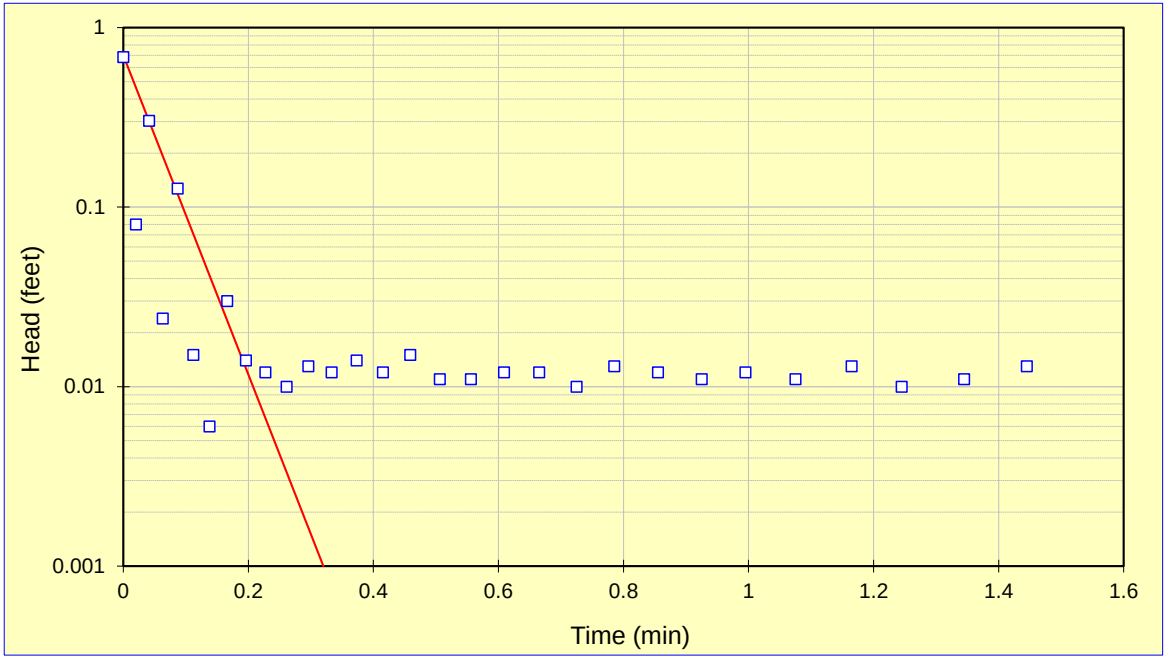
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.22
y_0 =	0.70
y_t =	0.001
t =	0.3

RESULTS

K=	1.16E-02	cm/sec
K=	3.30E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

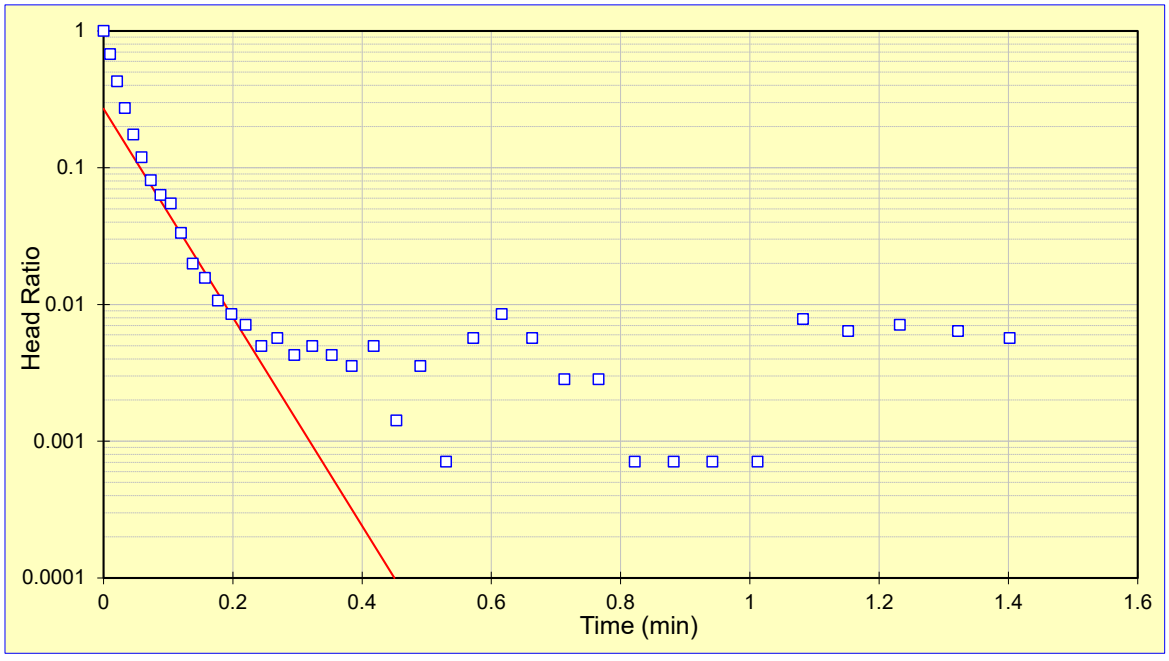
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13 (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
R_e =	0.34			
L_e =	9.037	K=	6.50E-02	cm/sec
t_1 =	0	K=	1.84E+02	ft/day
t_2 =	0.45			
h_1/h_0 =	0.27			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

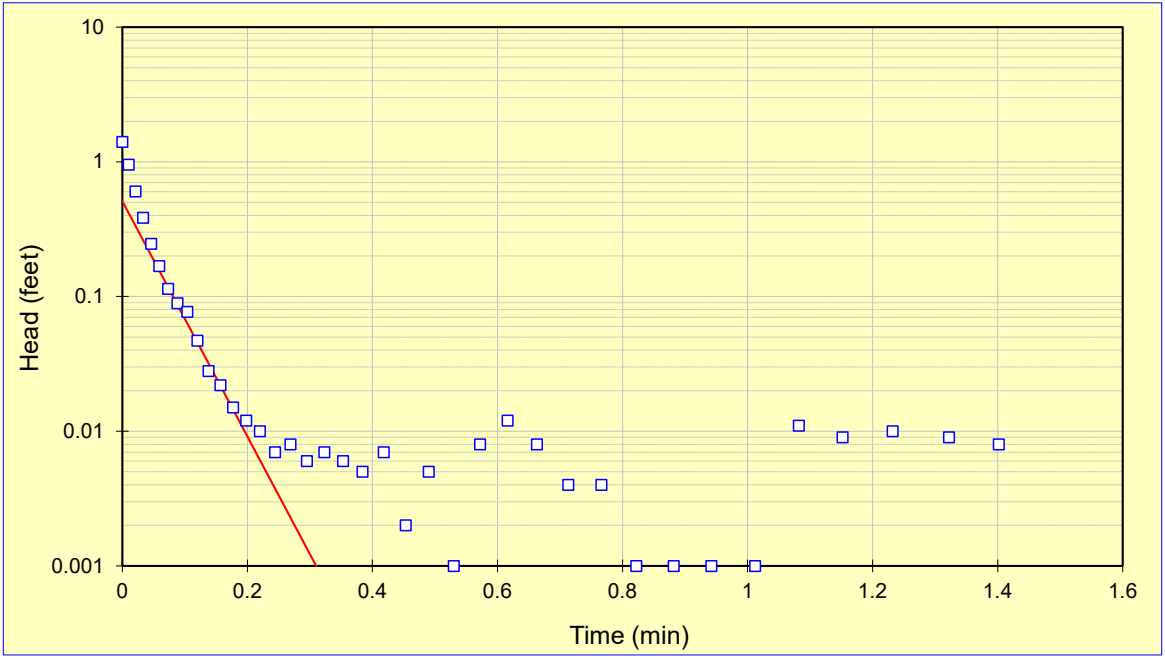
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	9.037
$\ln(R_e/r_w)$=	2.11
y_0 =	0.51
y_t =	0.001
t =	0.3

RESULTS

K=	4.81E-02	cm/sec
K=	1.36E+02	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

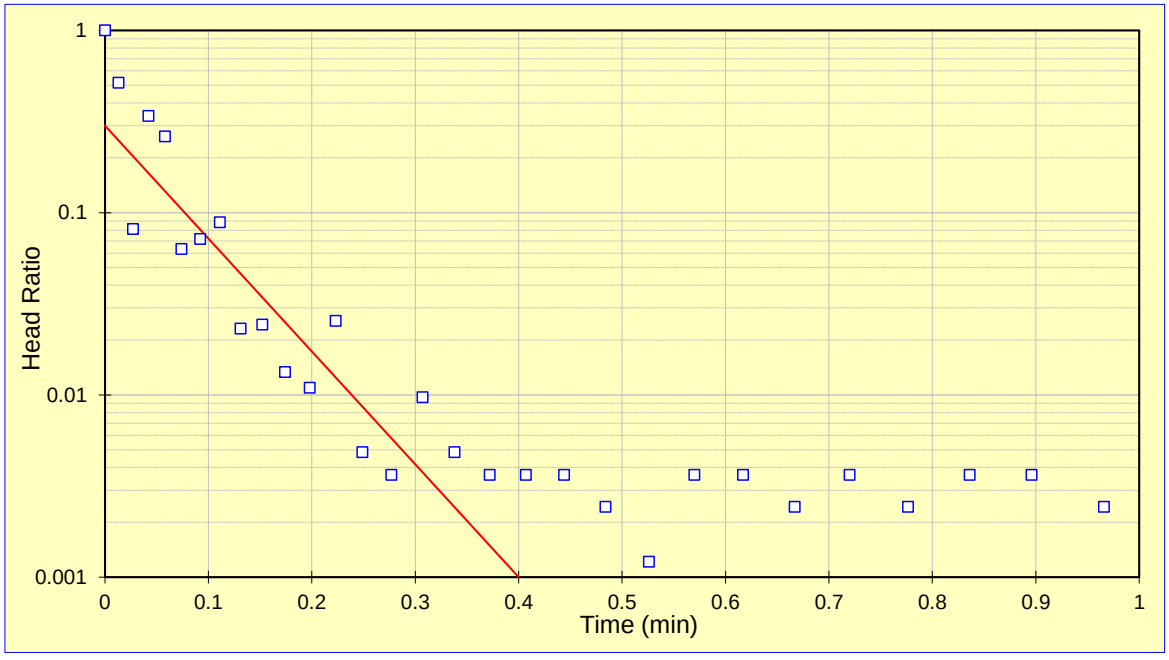
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left|\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right| 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	8.48E-03	cm/sec
t_1 =	0	K=	2.40E+01	ft/day
t_2 =	0.4			
h_1/h_0 =	0.30			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
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Analysis By: DFS
Checked By: JRS
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BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

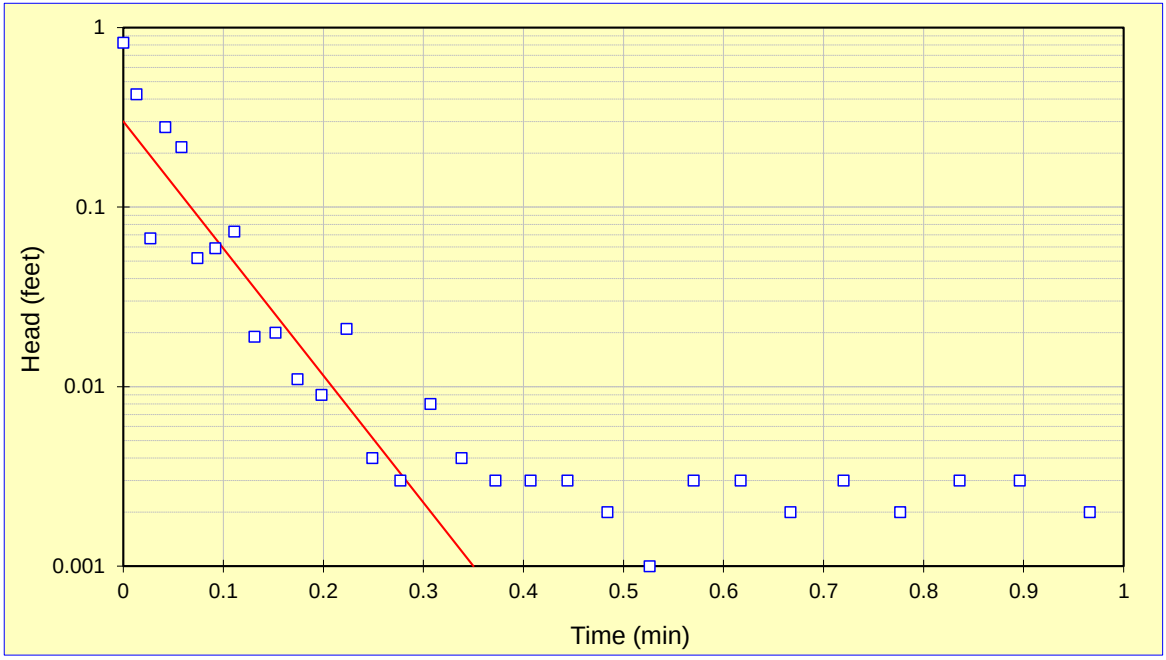
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.22
y_0 =	0.30
y_t =	0.001
t =	0.4

RESULTS

K=	9.27E-03	cm/sec
K=	2.63E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

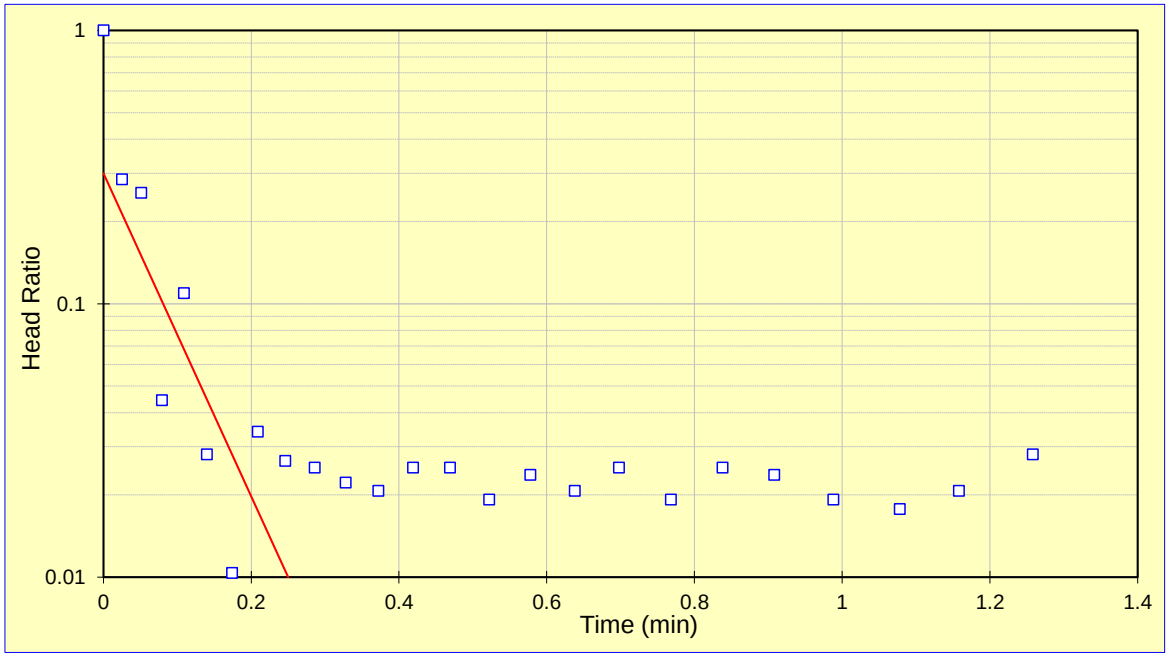
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	8.09E-03	cm/sec
t_1 =	0	K=	2.29E+01	ft/day
t_2 =	0.25			
h_1/h_0 =	0.30			
h_2/h_0 =	0.01			



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Analysis By: DFS
Checked By: JRS
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BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

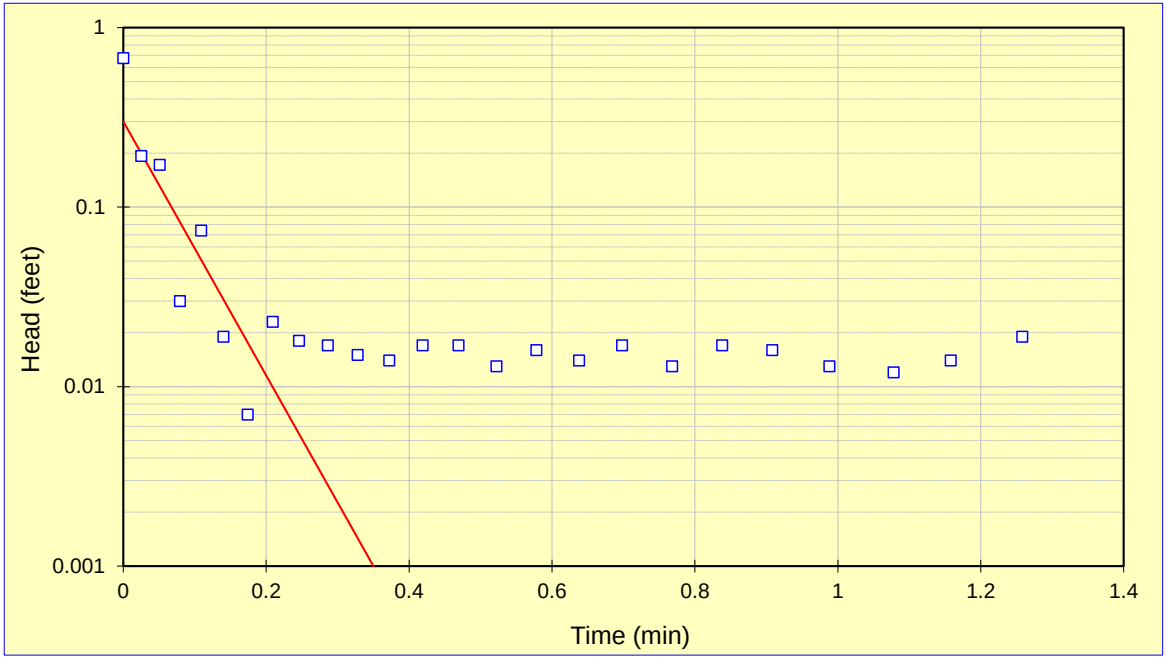
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.22
y_0 =	0.30
y_t =	0.001
t =	0.4

RESULTS

K=	9.27E-03	cm/sec
K=	2.63E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-13B (TEST 1)

$$T = b + a \ln T$$

where:

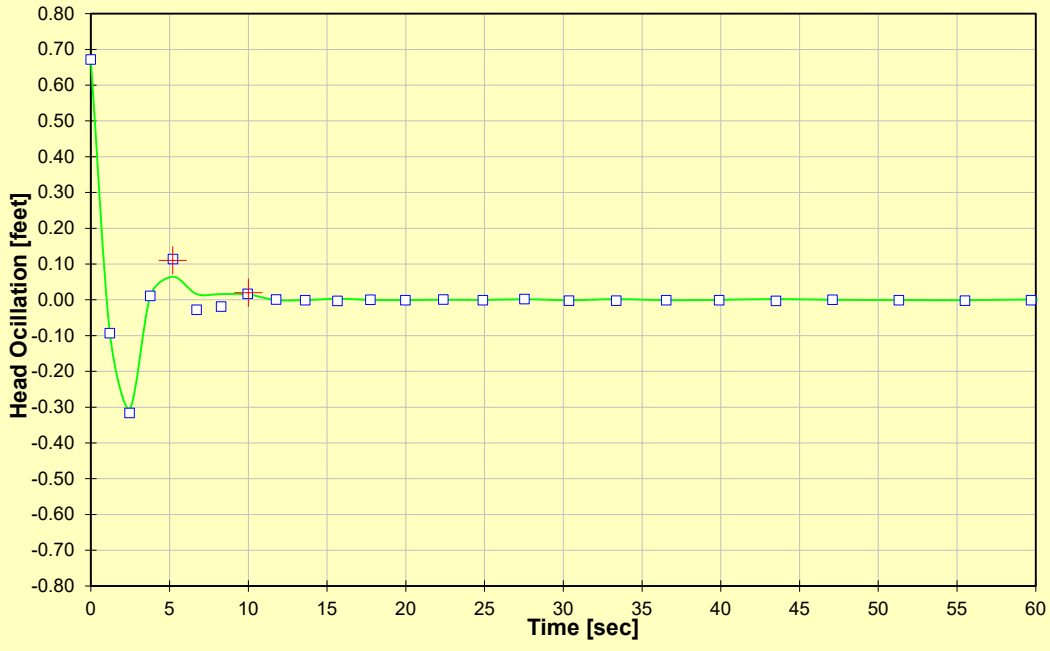
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.35632	ft^2
r_s =	0.08	ft	d =	0.2619	ft^{-1}
L_c =	19.45	ft	a =	0.00450	ft^3
L_s =	9.98	ft	t_1 =	5.20	sec
w =	1.3090	ft^{-1}	t_2 =	10.00	sec
g =	0.3552	ft^{-1}	$h(t_1)$ =	0.11	ft
L =	17.50	ft^3/sec^2	$h(t_2)$ =	0.02	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	4.27E-02	ft^2/sec	$a < 0.1$?	YES
T =	2.64E-02	ft^2/sec	$d < 0.7$?	YES
T =	2.28E+03	ft^2/day	L_1 =	17.50
K =	7.74E+01	ft/day	L_2 =	24.44
K =	2.73E-02	cm/sec	L_1:L_2 Diff <20% ?	NO



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 1)

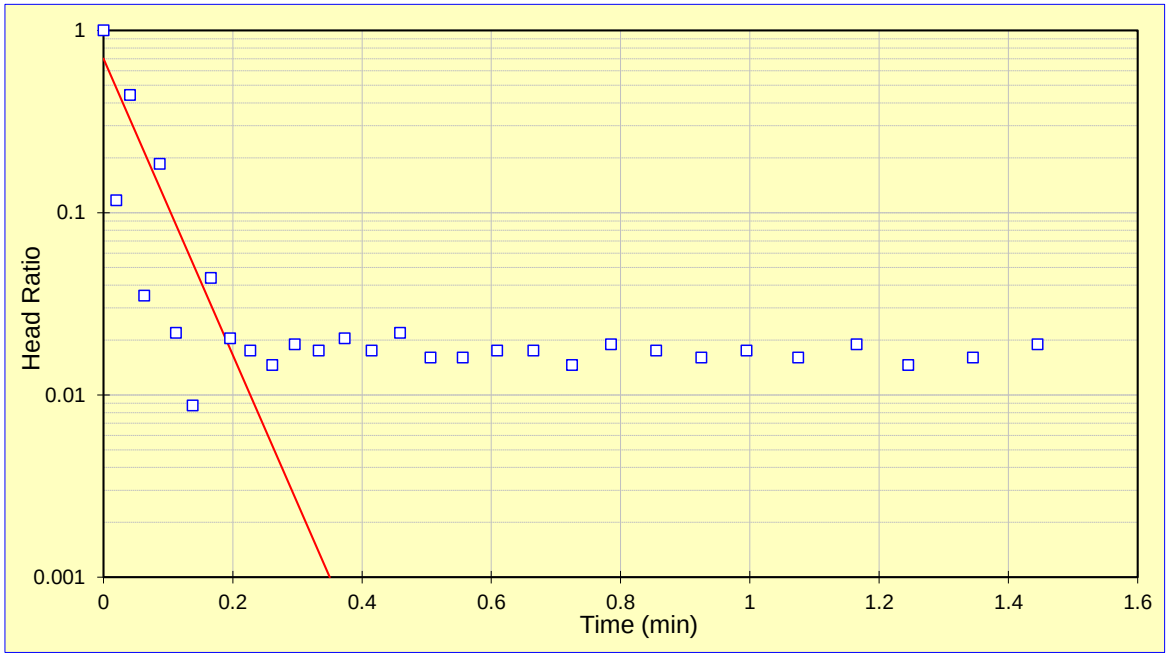
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	10
t_1 =	0
t_2 =	0.35
h_1/h_0 =	0.70
h_2/h_0 =	0.00

RESULTS

K=	1.11E-02	cm/sec
K=	3.15E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

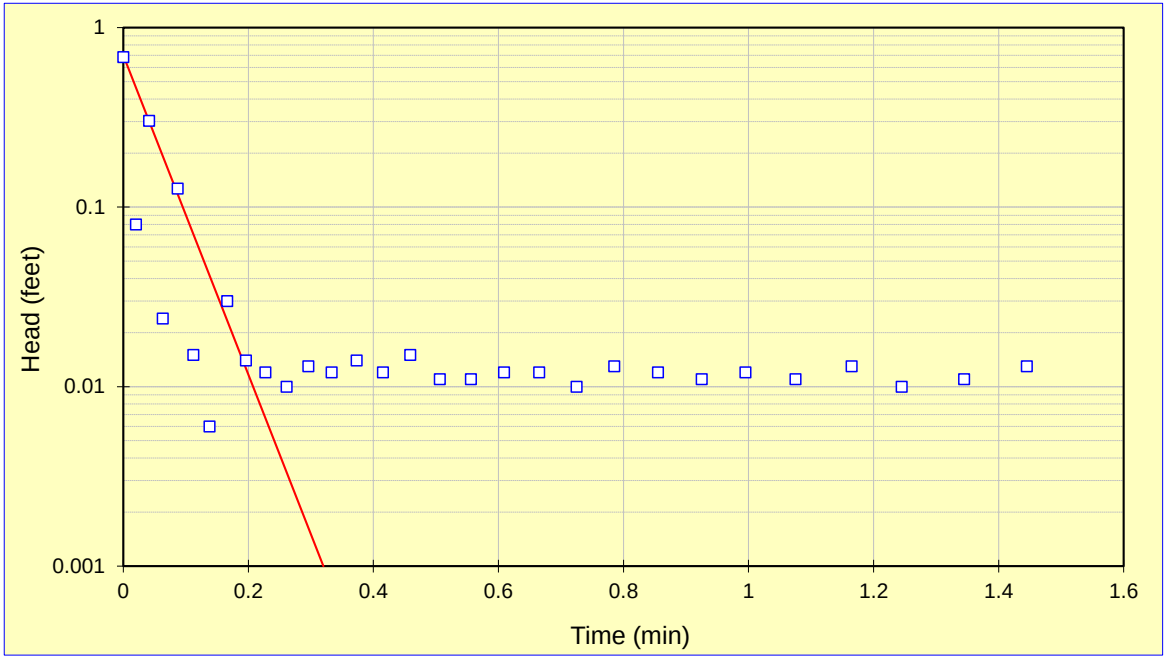
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.22
y_0 =	0.70
y_t =	0.001
t =	0.3

RESULTS

K=	1.16E-02	cm/sec
K=	3.30E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-13B (TEST 2)

$$T = b + a \ln T$$

where:

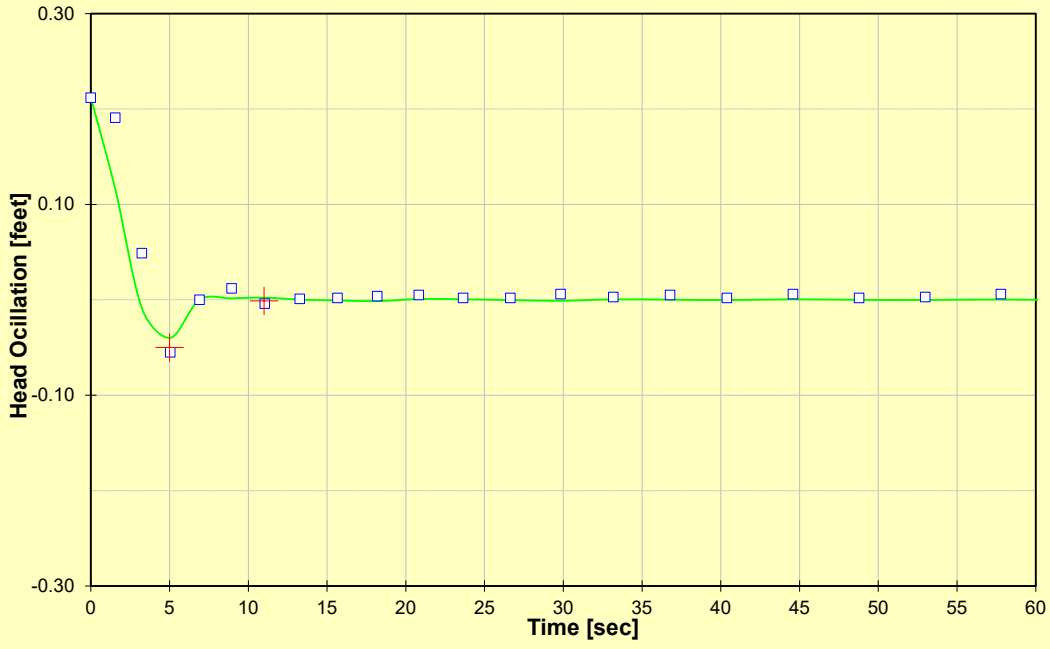
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.23358	ft^2
r_s =	0.08	ft	d =	0.5285	ft^{-1}
L_c =	19.14	ft	a =	0.00203	ft^3
L_s =	9.98	ft	t_1 =	5.00	sec
w =	1.0472	ft^{-1}	t_2 =	11.00	sec
g =	0.6520	ft^{-1}	$h(t_1)$ =	0.05	ft
L =	21.15	ft^3/sec^2	$h(t_2)$ =	0.00	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	1.95E-02	ft^2/sec	a < 0.1?	YES
T =	1.02E-02	ft^2/sec	d < 0.7?	YES
T =	8.77E+02	ft^2/day	L_1 =	21.15
K =	3.01E+01	ft/day	L_2 =	24.13
K =	1.06E-02	cm/sec	L_1:L_2 Diff <20% ?	YES



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

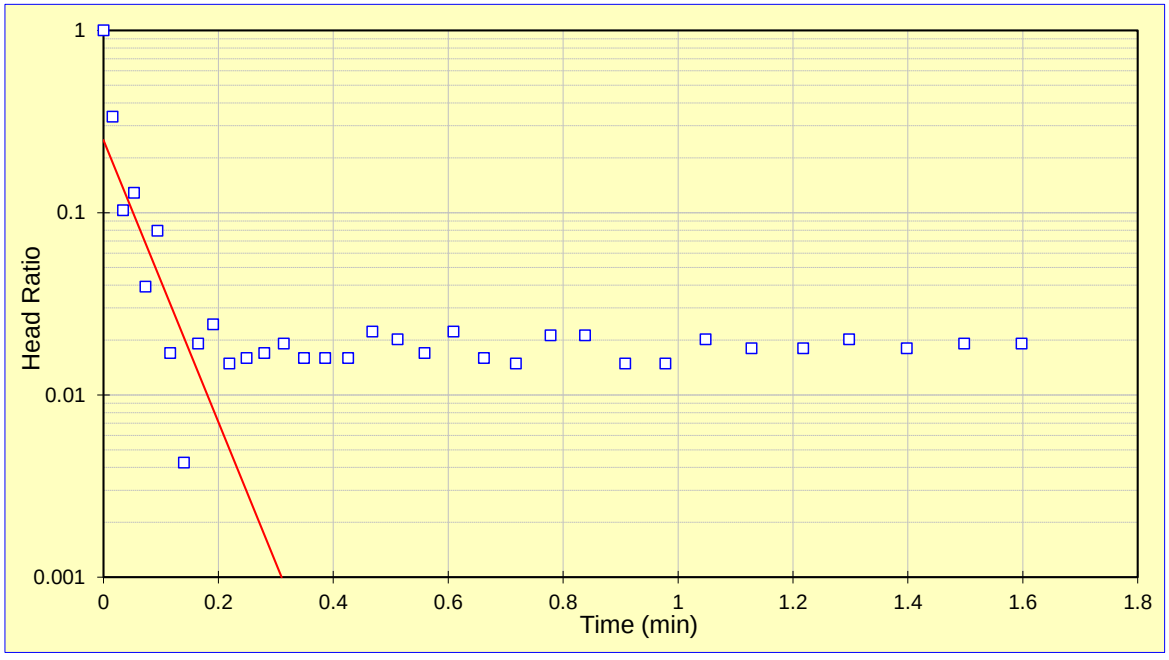
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left| \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right| 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.06E-02	cm/sec
t_1 =	0	K=	3.00E+01	ft/day
t_2 =	0.31			
h_1/h_0 =	0.25			
h_2/h_0 =	0.00			



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Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

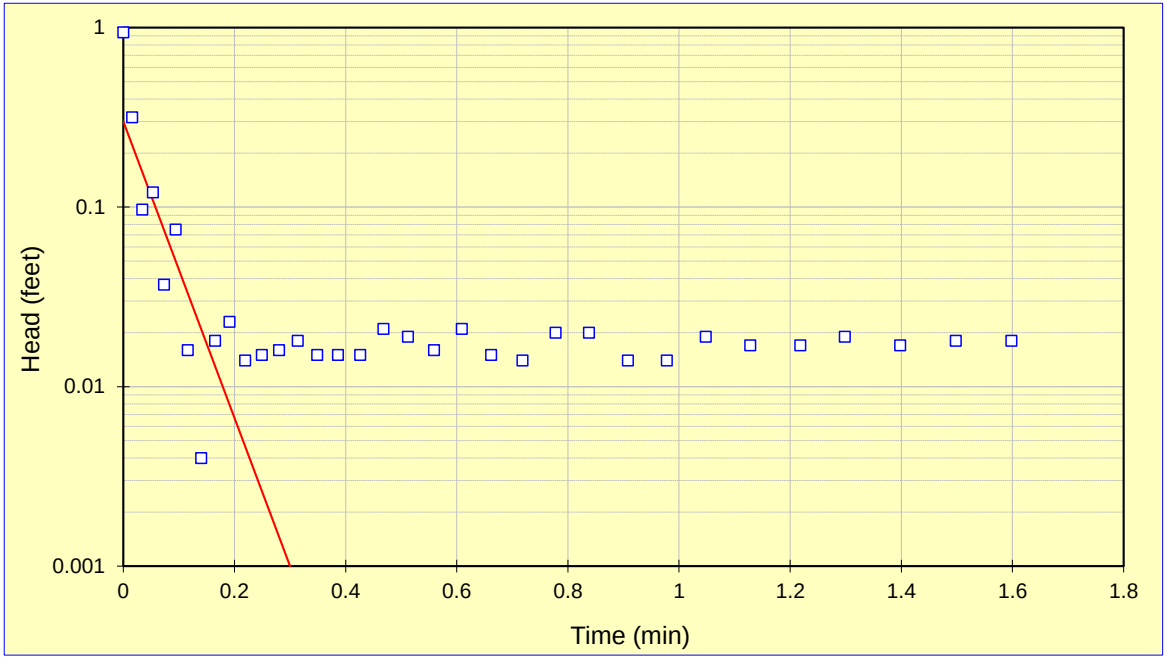
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.22
y_0 =	0.30
y_t =	0.001
t =	0.3

RESULTS

K=	1.08E-02	cm/sec
K=	3.06E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

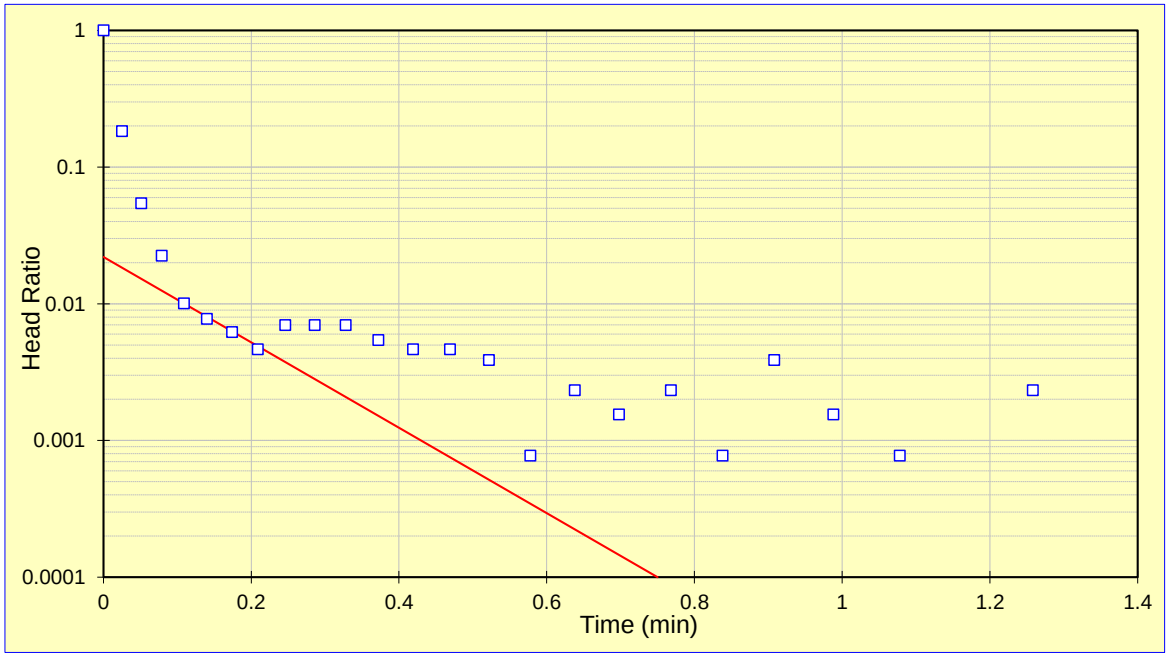
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15 (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
R_e =	0.34			
L_e =	9.417	K=	2.59E-02	cm/sec
t_1 =	0	K=	7.34E+01	ft/day
t_2 =	0.75			
h_1/h_0 =	0.02			
h_2/h_0 =	0.00			



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Analysis By: DFS
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BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15 (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

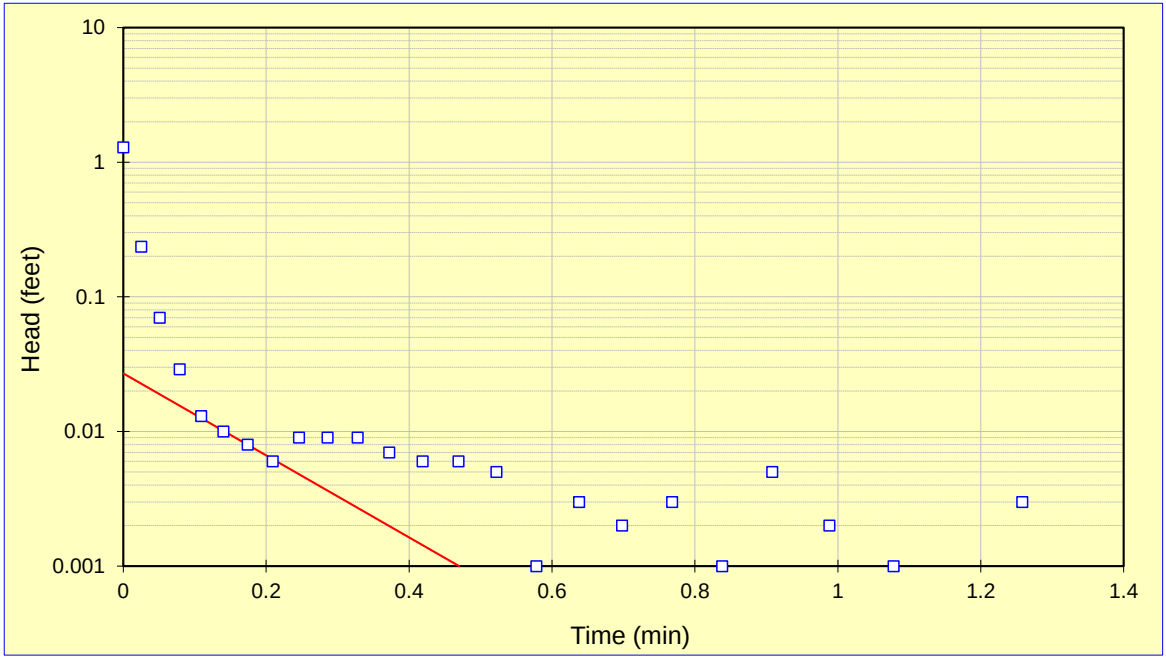
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	9.417
$\ln(R_e/r_w)$=	2.14
y_0 =	0.03
y_t =	0.001
t =	0.5

RESULTS

K=	1.63E-02	cm/sec
K=	4.63E+01	ft/day



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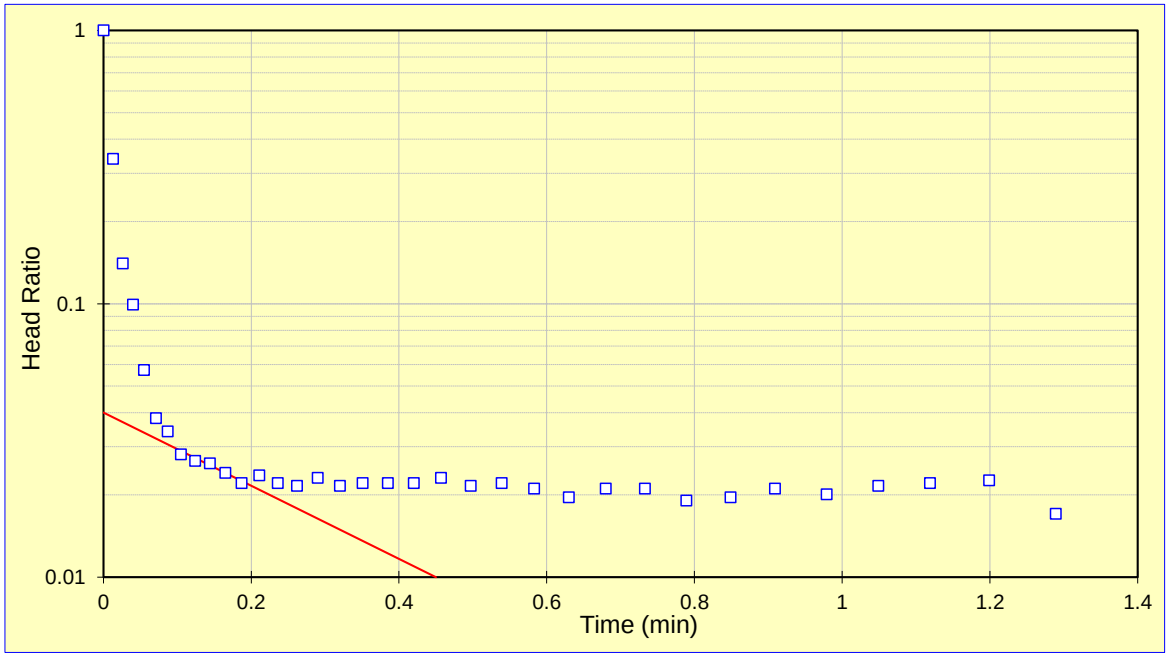
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15 (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
R_e =	0.34			
L_e =	9.348	K=	1.11E-02	cm/sec
t_1 =	0	K=	3.16E+01	ft/day
t_2 =	0.45			
h_1/h_0 =	0.04			
h_2/h_0 =	0.01			



Project Name: NIPSCO Schahfer
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Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

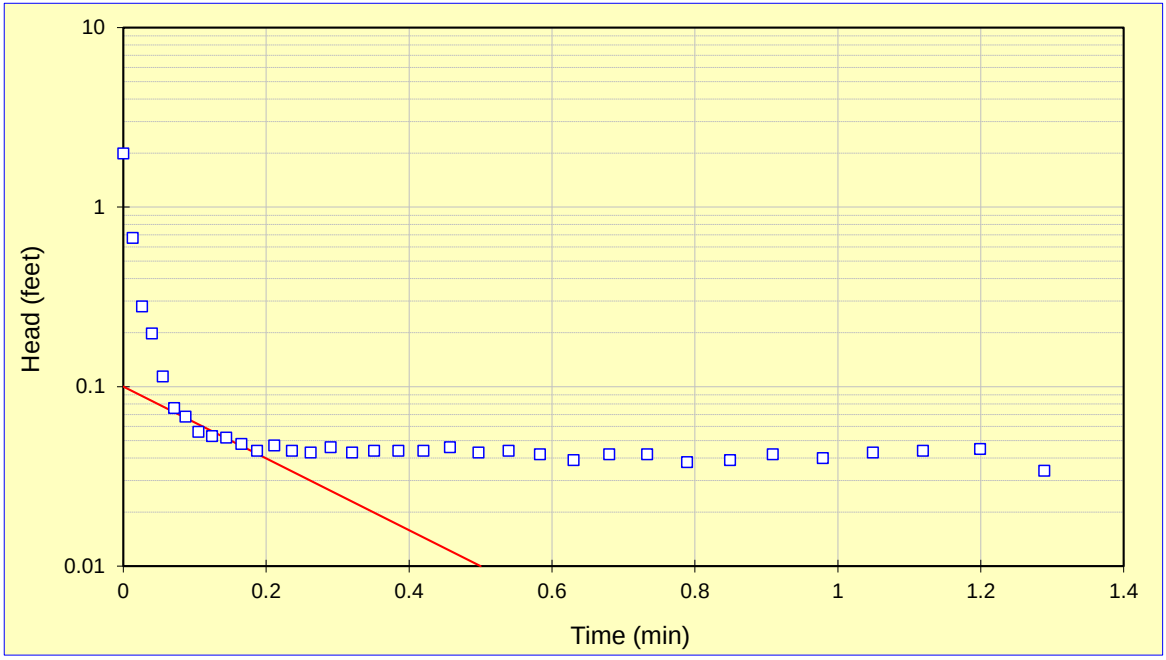
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	9.348
$\ln(R_e/r_w)$=	2.13
y_0 =	0.10
y_t =	0.010
t =	0.5

RESULTS

K=	1.08E-02	cm/sec
K=	3.05E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

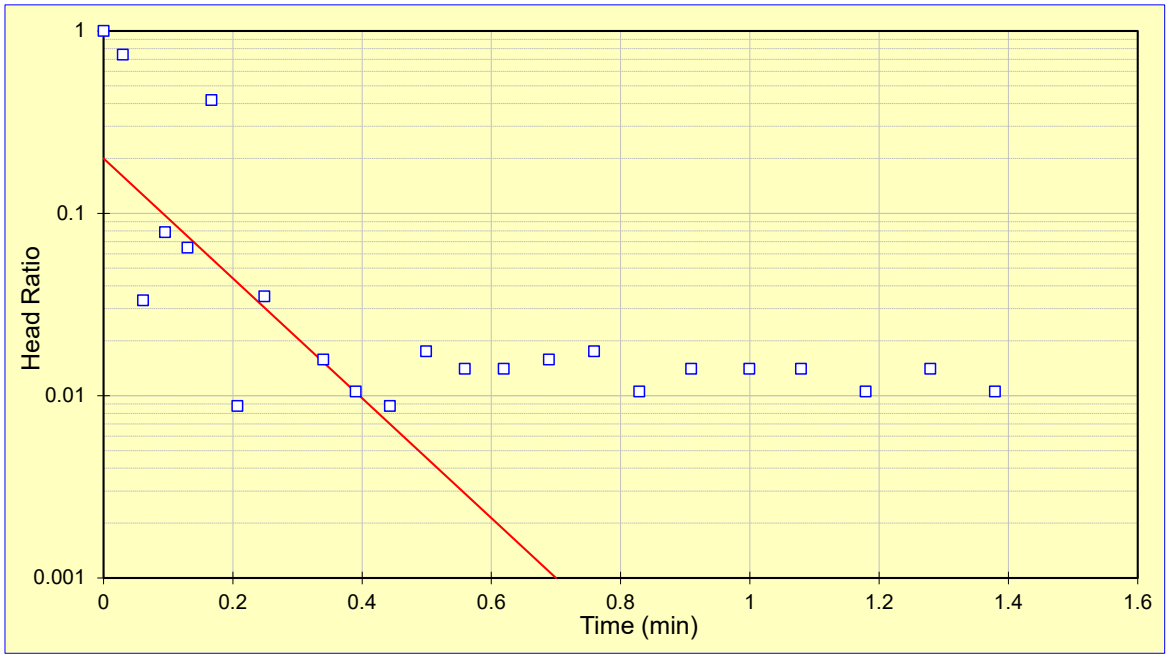
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	4.50E-03	cm/sec
t_1 =	0	K=	1.28E+01	ft/day
t_2 =	0.7			
h_1/h_0 =	0.20			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

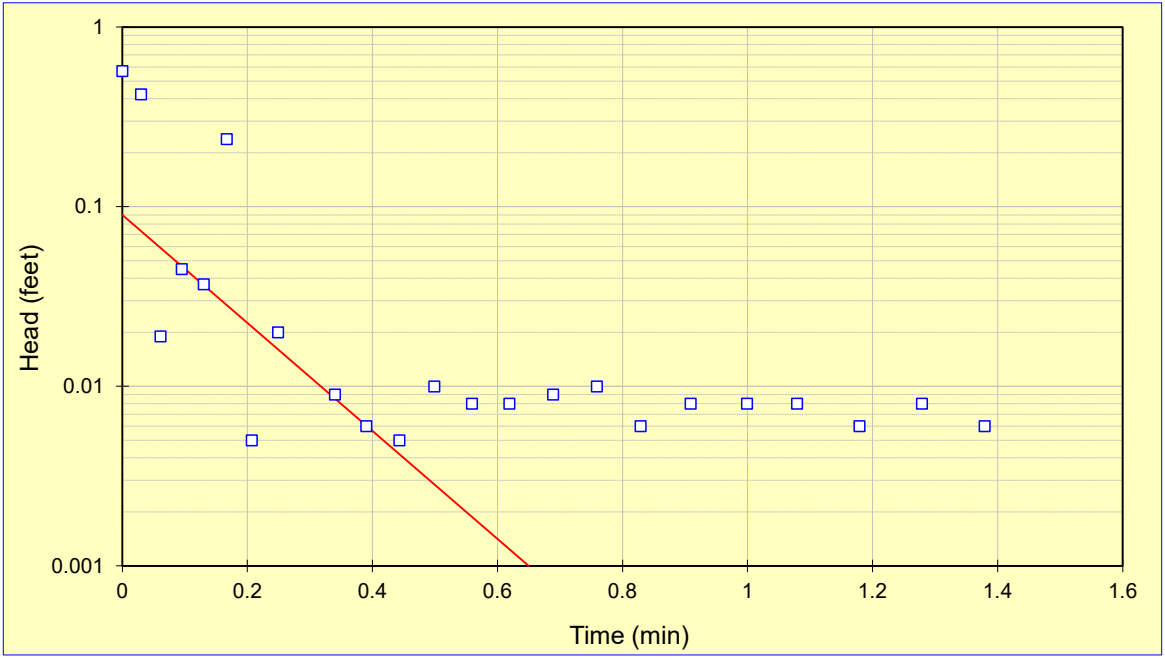
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.83
y_0 =	0.09
y_t =	0.001
t =	0.7

RESULTS

K=	3.45E-03	cm/sec
K=	9.79E+00	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP FALLING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-15B (TEST 2)

$$T = b + a \ln T$$

where:

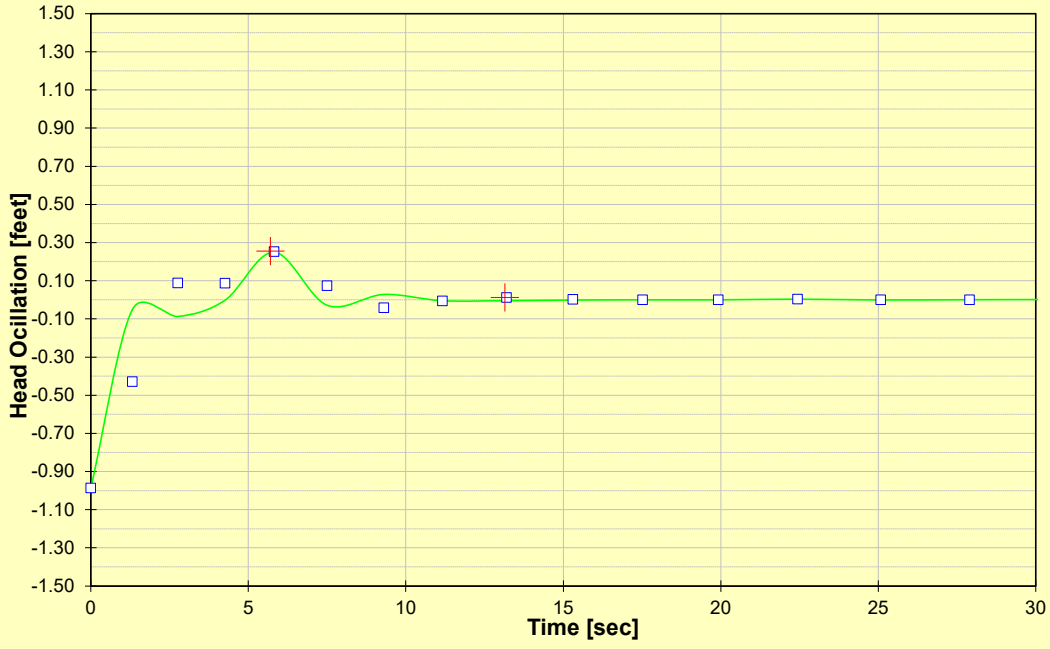
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	0.93787	ft^2
r_s =	0.08	ft	d =	0.4374	ft^{-1}
L_c =	19.23	ft	a =	0.00186	ft^3
L_s =	10.00	ft	t_1 =	5.70	sec
w =	0.8434	ft^{-1}	t_2 =	13.15	sec
g =	0.4102	ft^{-1}	$h(t_1)$ =	0.26	ft
L =	36.60	ft^3/sec^2	$h(t_2)$ =	0.01	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	1.84E-02	ft^2/sec	$a < 0.1$?	YES
T =	9.76E-03	ft^2/sec	$d < 0.7$?	YES
T =	8.44E+02	ft^2/day	L_1 =	36.60
K =	2.70E+01	ft/day	L_2 =	24.23
K =	9.53E-03	cm/sec	L_1:L_2 Diff <20% ?	NO



Project Name: NIPSCO RMSGS
Project No.: 164-8171
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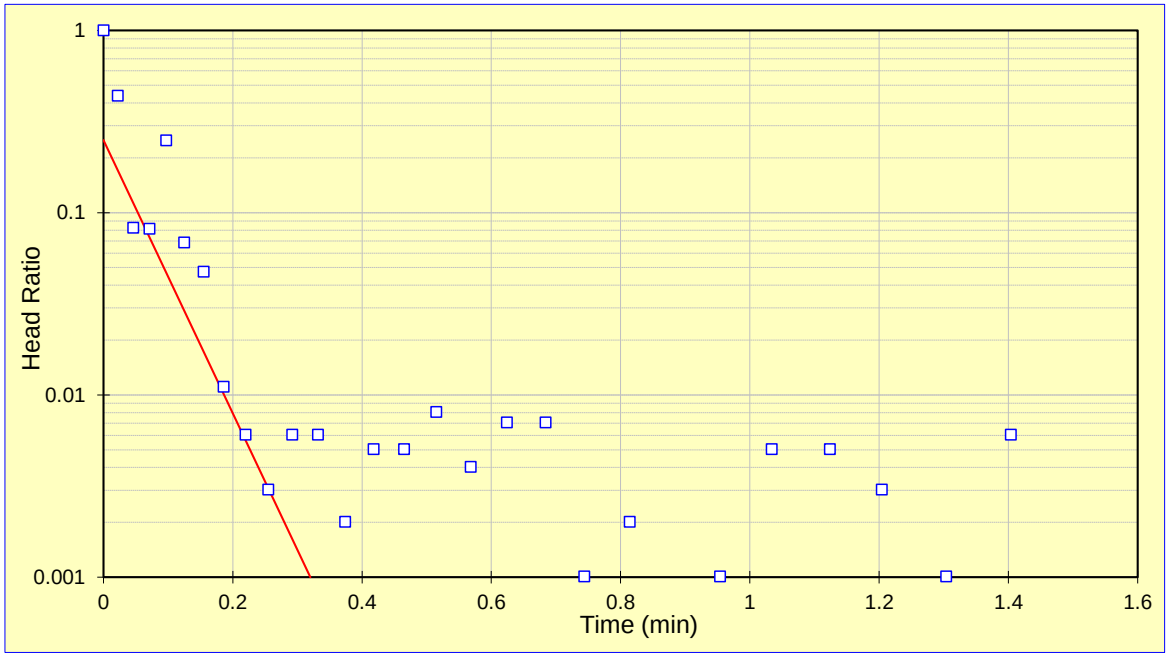
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left|\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right| 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.03E-02	cm/sec
t_1 =	0	K=	2.91E+01	ft/day
t_2 =	0.32			
h_1/h_0 =	0.25			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

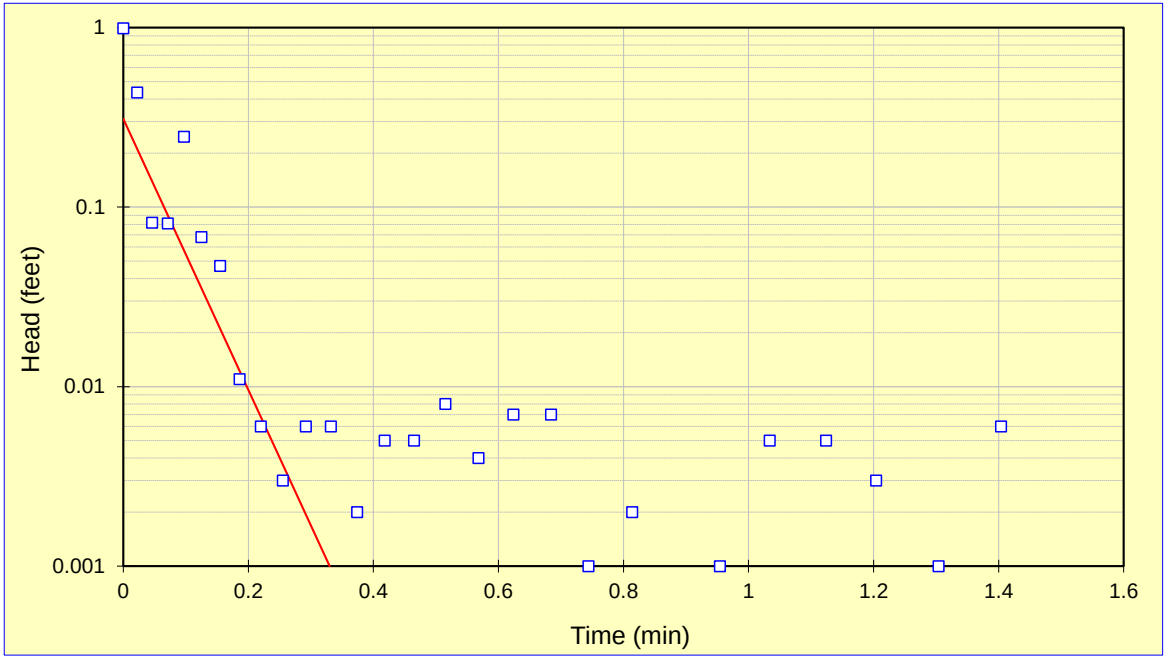
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.85
y_0 =	0.31
y_t =	0.001
t =	0.3

RESULTS

K=	8.75E-03	cm/sec
K=	2.48E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-15B (TEST 1)

$$T = b + a \ln T$$

where:

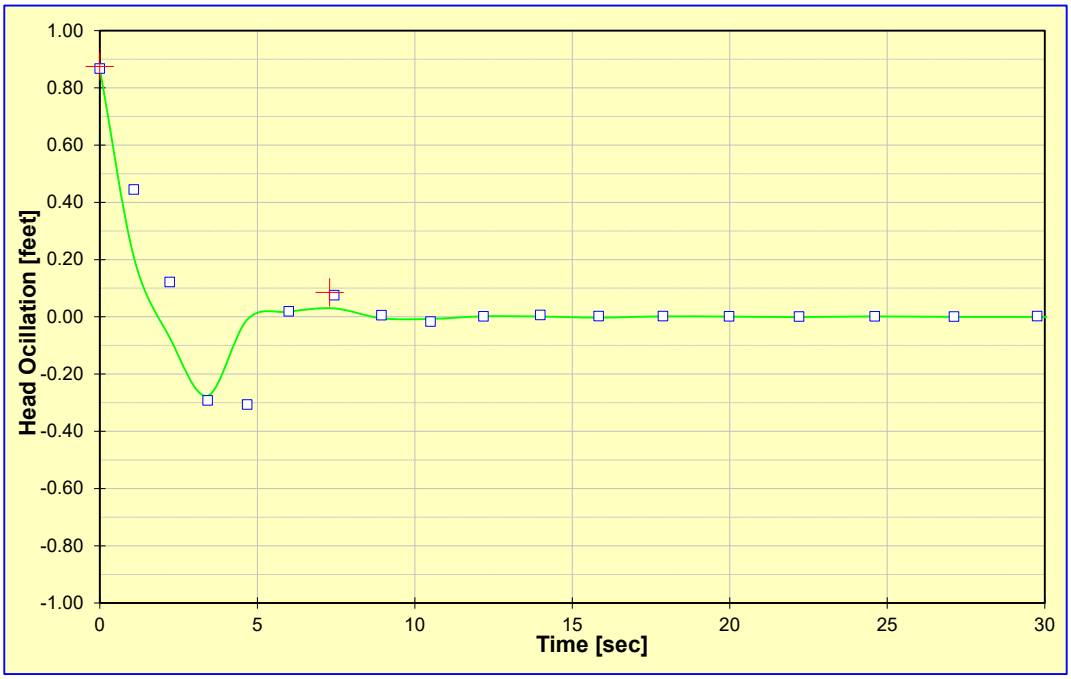
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	0.91806	ft^2
r_s =	0.08	ft	d =	0.3479	ft^{-1}
L_c =	19.23	ft	a =	0.00229	ft^3
L_s =	10.00	ft	t_1 =	0.00	sec
w =	0.8607	ft^{-1}	t_2 =	7.30	sec
g =	0.3194	ft^{-1}	$h(t_1)$ =	0.88	ft
L =	38.19	ft^3/sec^2	$h(t_2)$ =	0.09	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	2.27E-02	ft^2/sec	$a < 0.1$?	YES
T =	1.27E-02	ft^2/sec	$d < 0.7$?	YES
T =	1.09E+03	ft^2/day	L_1 =	38.19
K =	3.50E+01	ft/day	L_2 =	24.23
K =	1.24E-02	cm/sec	L_1:L_2 Diff <20% ?	NO



Project Name: NIPSCO RMSGS
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Test Date: 07/08/16

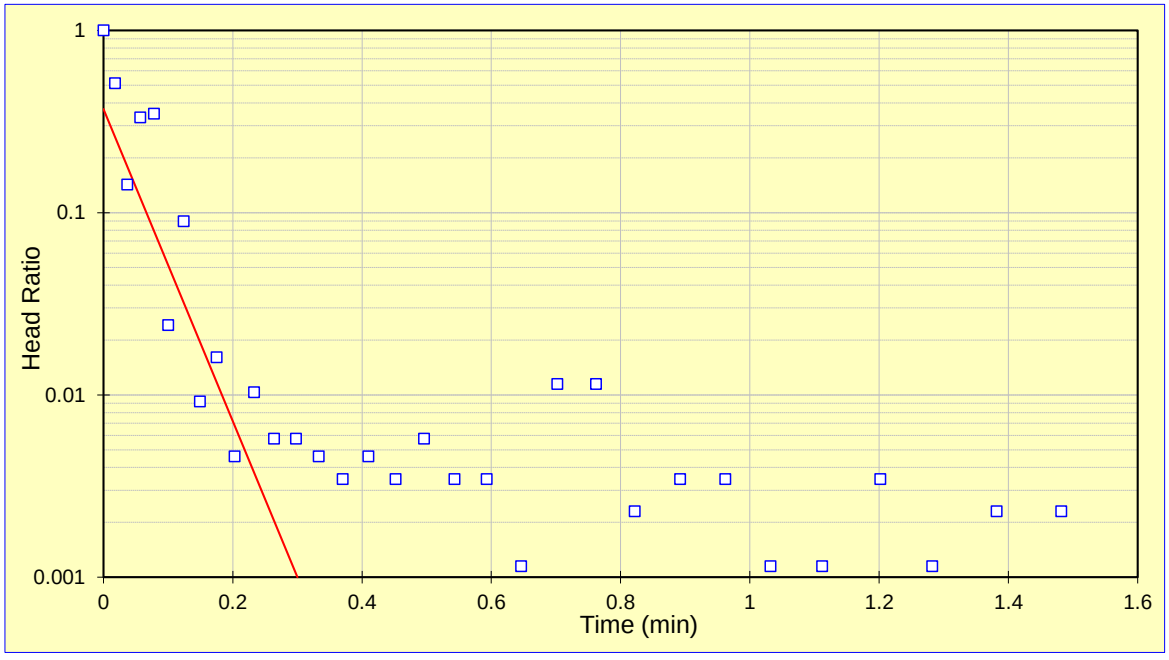
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.17E-02	cm/sec
t_1 =	0	K=	3.32E+01	ft/day
t_2 =	0.3			
h_1/h_0 =	0.37			
h_2/h_0 =	0.00			



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Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

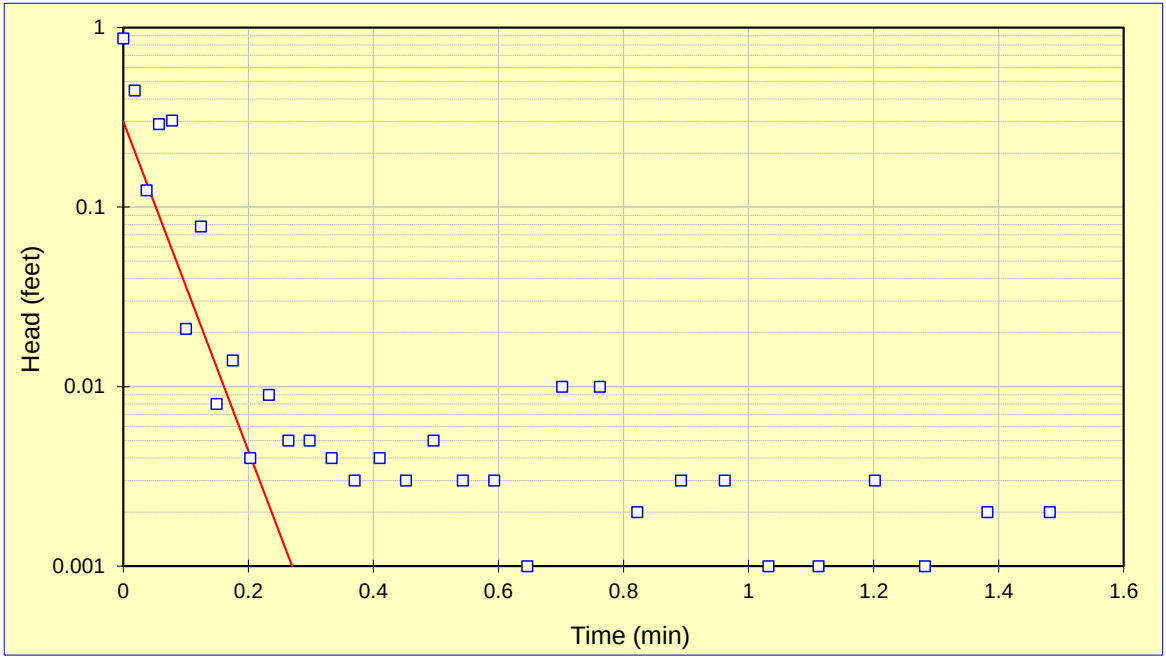
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.85
y_0 =	0.30
y_t =	0.001
t =	0.3

RESULTS

K=	1.06E-02	cm/sec
K=	3.02E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-15B (TEST 2)

$$T = b + a \ln T$$

where:

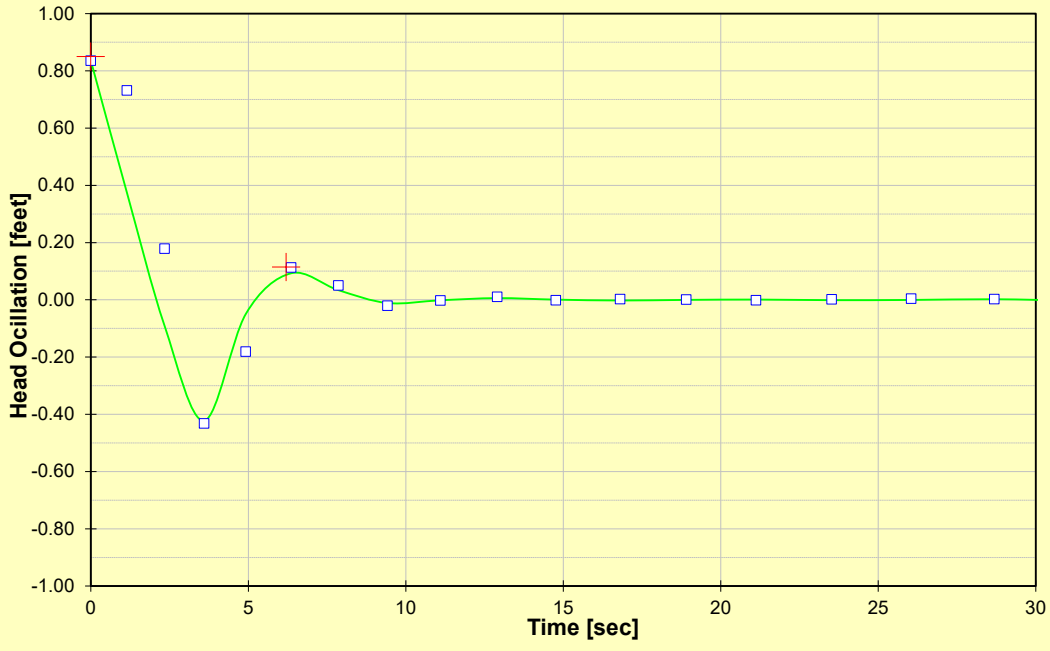
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.06353	ft^2
r_s =	0.08	ft	d =	0.3034	ft^{-1}
L_c =	19.22	ft	a =	0.00304	ft^3
L_s =	10.00	ft	t_1 =	0.00	sec
w =	1.0134	ft^{-1}	t_2 =	6.20	sec
g =	0.3226	ft^{-1}	$h(t_1)$ =	0.85	ft
L =	28.46	ft^3/sec^2	$h(t_2)$ =	0.12	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	2.97E-02	ft^2/sec	$a < 0.1$?	YES
T =	1.73E-02	ft^2/sec	$d < 0.7$?	YES
T =	1.50E+03	ft^2/day	L_1 =	28.46
K =	4.80E+01	ft/day	L_2 =	24.22
K =	1.69E-02	cm/sec	L_1:L_2 Diff <20% ?	YES



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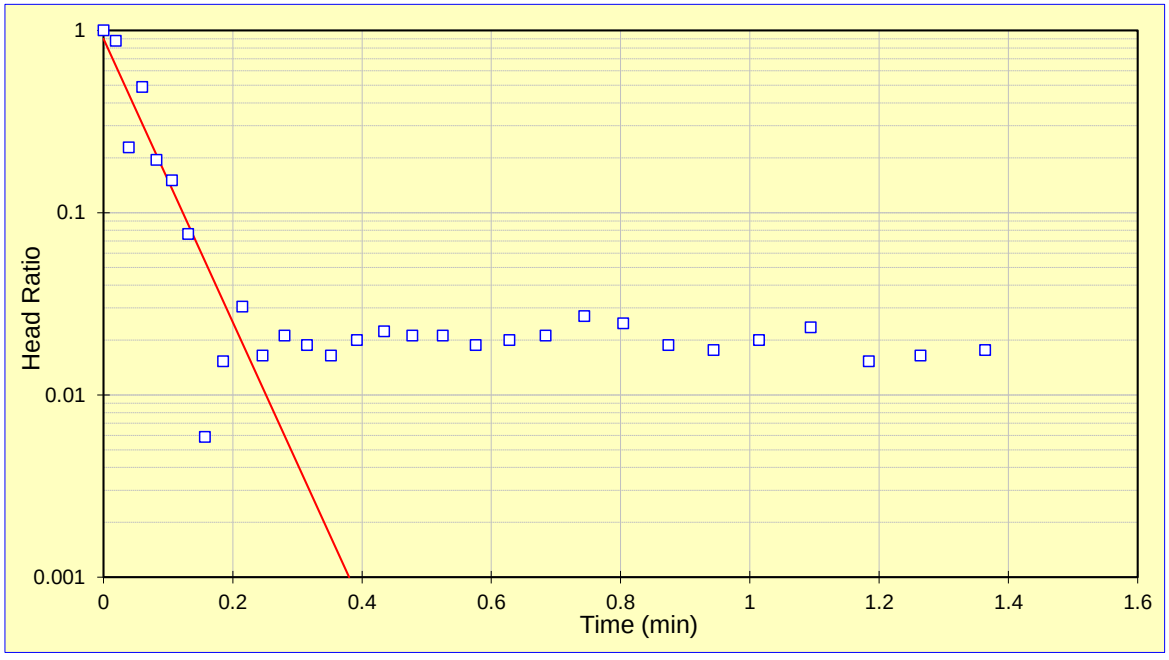
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.06E-02	cm/sec
t_1 =	0	K=	3.02E+01	ft/day
t_2 =	0.38			
h_1/h_0 =	0.90			
h_2/h_0 =	0.00			



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Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

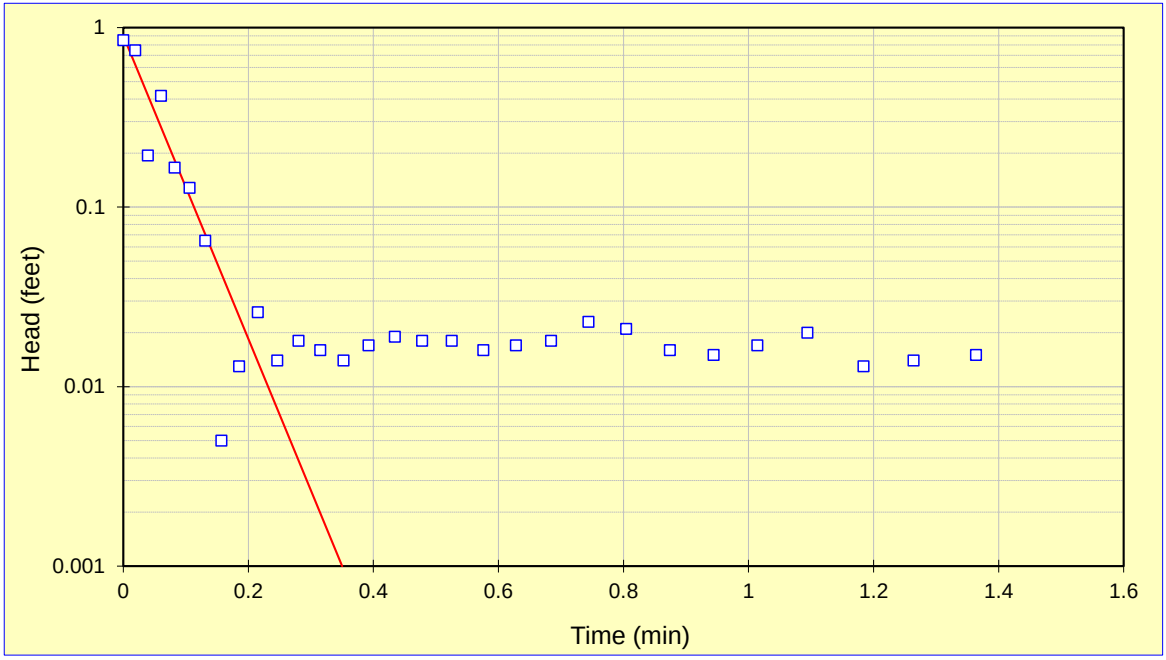
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.85
y_0 =	0.90
y_t =	0.001
t =	0.4

RESULTS

K=	9.79E-03	cm/sec
K=	2.77E+01	ft/day



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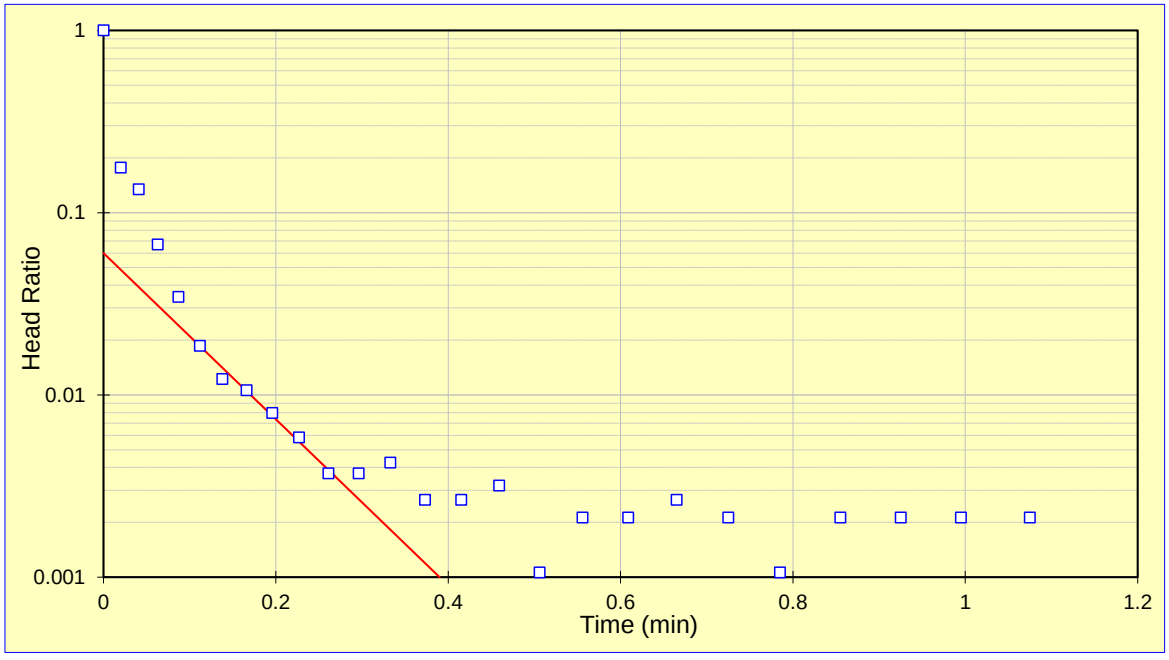
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19 (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left|\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right| 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
R_e =	0.34			
L_e =	9.705	K=	3.70E-02	cm/sec
t_1 =	0	K=	1.05E+02	ft/day
t_2 =	0.39			
h_1/h_0 =	0.06			
h_2/h_0 =	0.00			



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Analysis By: DFS
Checked By: JRS
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BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19 (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

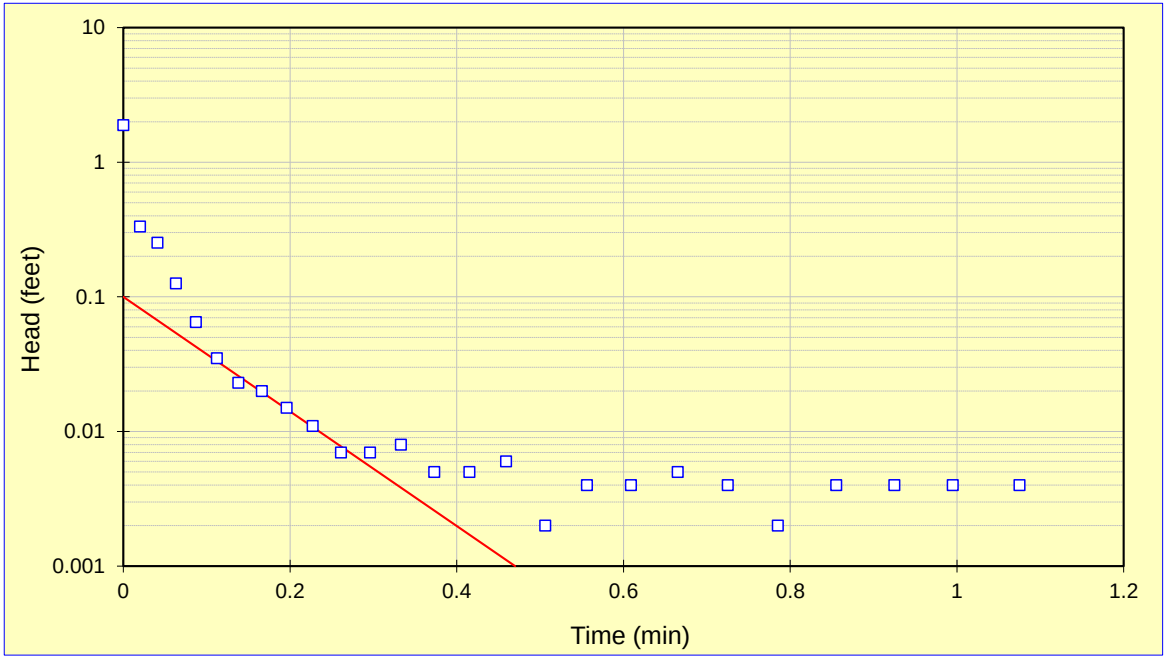
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	9.705
$\ln(R_e/r_w)$=	2.18
y_0 =	0.10
y_t =	0.001
t =	0.5

RESULTS

K=	2.25E-02	cm/sec
K=	6.38E+01	ft/day



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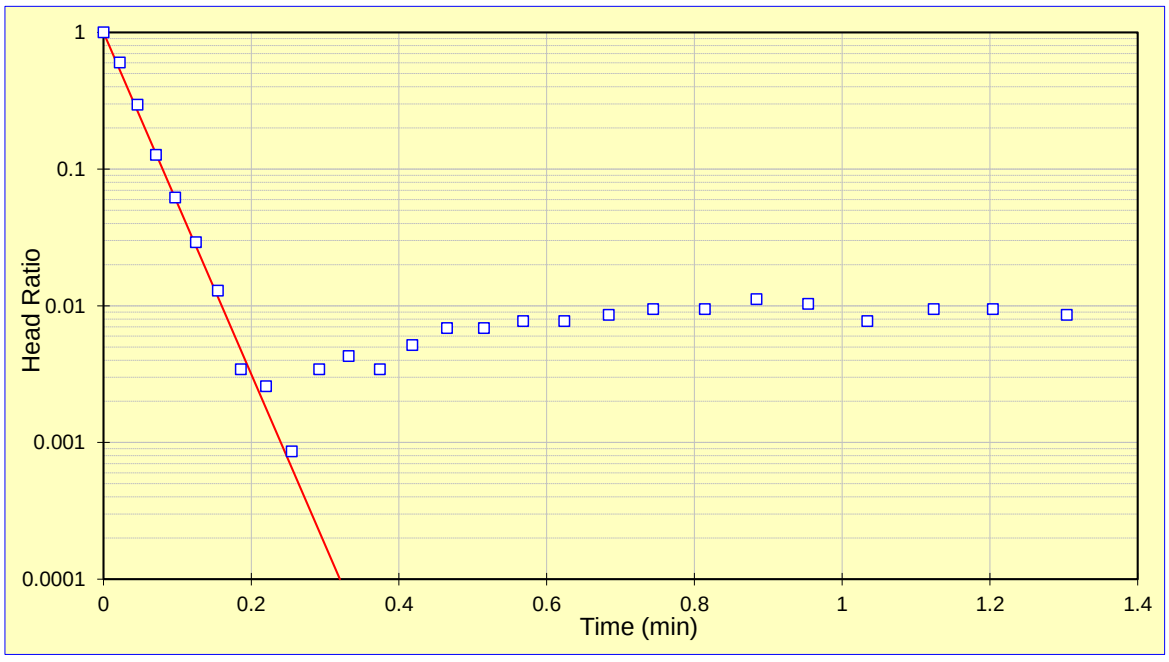
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19 (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
R_e =	0.34			
L_e =	9.735	K=	1.01E-01	cm/sec
t_1 =	0	K=	2.87E+02	ft/day
t_2 =	0.32			
h_1/h_0 =	1.00			
h_2/h_0 =	0.00			



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Analysis By: DFS
Checked By: JRS
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BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

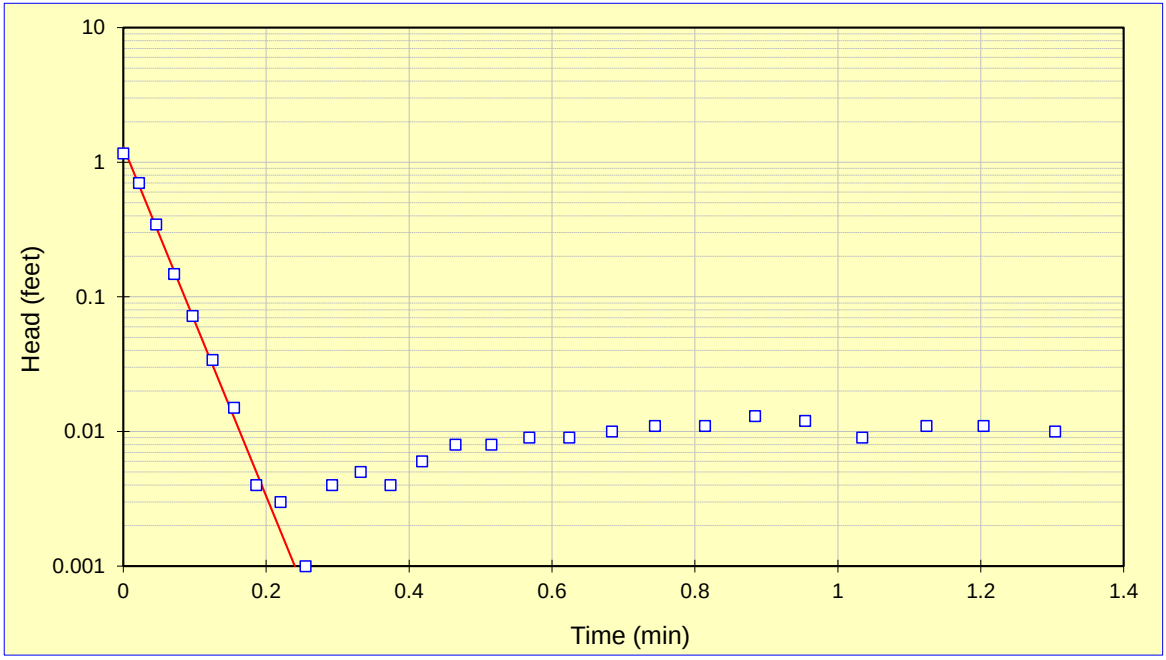
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	9.735
$\ln(R_e/r_w)$=	2.18
y_0 =	1.30
y_t =	0.001
t =	0.2

RESULTS

K=	6.85E-02	cm/sec
K=	1.94E+02	ft/day



Project Name: NIPSCO Schahfer
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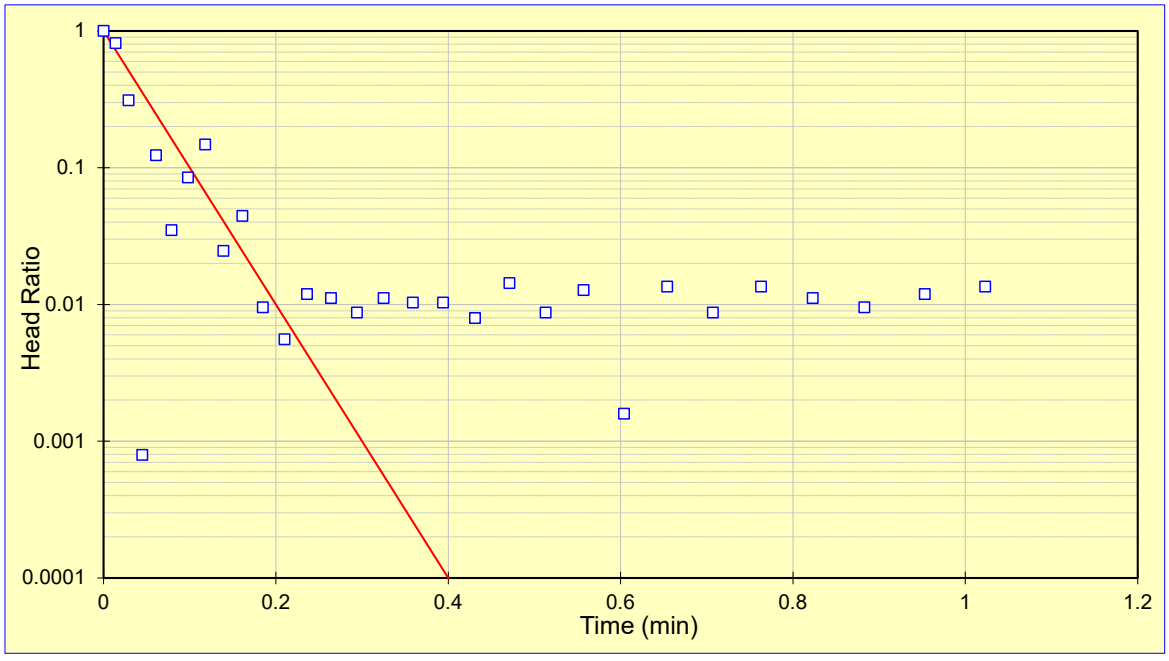
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-19B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.37E-02	cm/sec
t_1 =	0	K=	3.88E+01	ft/day
t_2 =	0.4			
h_1/h_0 =	1.00			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
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BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-19B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

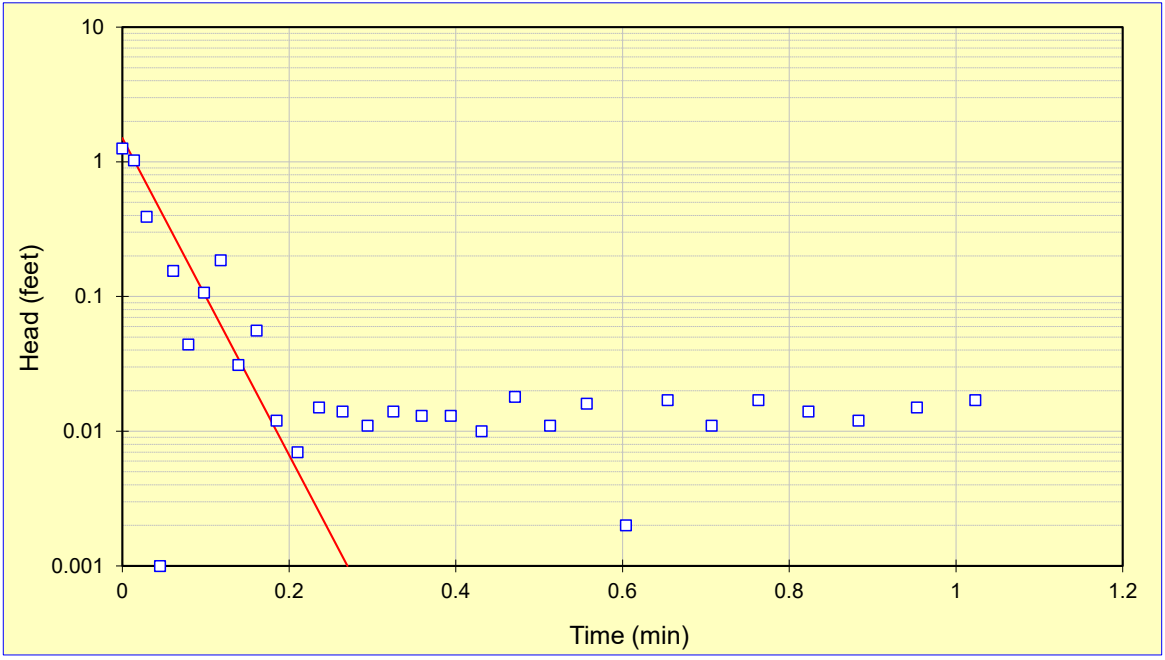
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.02
y_0 =	1.50
y_t =	0.001
t =	0.3

RESULTS

K=	1.44E-02	cm/sec
K=	4.09E+01	ft/day



Project Name: NIPSCO Schahfer
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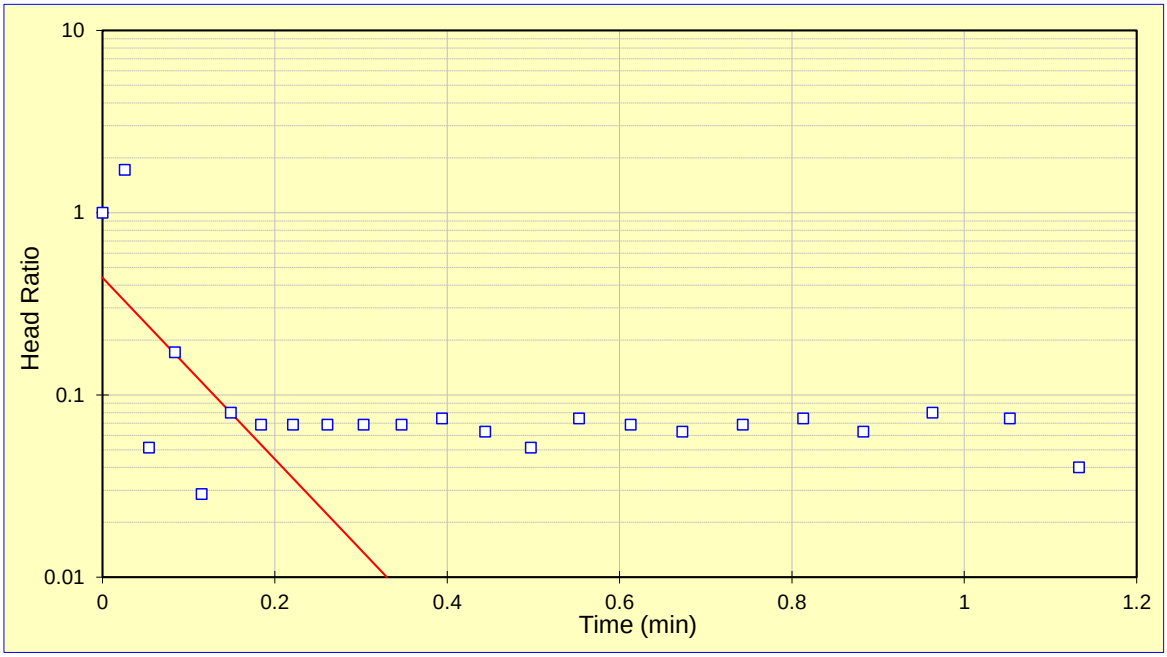
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-19B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	6.82E-03	cm/sec
t_1 =	0	K=	1.93E+01	ft/day
t_2 =	0.33			
h_1/h_0 =	0.44			
h_2/h_0 =	0.01			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-19B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

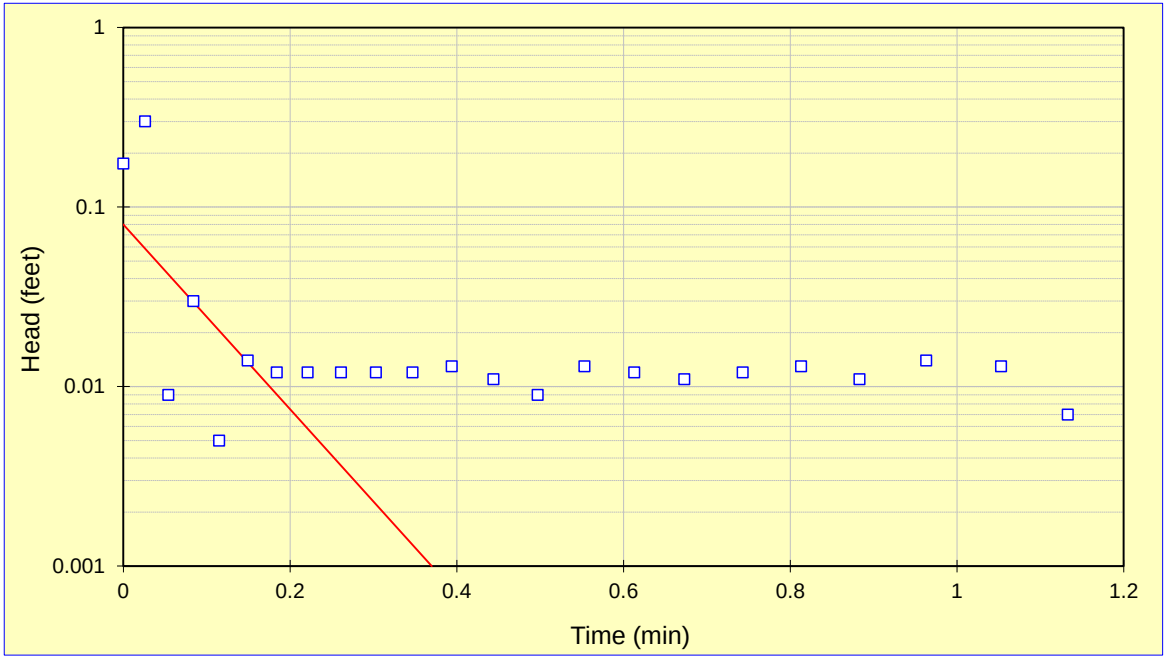
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.02
y_0 =	0.08
y_t =	0.001
t =	0.4

RESULTS

K=	6.31E-03	cm/sec
K=	1.79E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS

UNDERDAMPED SLUG TEST GAMW-19B (TEST 1)

$$T = b + a \ln T$$

where:

$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$

$$a = r_c^2 \left(g / L^{1/2}\right) / 8d$$

$$d = \gamma / (g/L)^{1/2}$$

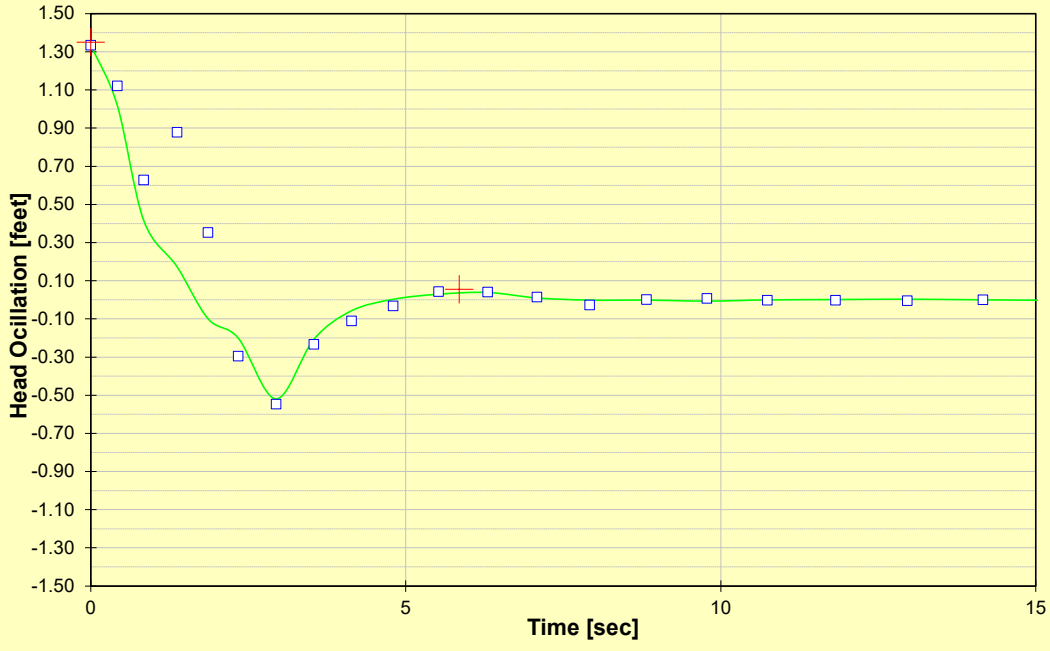
$$L = g / \left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.20536	ft^2
r_s =	0.08	ft	d =	0.4539	ft^{-1}
L_c =	17.92	ft	a =	0.00231	ft^3
L_s =	10.00	ft	t_1 =	0.00	sec
w =	1.0740	ft^{-1}	t_2 =	5.85	sec
g =	0.5471	ft^{-1}	$h(t_1)$ =	1.35	ft
L =	22.16	ft^3/sec^2	$h(t_2)$ =	0.06	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	2.22E-02	ft^2/sec	$a < 0.1$?	YES
T =	1.20E-02	ft^2/sec	$d < 0.7$?	YES
T =	1.04E+03	ft^2/day	L_1 =	22.16
K =	3.67E+01	ft/day	L_2 =	22.92
K =	1.29E-02	cm/sec	L_1:L_2 Diff <20% ?	YES



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19B (TEST 1)

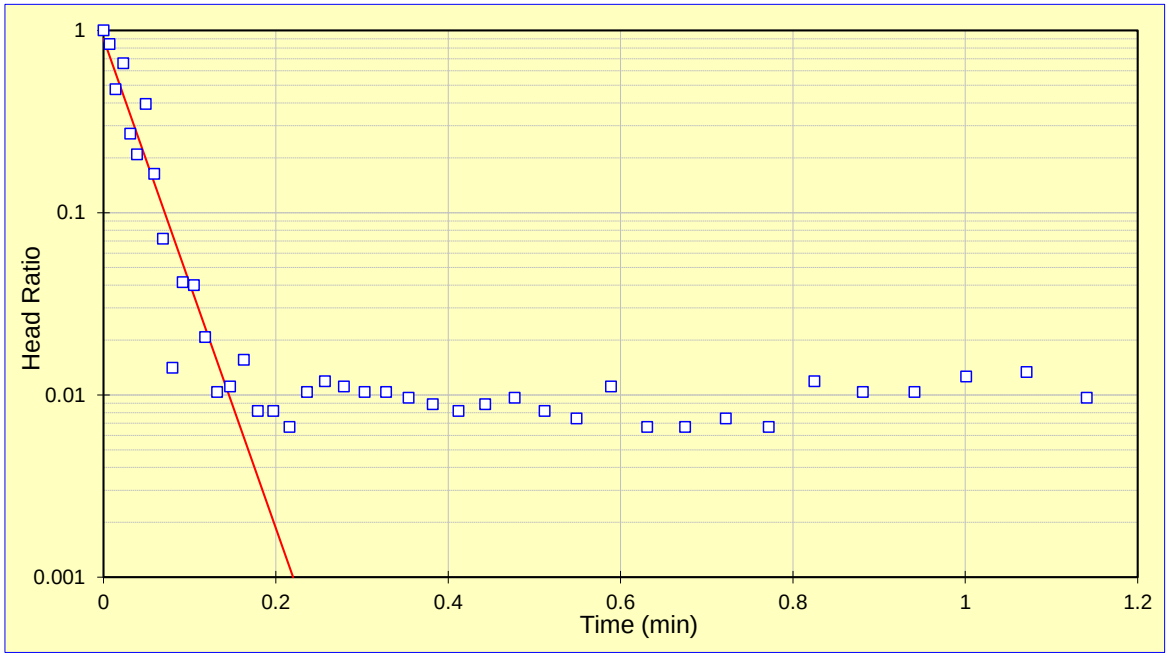
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	10
t_1 =	0
t_2 =	0.22
h_1/h_0 =	0.90
h_2/h_0 =	0.00

RESULTS

K=	1.84E-02	cm/sec
K=	5.21E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

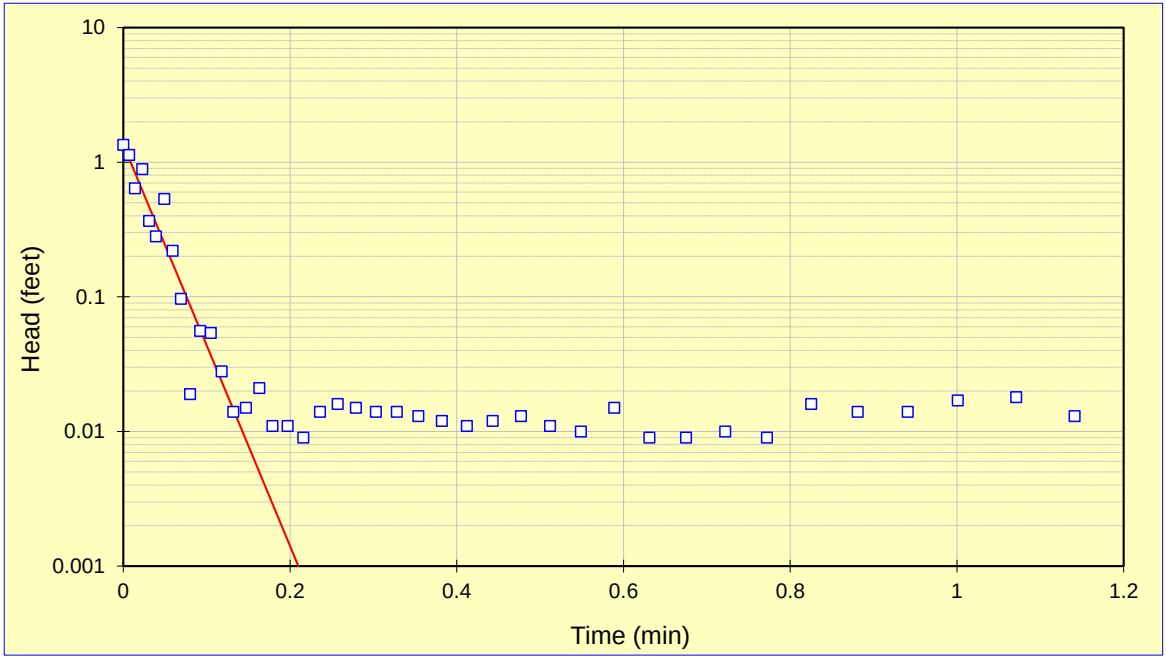
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.02
y_0 =	1.35
y_t =	0.001
t =	0.2

RESULTS

K=	1.83E-02	cm/sec
K=	5.18E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-19B (TEST 2)

$$T = b + a \ln T$$

where:

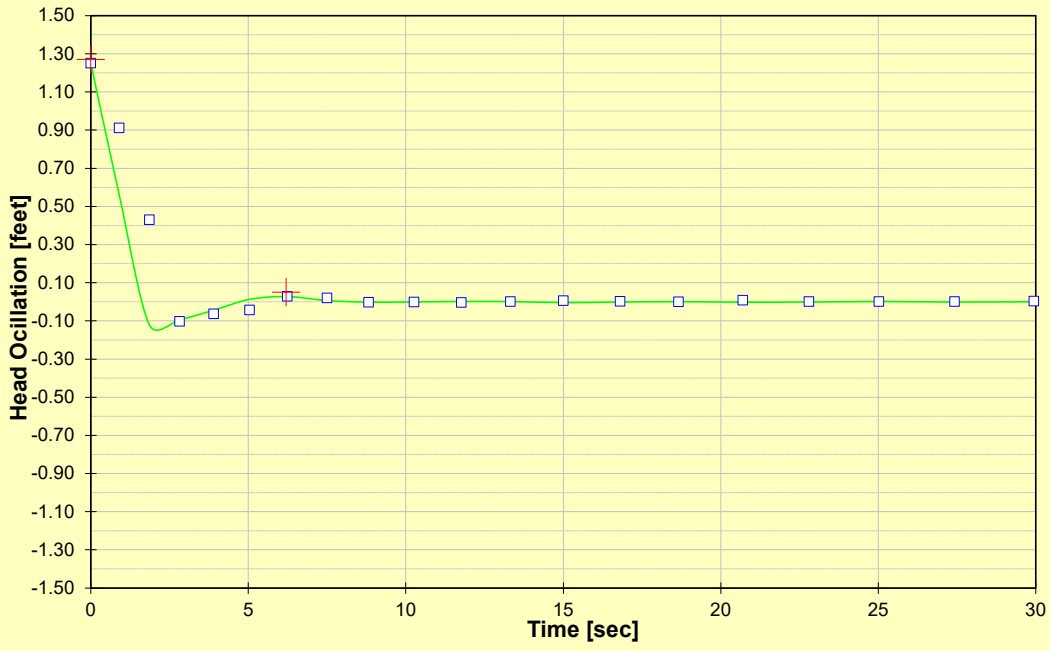
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.13983	ft^2
r_s =	0.08	ft	d =	0.4577	ft^{-1}
L_c =	17.95	ft	a =	0.00216	ft^3
L_s =	10.00	ft	t_1 =	0.00	sec
w =	1.0134	ft^{-1}	t_2 =	6.20	sec
g =	0.5217	ft^{-1}	$h(t_1)$ =	1.27	ft
L =	24.78	ft^3/sec^2	$h(t_2)$ =	0.05	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	2.09E-02 ft^2/sec	$a < 0.1$?	YES
T =	1.12E-02 ft^2/sec	$d < 0.7$?	YES
T =	9.69E+02 ft^2/day	L_1 =	24.78
K =	3.43E+01 ft/day	L_2 =	22.95
K =	1.21E-02 cm/sec	L_1:L_2 Diff <20% ?	YES



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

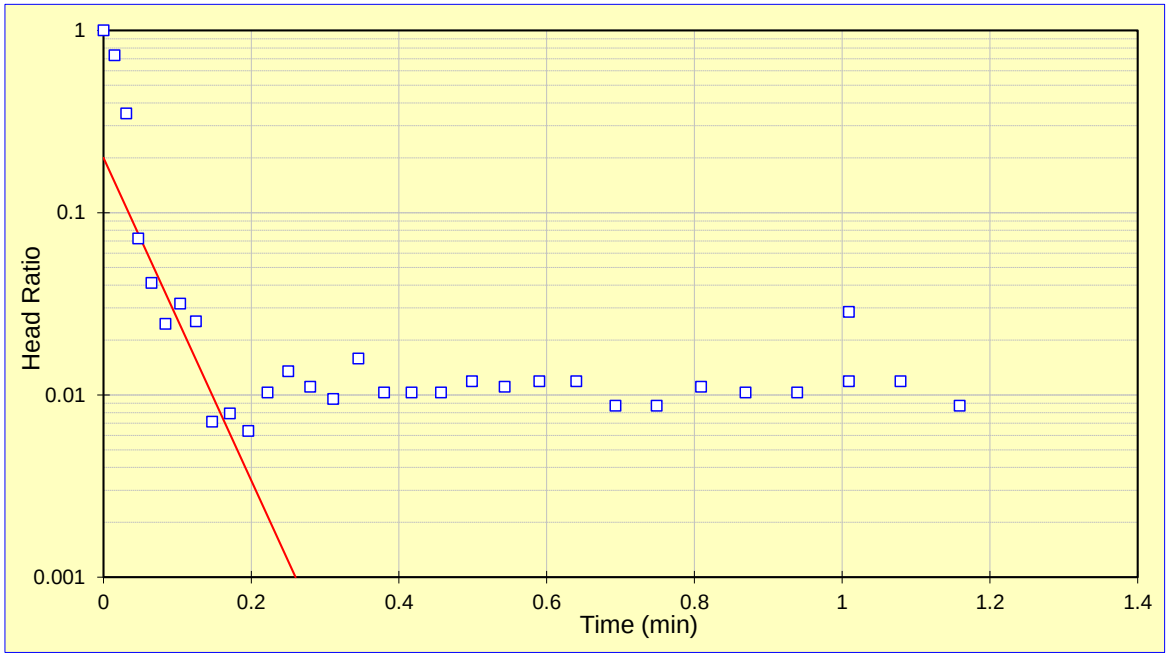
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.21E-02	cm/sec
t_1 =	0	K=	3.43E+01	ft/day
t_2 =	0.26			
h_1/h_0 =	0.20			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

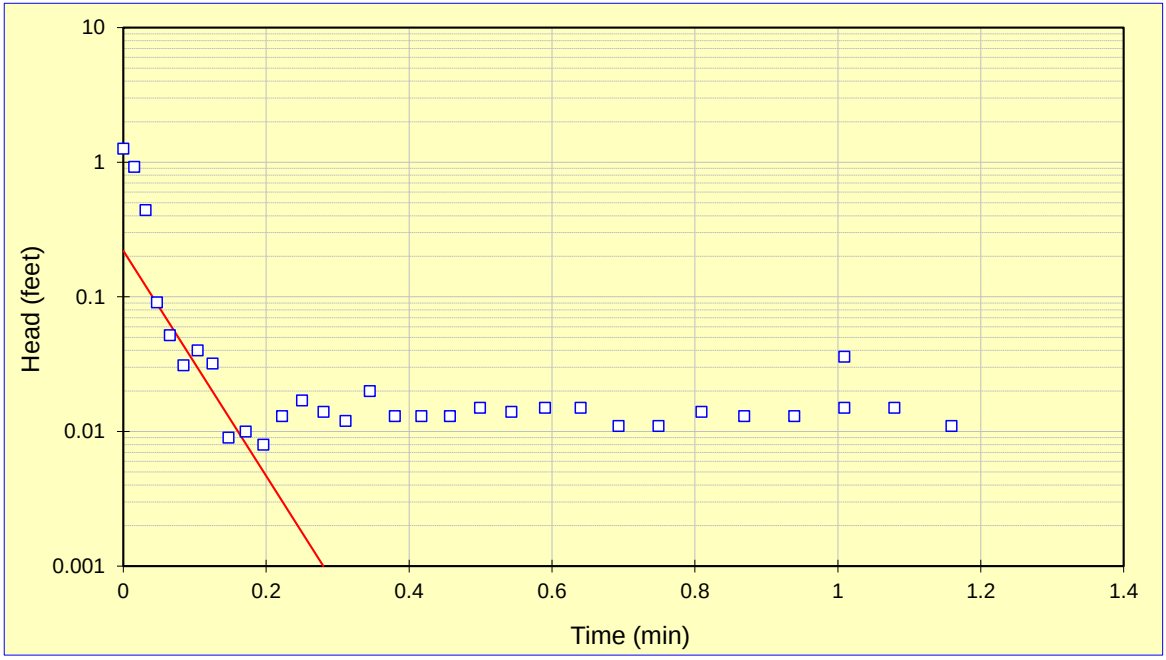
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.02
y_0 =	0.22
y_t =	0.001
t =	0.3

RESULTS

K=	1.03E-02	cm/sec
K=	2.91E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

APPENDIX C

Vertical Gradient Calculation

APPENDIX C

Vertical Gradient Calculation

Appendix C
VERTICAL GRADIENT FLOW CALCULATIONS

Monitoring Well Locations	Ground Surface Elevation (ft-msl)	Top of Casing Elevation (ft-msl)	Screen Interval				June 13, 2016				July 11, 2016				September 6, 2016				November 7, 2016			
			Top (ft-bgs)	Bottom (ft-bgs)	Center (ft bgs)	Center (ft msl)	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction
GAMW07	666.55	669.89	5	15	10	656.55	10.17	659.72	NA	NA	10.48	659.41	NA	NA	8.57	661.32	NA	NA	7.88	662.01	-1.08E-01	Down
GAMW07B	666.83	669.39	30	40	35	631.83	-	-			-	-			-	-			10.04	659.35		
GAMW08	665.95	669.66	5	15	10	655.95	8.91	660.75	NA	NA	-	-	NA	NA	9.86	659.80	NA	NA	10.40	659.26	-3.95E-02	Down
GAMW08B	665.92	668.47	26	36	31	634.92	-	-			-	-			-	-			10.04	658.43		
GAMW09	665.1	668.99	5	15	10	655.51	9.02	659.97	-2.19E-02	Down	10.09	658.90	-2.14E-02	Down	8.41	660.58	-2.24E-02	Down	8.92	660.07	-2.34E-02	Down
GAMW09B	665.35	668.29	24.5	34.5	29.5	635.87	8.75	659.54			9.81	658.48			8.15	660.14			8.68	659.61		
GAMW15	665.01	668.25	5	15	10	654.54	8.59	659.66	-4.91E-04	Down	8.82	659.43	0.00E+00	Up	7.32	660.93	1.97E-03	Up	6.76	661.49	0.00E+00	Up
GAMW15B	665.14	668.05	27.7	37.7	32.7	634.19	8.40	659.65			8.62	659.43			7.08	660.97			6.56	661.49		
GAMW16	665.2	668.37	5	15	10	655.17	9.21	659.16	-1.33E-02	Down	9.61	658.76	4.44E-04	Up	8.08	660.29	4.44E-04	Up	8.24	660.13	4.39E-02	Up
GAMW16B	665.16	667.76	27.75	37.75	32.75	632.63	8.90	658.86			8.99	658.77			7.46	660.30			6.64	661.12		
GAMW17	668.81	671.93	5	15	10	658.93	13.13	658.80	4.22E-04	Up	9.72	662.21	-1.66E-01	Down	12.05	659.88	-4.22E-04	Down	12.60	659.33	-4.22E-04	Down
GAMW17B	668.86	670.6	28	38	33	635.26	11.79	658.81			12.31	658.29			10.73	659.87			11.28	659.32		
GAMW18	666.04	669.07	5	15	10	656.04	8.75	660.32	NA	NA	9.96	659.11	NA	NA	8.44	660.63	NA	NA	8.86	660.21	-8.86E-02	Down
GAMW18B	665.94	668.47	25	35	30	635.94	-	-			-	-			-	-			10.04	658.43		
GAMW46	661.99	664.80	5	15	10	651.99	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	7.04	657.76	-1.18E-03	Down
GAMW46B	661.98	664.79	22	32	27	634.98	-	-			-	-			-	-			7.05	657.74		
GAMW52	664.07	666.79	5	15	10	654.07	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	7.04	659.75	4.64E-03	Up
GAMW52B	664.50	666.90	27	37	32	632.50	-	-			-	-			-	-			7.05	659.85		
GAMW53	664.68	667.24	5	15	10	654.68	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	6.05	661.19	1.42E-03	Up
GAMW53B	664.62	667.29	26	36	31	633.62	-	-			-	-			-	-			6.07	661.22		
GAMW54	663.87	666.37	5	15	10	653.87	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	6.05	660.32	4.74E-03	Up
GAMW54B	663.98	666.47	22	32	27	636.98	-	-			-	-			-	-			6.07	660.40		
GAMW55	665.06	667.64	5	15	10	655.06	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	10.04	657.60	-1.56E-02	Down
GAMW55B	665.18	667.53	25	35	30	635.18	-	-			-	-			-	-			10.24	657.29		
GAMW56	665.43	667.91	5	15	10	655.43	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	7.04	660.87	-4.98E-03	Down
GAMW56B	665.33	667.82	25	35	30	635.33	-	-			-	-			-	-			7.05	660.77		

Notes:
ft-bgs = Feet below ground surface
ft-msl = Feet above mean sea level
ft-btoc = Feet below top of casing
ft/ft = Feet/Feet
NA= not applicable

Appendix C
VERTICAL GRADIENT FLOW CALCULATIONS

Monitoring Well Locations	Ground Surface Elevation (ft-msl)	Top of Casing Elevation (ft-msl)	Screen Interval				January 4, 2017				February 27, 2017				April 24, 2017				June 26, 2017			
			Top (ft-bgs)	Bottom (ft-bgs)	Center (ft bgs)	Center (ft msl)	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction
GAMW07	666.55	669.89	5	15	10	656.55	10.09	659.80	-1.62E-03	Down	8.82	661.07	-6.67E-02	Down	8.56	661.33	NA	NA	9.52	660.37	NA	NA
GAMW07B	666.83	669.39	30	40	35	631.83	9.63	659.76			9.97	659.42			-	-			-	-		
GAMW08	665.95	669.66	5	15	10	655.95	10.82	658.84	5.41E-15	Up	10.62	659.04	-2.57E-02	Down	9.71*	659.95	NA	NA	10.15	659.51	NA	NA
GAMW08B	665.92	668.47	26	36	31	634.92	9.63	658.84			9.97	658.50			-	-			-	-		
GAMW09	665.1	668.99	5	15	10	655.51	8.95	660.04	-2.09E-02	Down	8.50	660.49	-2.09E-02	Down	7.59	661.40	-1.93E-02	Down	8.30	660.69	-2.14E-02	Down
GAMW09B	665.35	668.29	24.5	34.5	29.5	635.87	8.66	659.63			8.21	660.08			7.27	661.02			8.02	660.27		
GAMW15	665.01	668.25	5	15	10	654.54	8.63	659.62	0.00E+00	Up	7.35	660.90	4.91E-04	Up	7.00	661.25	1.47E-03	Up	8.00	660.25	0.00E+00	Up
GAMW15B	665.14	668.05	27.7	37.7	32.7	634.19	8.43	659.62			7.14	660.91			6.77	661.28			7.80	660.25		
GAMW16	665.2	668.37	5	15	10	655.17	9.18	659.19	4.44E-04	Up	8.66	659.71	2.22E-03	Up	7.87	660.50	8.87E-04	Up	8.72	659.65	1.33E-03	Up
GAMW16B	665.16	667.76	27.75	37.75	32.75	632.63	8.56	659.20			8.00	659.76			7.24	660.52			8.08	659.68		
GAMW17	668.81	671.93	5	15	10	658.93	NA	-	NA	NA	12.67	659.26	0.00E+00	Up	11.75	660.18	8.45E-04	Up	12.30	659.63	1.65E-02	Up
GAMW17B	668.86	670.6	28	38	33	635.26	11.62	658.98			11.34	659.26			10.40	660.20			10.58	660.02		
GAMW18	666.04	669.07	5	15	10	656.04	8.96	660.11	-6.32E-02	Down	8.55	660.52	-1.00E-01	Down	7.45	661.62	NA	NA	8.55	660.52	NA	NA
GAMW18B	665.94	668.47	25	35	30	635.94	9.63	658.84			9.97	658.50			-	-			-	-		
GAMW46	661.99	664.80	5	15	10	651.99	6.75	658.05	-5.88E-04	Down	7.05	657.75	5.88E-04	Up	-	-	NA	NA	-	-	NA	NA
GAMW46B	661.98	664.79	22	32	27	634.98	6.75	658.04			7.03	657.76			-	-			-	-		
GAMW52	664.07	666.79	5	15	10	654.07	6.75	660.04	5.10E-03	Up	7.05	659.74	6.03E-03	Up	-	-	NA	NA	-	-	NA	NA
GAMW52B	664.50	666.90	27	37	32	632.50	6.75	660.15			7.03	659.87			-	-			-	-		
GAMW53	664.68	667.24	5	15	10	654.68	5.85	661.39	2.37E-03	Up	6.07	661.17	2.37E-03	Up	-	-	NA	NA	-	-	NA	NA
GAMW53B	664.62	667.29	26	36	31	633.62	5.85	661.44			6.07	661.22			-	-			-	-		
GAMW54	663.87	666.37	5	15	10	653.87	5.85	660.52	5.92E-03	Up	6.07	660.30	5.92E-03	Up	-	-	NA	NA	-	-	NA	NA
GAMW54B	663.98	666.47	22	32	27	636.98	5.85	660.62			6.07	660.40			-	-			-	-		
GAMW55	665.06	667.64	5	15	10	655.06	9.63	658.01	-1.56E-02	Down	9.97	657.67	-1.51E-02	Down	-	-	NA	NA	-	-	NA	NA
GAMW55B	665.18	667.53	25	35	30	635.18	9.83	657.70			10.16	657.37			-	-			-	-		
GAMW56	665.43	667.91	5	15	10	655.43	6.75	661.16	-4.48E-03	Down	7.05	660.86	-3.48E-03	Down	-	-	NA	NA	-	-	NA	NA
GAMW56B	665.33	667.82	25	35	30	635.33	6.75	661.07			7.03	660.79			-	-			-	-		

Notes:
ft-bgs = Feet below ground surface
ft-msl = Feet above mean sea level
ft-btoc = Feet below top of casing
ft/ft = Feet/Feet
NA= not applicable

Appendix C
VERTICAL GRADIENT FLOW CALCULATIONS

Monitoring Well Locations	Ground Surface Elevation (ft-msl)	Top of Casing Elevation (ft-msl)	Screen Interval				August 21, 2017				October 2, 2017				February 26, 2018				March 12, 2018			
			Top (ft-bgs)	Bottom (ft-bgs)	Center (ft bgs)	Center (ft msl)	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction
GAMW07	666.55	669.89	5	15	10	656.55	9.08	660.81	NA	NA	10.16	659.73	NA	NA	-	-	NA	NA	8.8	661.09	NA	NA
GAMW07B	666.83	669.39	30	40	35	631.83	-	-			-	-			-	-			-	-		
GAMW08	665.95	669.66	5	15	10	655.95	10.15	659.51	NA	NA	NA	-	NA	NA	-	-	NA	NA	8.38	661.28	NA	NA
GAMW08B	665.92	668.47	26	36	31	634.92	-	-			-	-			-	-			-	-		
GAMW09	665.1	668.99	5	15	10	655.51	8.11	660.88	-2.24E-02	Down	10.06	658.93	-2.29E-02	Down	-	-	NA	NA	6.23	662.76	-2.14E-02	Down
GAMW09B	665.35	668.29	24.5	34.5	29.5	635.87	7.85	660.44			9.81	658.48			-	-			5.95	662.34		
GAMW15	665.01	668.25	5	15	10	654.54	7.56	660.69	1.47E-03	Up	9.02	659.23	2.46E-03	Up	-	-	NA	NA	7.38	660.87	9.83E-04	Up
GAMW15B	665.14	668.05	27.7	37.7	32.7	634.19	7.33	660.72			8.77	659.28			-	-			7.16	660.89		
GAMW16	665.2	668.37	5	15	10	655.17	8.45	659.92	0.00E+00	Up	10.56	657.81	4.44E-04	Up	-	-	NA	NA	7.38	660.99	4.44E-03	Up
GAMW16B	665.16	667.76	27.75	37.75	32.75	632.63	7.84	659.92			9.94	657.82			-	-			6.67	661.09		
GAMW17	668.81	671.93	5	15	10	658.93	12.24	659.69	-1.69E-03	Down	NA	-	NA	NA	-	-	NA	NA	10.45	661.48	4.80E-15	Up
GAMW17B	668.86	670.6	28	38	33	635.26	10.95	659.65			13.33	657.27			-	-			9.12	661.48		
GAMW18	666.04	669.07	5	15	10	656.04	8.23	660.84	NA	NA	10.03	659.04	NA	NA	-	-	NA	NA	6.3	662.77	NA	NA
GAMW18B	665.94	668.47	25	35	30	635.94	-	-			-	-			-	-			-	-		
GAMW46	661.99	664.80	5	15	10	651.99	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA
GAMW46B	661.98	664.79	22	32	27	634.98	-	-			-	-			-	-			-	-		
GAMW52	664.07	666.79	5	15	10	654.07	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA
GAMW52B	664.50	666.90	27	37	32	632.50	-	-			-	-			-	-			-	-		
GAMW53	664.68	667.24	5	15	10	654.68	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA
GAMW53B	664.62	667.29	26	36	31	633.62	-	-			-	-			-	-			-	-		
GAMW54	663.87	666.37	5	15	10	653.87	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA
GAMW54B	663.98	666.47	22	32	27	636.98	-	-			-	-			-	-			-	-		
GAMW55	665.06	667.64	5	15	10	655.06	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA
GAMW55B	665.18	667.53	25	35	30	635.18	-	-			-	-			-	-			-	-		
GAMW56	665.43	667.91	5	15	10	655.43	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA
GAMW56B	665.33	667.82	25	35	30	635.33	-	-			-	-			-	-			-	-		

Notes:
ft-bgs = Feet below ground surface
ft-msl = Feet above mean sea level
ft-btoc = Feet below top of casing
ft/ft = Feet/Feet
NA= not applicable

Appendix C
VERTICAL GRADIENT FLOW CALCULATIONS

Monitoring Well Locations	Ground Surface Elevation (ft-msl)	Top of Casing Elevation (ft-msl)	Screen Interval				April 18, 2018				June 12, 2018				August 27-28, 2018				October 22-24, 2018			
			Top (ft-bgs)	Bottom (ft-bgs)	Center (ft bgs)	Center (ft msl)	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction
GAMW07	666.55	669.89	5	15	10	656.55	8.9	660.99	1.78E-01	Up	9.15	660.74	1.75E-01	Up	9.95	659.94	2.83E-03	Up	10.62	659.27	8.09E-04	Up
GAMW07B	666.83	669.39	30	40	35	631.83	4	665.39			4.32	665.07			9.38	660.01			10.1	659.29		
GAMW08	665.95	669.66	5	15	10	655.95	9.58	660.08	2.09E-01	Up	9.55	660.11	1.92E-01	Up	10.22	659.44	4.28E-03	Up	10.6	659.06	2.85E-03	Up
GAMW08B	665.92	668.47	26	36	31	634.92	4	664.47			4.32	664.15			8.94	659.53			9.35	659.12		
GAMW09	665.1	668.99	5	15	10	655.51	7.42	661.57	-2.04E-02	Down	7.5	661.49	-2.19E-02	Down	8.36	660.63	-2.04E-02	Down	8.65	660.34	-2.04E-02	Down
GAMW09B	665.35	668.29	24.5	34.5	29.5	635.87	7.12	661.17			7.23	661.06			8.06	660.23			8.35	659.94		
GAMW15	665.01	668.25	5	15	10	654.54	7.62	660.63	9.83E-04	Up	7.9	660.35	5.06E-02	Up	8.56	659.69	1.97E-03	Up	9.15	659.1	1.47E-03	Up
GAMW15B	665.14	668.05	27.7	37.7	32.7	634.19	7.4	660.65			6.67	661.38			8.32	659.73			8.92	659.13		
GAMW16	665.2	668.37	5	15	10	655.17	8.15	660.22	3.99E-03	Up	8.28	660.09	3.11E-03	Up	8.94	659.43	1.77E-03	Up	9.3	659.07	3.11E-03	Up
GAMW16B	665.16	667.76	27.75	37.75	32.75	632.63	7.45	660.31			7.6	660.16			8.29	659.47			8.62	659.14		
GAMW17	668.81	671.93	5	15	10	658.93	11.75	660.18	4.80E-15	Up	11.65	660.28	0.00E+00	Up	12.28	659.65	-2.11E-03	Down	12.7	659.23	-2.11E-03	Down
GAMW17B	668.86	670.6	28	38	33	635.26	10.42	660.18			10.32	660.28			11	659.6			11.42	659.18		
GAMW18	666.04	669.07	5	15	10	656.04	7.17	661.9	1.28E-01	Up	7.72	661.35	1.39E-01	Up	8.86	660.21	0.00E+00	Up	9.5	659.57	2.89E-02	Up
GAMW18B	665.94	668.47	25	35	30	635.94	4	664.47			4.32	664.15			8.26	660.21			8.32	660.15		
GAMW46	661.99	664.80	5	15	10	651.99	-	-	NA	NA	7.55	657.25	-5.88E-04	Down	9.24	655.56	-5.88E-04	Down	8.75	655.75	-7.23E-02	Down
GAMW46B	661.98	664.79	22	32	27	634.98	-	-			7.55	657.24			9.24	655.55			9.80	654.52		
GAMW52	664.07	666.79	5	15	10	654.07	-	-	NA	NA	-	-	NA	NA	8.50	658.29	4.64E-04	Up	8.80	657.99	4.64E-04	Up
GAMW52B	664.50	666.90	27	37	32	632.50	-	-			-	-			8.60	658.30			8.90	658.00		
GAMW53	664.68	667.24	5	15	10	654.68	-	-	NA	NA	7.13	660.11	7.12E-03	Up	8.80	658.44	4.27E-03	Up	9.10	658.14	4.75E-03	Up
GAMW53B	664.62	667.29	26	36	31	633.62	-	-			7.03	660.26			8.76	658.53			9.05	658.24		
GAMW54	663.87	666.37	5	15	10	653.87	7.20	-7.20	5.92E-03	Up	7.93	658.44	9.47E-03	Up	7.58	658.79	-4.14E-03	Down	7.90	658.47	-2.96E-03	Down
GAMW54B	663.98	666.47	22	32	27	636.98	7.10	-7.10			7.87	658.60			7.75	658.72			8.05	658.42		
GAMW55	665.06	667.64	5	15	10	655.06	-	-	NA	NA	8.64	659.00	2.52E-03	Up	8.68	658.96	-2.52E-03	Down	8.92	658.72	-2.01E-03	Down
GAMW55B	665.18	667.53	25	35	30	635.18	-	-			8.48	659.05			8.62	658.91			8.85	658.68		
GAMW56	665.43	667.91	5	15	10	655.43	-	-	NA	NA	7.55	660.36	-4.48E-03	Down	8.92	658.99	4.98E-04	Up	9.05	658.86	4.98E-04	Up
GAMW56B	665.33	667.82	25	35	30	635.33	-	-			7.55	660.27			8.82	659.00			8.95	658.87		

Notes:
ft-bgs = Feet below ground surface
ft-msl = Feet above mean sea level
ft-btoc = Feet below top of casing
ft/ft = Feet/Feet
NA= not applicable

Appendix C
VERTICAL GRADIENT FLOW CALCULATIONS

Monitoring Well Locations	Ground Surface Elevation (ft-msl)	Top of Casing Elevation (ft-msl)	Screen Interval				February 25, 2019				Average Vertical Gradient (ft/ft)	Flow Direction
			Top (ft-bgs)	Bottom (ft-bgs)	Center (ft bgs)	Center (ft msl)	Depth To Water (ft-btoc)	Groundwater Elevation (ft-msl)	Vertical Gradient (ft/ft)	Flow Direction		
GAMW07	666.55	669.89	5	15	10	656.55	8.85	661.04	4.85E-03	Up	0.0232	Up
GAMW07B	666.83	669.39	30	40	35	631.83	8.23	661.16				
GAMW08	665.95	669.66	5	15	10	655.95	9.46	660.2	6.66E-03	Up	0.0437	Up
GAMW08B	665.92	668.47	26	36	31	634.92	8.13	660.34				
GAMW09	665.1	668.99	5	15	10	655.51	6.78	662.21	-2.04E-02	Down	-0.0214	Down
GAMW09B	665.35	668.29	24.5	34.5	29.5	635.87	6.48	661.81				
GAMW15	665.01	668.25	5	15	10	654.54	7.78	660.47	3.44E-03	Up	0.0042	Up
GAMW15B	665.14	668.05	27.7	37.7	32.7	634.19	7.51	660.54				
GAMW16	665.2	668.37	5	15	10	655.17	8.28	660.09	6.21E-03	Up	0.0037	Up
GAMW16B	665.16	667.76	27.75	37.75	32.75	632.63	7.53	660.23				
GAMW17	668.81	671.93	5	15	10	658.93	11.46	660.47	-1.27E-03	Down	-0.0111	Down
GAMW17B	668.86	670.6	28	38	33	635.26	10.16	660.44				
GAMW18	666.04	669.07	5	15	10	656.04	6.69	662.38	1.19E-02	Up	0.0070	Up
GAMW18B	665.94	668.47	25	35	30	635.94	5.85	662.62				
GAMW46	661.99	664.80	5	15	10	651.99	7.05	657.75	5.88E-04	Up	-0.0106	Down
GAMW46B	661.98	664.79	22	32	27	634.98	7.03	657.76				
GAMW52	664.07	666.79	5	15	10	654.07	8.10	658.69	4.64E-04	Up	0.0029	Up
GAMW52B	664.50	666.90	27	37	32	632.50	8.20	658.70				
GAMW53	664.68	667.24	5	15	10	654.68	8.45	658.79	7.12E-03	Up	0.0042	Up
GAMW53B	664.62	667.29	26	36	31	633.62	8.35	658.94				
GAMW54	663.87	666.37	5	15	10	653.87	6.90	659.47	-5.92E-03	Down	0.0024	Up
GAMW54B	663.98	666.47	22	32	27	636.98	7.10	659.37				
GAMW55	665.06	667.64	5	15	10	655.06	8.03	659.61	5.03E-03	Up	-0.0062	Down
GAMW55B	665.18	667.53	25	35	30	635.18	7.82	659.71				
GAMW56	665.43	667.91	5	15	10	655.43	7.91	660.00	-5.66E-15	Down	-0.0023	Down
GAMW56B	665.33	667.82	25	35	30	635.33	7.82	660.00				

Notes:
ft-bgs = Feet below ground surface
ft-msl = Feet above mean sea level
ft-btoc = Feet below top of casing
ft/ft = Feet/Feet
NA= not applicable

Prepared by: ERW
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APPENDIX D

Monitored Natural Attenuation Evaluation

REPORT

MONITORED NATURAL ATTENUATION EVALUATION

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November 2020

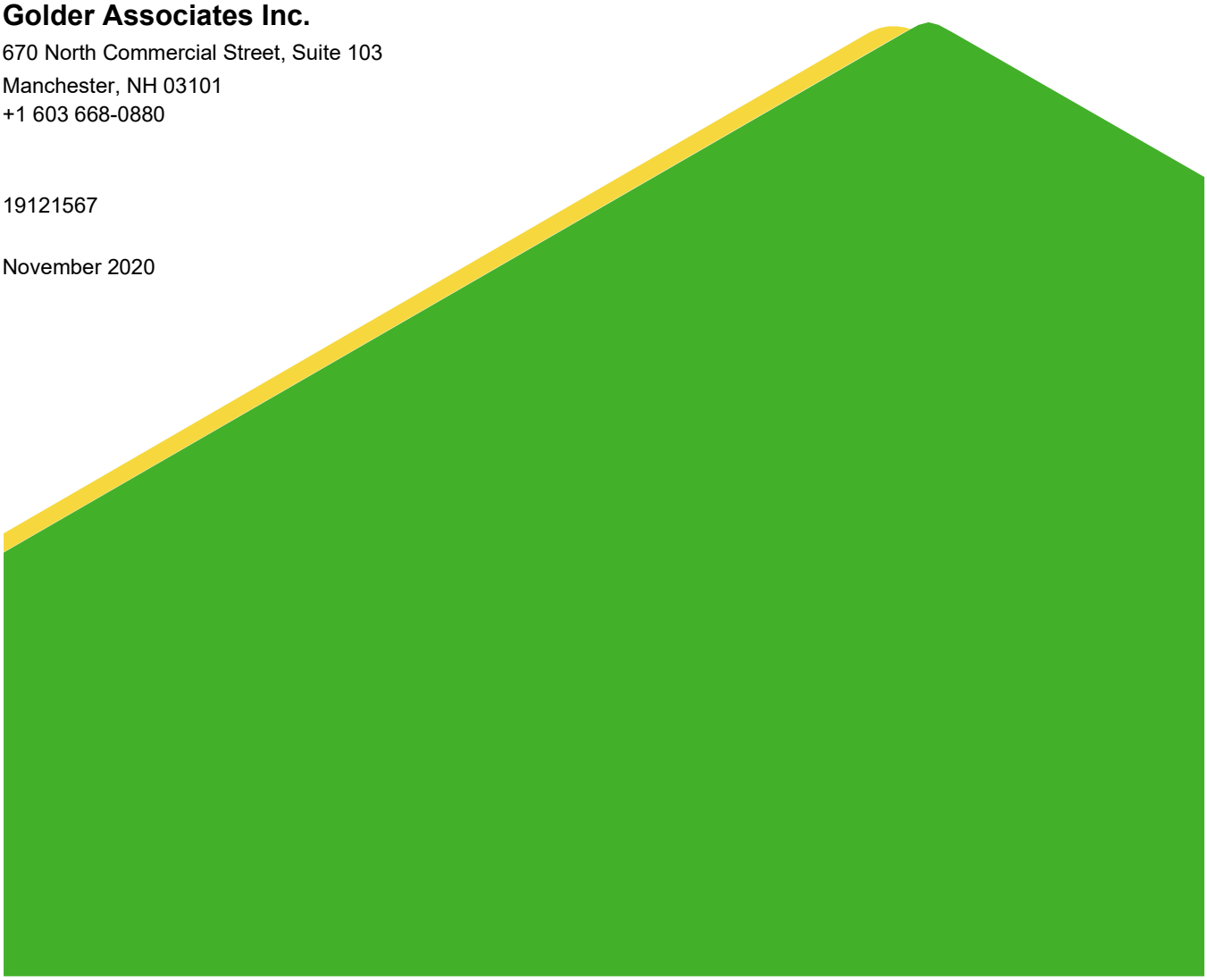


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APPENDICES

APPENDIX A
Groundwater and Porewater Monitoring Data

APPENDIX B
Groundwater Flow Model Technical Memorandum

Acronyms

ACM	Assessment of Corrective Measures
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
DO	Dissolved Oxygen
Eh	Reduction Potential
ft bgs	feet below ground surface
g	Gram
GMPIM	Groundwater Monitoring Program Implementation Manual
GWPS	Groundwater Protection Standards
IAP	Ion Activity Product
IDEM	Indiana Department of Environmental Management
ITRC	Interstate Technology Regulatory Council
kg	kilogram
Ksp	Solubility Product
MCL	Maximum Contaminant Level
MCWB	Metal Cleaning Waste Basin
mg	milligram
mg/L	milligram per liter
MNA	Monitored Natural Attenuation
mV	millivolt
MSRB	Material Storage Runoff Basin
NIPSCO LLC	Northern Indiana Public Service Company LLC
ORP	Oxidation-Reduction Potential
RMSGS	R. M. Schahfer Generating Station
SCM	surface complexation model
SEP	Sequential Extraction Potential
SI	Saturation Index
SSL	Statistically Significant Level
SU	Standard Unit
TAL	Target Analyte List
TDS	Total Dissolved Solids
USEPA	United States Environmental Protection Agency
XRD	X-ray diffraction

1.0 OVERVIEW

Groundwater and solid materials were evaluated to determine the feasibility of Monitored Natural Attenuation (MNA) as part of the assessment of corrective measures process for the Coal Combustion Residuals (CCR) surface impoundments (i.e., Material Storage Runoff Basin (MSRB), Metal Cleaning Waste Basin (MCWB), and the Drying Area (together, the CCR Unit) at the Northern Indiana Public Service Company LLC (NIPSCO LLC) Rollin M. Schahfer Generating Station (RMSGS, or Site). The structure of this feasibility evaluation closely follows the United States Environmental Protection Agency (USEPA) guidance on using MNA as a remedial strategy (USEPA 2007a and 2007b) and considers best practices from the Interstate Technology Regulatory Council (ITRC) document: “A Decision Framework for Applying Monitored Natural Attenuation Processes to Metals and Radionuclides in Groundwater” (ITRC 2010).

RMSGS manages CCR in the surface impoundments subject to applicable requirements of 40 Code of Federal Regulations (CFR) Part 257 as amended (CCR Rule). In April 2019, pursuant to 40 CFR §257.96(a), an assessment of corrective measures (ACM) was completed for the CCR Unit. This evaluation identified MNA as a potential remedial alternative for cobalt due to a detection at a Statistically Significant Level (SSL) in groundwater. Additionally, arsenic, boron, lithium, and molybdenum were evaluated as part of this assessment due to the potential for future SSLs, should they ever occur. The results of the evaluation will be used to assess the performance and reliability of MNA as a potential remedial alternative as required by 40 CFR §257.97, Golder determined the overall feasibility of MNA for the CCR Unit by evaluating the following tiers (USEPA 2007a,b):

1) Demonstrate active constituent removal from groundwater and dissolved plume stability (Tier I)

2) Determine the mechanisms and rates of the operative attenuation processes (Tier II)

3) Determine the long-term capacity for attenuation and the stability of immobilized constituents (Tier III)

Following completion of this multi-tier evaluation, the fourth and final tier of an MNA program, which involves the design of a performance monitoring program and the development of a contingency plan, will be developed.

2.0 APPROACH

Golder evaluated the feasibility, mechanisms, rates, and stability of MNA as a remedy for groundwater impacts from the CCR Unit. In order to perform the evaluation, Golder collected samples of groundwater and overburden soil between July 24, 2018 and March 3, 2020 for geochemical analysis. The supplemental MNA assessment included the following activities:

- Groundwater:
  - Characterization to identify temporal and geographical trends, where present, and to estimate site-wide attenuation rates using temporal and spatial trends in groundwater quality data.
  - Geochemical modeling to identify the major chemical species and evaluate saturation indices of minerals relevant to attenuation of arsenic, boron, cobalt, lithium, and molybdenum.
  - Determination of the capacity of different mechanisms to attenuate arsenic, boron, cobalt, lithium, and molybdenum, including adsorption, precipitation and co-precipitation, and physical attenuation (dilution/dispersion).
  - Geochemical modeling to assess the stability and reversibility of attenuation due to adsorption.

- Overburden soil:
  - Mineralogical analysis of overburden soils to identify and quantify the major mineral components.
  - Chemical analysis of overburden soils to quantify the total metal content and identify the environmentally-available fraction of metals.

The results generated by this supplemental assessment were used by Golder to complete the Tier I, Tier II, and Tier III evaluation (USEPA 2007a,b). In addition, groundwater data collected during previous sampling events were used. The results of the Tier I, Tier II, and Tier III are described in the subsequent sections to establish a basis for the likely success of MNA at the RMSGS site.

2.1 Groundwater and Porewater Sampling

2.1.1 Sample Collection

Golder personnel collected groundwater and porewater samples in accordance with the Golder RMSGS Groundwater Monitoring Program Implementation Manual (GMPIM, Golder 2017) from the background, downgradient, Assessment, and property boundary monitoring wells presented in Table 1, and from piezometers located within the CCR Unit. Piezometer GAPIEZ-06 is located interior of the slurry wall on the western edge of the MSRB and is screened within the CCR materials. Piezometers DAPZ-02A and DAPZ-02B (abandoned in April 2020) were installed interior of the slurry wall on the eastern edge of the Drying Area and were screened in native materials (i.e., below the extent of CCR) from approximately five to 20 feet below ground surface (ft bgs) and 33 to 38 ft bgs, respectively. The monitoring well and former piezometer locations are shown in Figure 1.

Table 1: Overview of the Wells Used in the Monitored Natural Attenuation Assessment

Background Wells	Downgradient Wells	Assessment Wells	Property Boundary Wells
GAMW-04, GAMW-07, GAMW-07B, GAMW-15, GAMW-15B	GAMW-08, GAMW-08B, GAMW-09, GAMW-09B, GAMW-16, GAMW-16B, GAMW-17, GAMW-17B, GAMW-18, GAMW-18B	GAMW-52, GAMW-52B, GAMW-53, GAMW-53B, GAMW-54, GAMW-54B, GAMW-55/55R, GAMW-55B, GAMW-56, GAMW-56B	GAMW-46, GAMW-46B

2.1.2 Groundwater and Porewater Analysis

The geochemical characterization of porewater and groundwater samples included the measurement of field parameters and the laboratory analysis of samples for total metals and major cations and anions. The field parameters and laboratory analyses included:

Field Parameters: Parameters measured in the field included pH, dissolved oxygen (DO), oxidation reduction potential (ORP), conductivity, and temperature. These measurements were used to determine general geochemical conditions in the groundwater and support geochemical modeling.

Metals: Analysis of Appendix III and IV metals concentrations was conducted to understand the geochemical composition of groundwater and porewater. Metals analysis allows for the delineation of a potential plume, evaluation of mineral saturation indices, development of partitioning coefficients (in conjunction with solid material analyses), and evaluation of background contributions from natural sources or anthropogenic sources.

Major Cations and Anions: Geochemical modeling of mineral solubility, metals attenuation and background contributions requires analysis of major cations and anions because they affect and participate in sorption and mineral dissolution or precipitation reactions.

The groundwater and porewater samples were analyzed using the following methods:

- pH following SW846 9040C “pH Electrometric Measurement” (USEPA 2004)
- Total dissolved solids standard method (SM) 2540C “Total Dissolved Solids Dried at 180°C” (USEPA 1993a)
- Total hardness following SM 2340B (USEPA 1997)
- Chloride, fluoride, and sulfide following USEPA SW846 9056A “Determination of Inorganic Anions by Ion Chromatography”, Revision 1 (USEPA 2007c)
- Nitrate and nitrite following USEPA 353.2 “Determination of Nitrate-Nitrite Nitrogen by Automated Colorimetry, Revision 2.0” (USEPA 1993b)
- Alkalinity following SM 2320B “Alkalinity by Titration” (USEPA 2005a)
- Phosphorous following SM 4500-P E “Phosphorous by Ascorbic Acid Method” (USEPA 2005b)
- Total Target Analyte List (TAL) metals following USEPA SW846 6010C “Inductively Coupled Plasma-Atomic Emission Spectrometry”, Revision 3, SW846 6020B “Inductively Coupled Plasma-Mass Spectrometry”, Revision 2, and SW846 6020A “Inductively Coupled Plasma-Mass Spectrometry”, Revision 1 (USEPA 1998a)

2.2 Overburden Soil Sampling and Analysis

2.2.1 Sample Collection

Golder subcontracted a licensed well driller to advance borings into the overburden soil and install monitoring wells using roto sonic drilling methods. During boring operations, the driller collected continuous drill cores from all deep wells (i.e.” B” flagged wells). From the drill cores, Golder staff collected overburden samples from the depth of the screened intervals (i.e. 10-foot screened interval) from one background well soil boring (SB-07B), two downgradient well soil borings (SB-08B and SB-18B) and from five Assessment Monitoring well soil borings (SB-52B, SB-53B, SB-54B, SB-55B, and SB-56B). Golder staff also collected an additional sample from SB-53B (25’-27’) at the top of the screened interval due to minor unidentified visual soil staining encountered within the planned interval itself. An additional soil boring was completed just external to the slurry wall on the eastern side of the MCWB (OW-9) and samples were collected on approximately 10-foot intervals.

The driller used a “marsh buggy” with a hollow stem auger drill rig specifically designed to work in the wet, soft soil/ash conditions inside the CCR Unit to advance eight soil borings within the Drying Area. From these eight borings, 23 samples were analyzed for total metals with one of these samples (DA-14_4-6’) also analyzed using the 7-step sequential extraction. The only sample for which data are included in this report is DA-14_4-6’; all other data, which were obtained for other purposes, are provided in the Ash Pond Assessment Report (Golder 2020).

Soil borings were numbered to match the equivalent monitoring wells, where applicable. Golder field staff prepared a composite overburden sample from boreholes by selecting a two-foot interval from each drill core and submitting it to the laboratory for analysis under chain-of-custody procedures. The unique descriptions used to

identify the samples included the boring name and depth of the sample below ground surface (e.g., SB-07B-35'-37'). The sample type and analytical testing conducted on each sample are provided in Table 2.

Table 2: Summary of Overburden Soil Samples/Analyses

Sample Location	Number of Samples	Analyses
Background boring (SB-07B) 35'-37'	1	Total metals, sequential extraction
Downgradient boring (SB-08B) 30'-32'	1	Total metals, sequential extraction
Downgradient boring (SB-18B) 32'-34'	1	Total metals, sequential extraction
Assessment boring (SB-52B) 35'-37'	1	Total metals, sequential extraction, mineralogical composition
Assessment boring (SB-53B) 25'-27' & 30'-32'	2	Total metals, sequential extraction
Assessment boring (SB-54B) 30'-32'	1	Total metals, sequential extraction, mineralogical composition
Assessment boring (SB-55B) 30'-32'	1	Total metals, sequential extraction
Assessment boring (SB-56B) 30'-32'	1	Total metals, sequential extraction, mineralogical composition
Downgradient boring (OW-9) 10'-12' & 18'-20'	2	Total metals, sequential extraction, mineralogical composition
Drying area boring (DA-14) 4'-6'	1	Total metals, sequential extraction

2.2.2 Overburden Soil Analyses

Multiple geochemical methods were used to assess the mineralogical and chemical composition of the overburden soil samples. The selected geochemical test methods included the following:

- **Mineralogical composition:** The mineralogical analysis was used to identify and quantify the crystalline mineral phases in each sample. This information is required for geochemical modeling as the release or attenuation of constituents of interest is influenced by the mineral phase(s) present in the aquifer (Hem 1985). The mineralogical testing laboratory (SGS Minerals Services) performed the mineralogical analysis using quantitative (Rietveld) X-ray diffraction (XRD) and a Bruker AXS D8 Advance Diffractometer.
- **Total metals:** This analysis was used to quantify the chemical composition of overburden soils. The total mass of metals, in combination with the results of sequential extraction testing, can be used to determine the provenance of metals and verify sequential extraction results. The laboratory analyzed a target analyte list of

metals following the methods USEPA SW846 6010C “Inductively Coupled Plasma-Atomic Emission Spectrometry”, Revision 3 (November 2000) and USEPA SW846 7471B “Mercury in Solid or Semisolid Wastes (Manual Cold-Vapor Technique)”, Revision 2.

- **Sequential extraction:** The sequential extraction procedure (SEP) consisted of a seven-step procedure to extract metals from solids, as per Tessier et al. (1979), to identify the provenance of constituents of interest (i.e. the operationally-defined fraction that contains the metal)[1] and determine their potential environmental mobility. For instance, metals bound in the carbonate fraction, or that are exchangeable, are much more likely to become mobile due to changes in groundwater conditions than metals bound within a sulfide or silicate fraction. The summed concentration of a metal measured from all seven steps (SEP SUM) can be compared to the concentration determined from a total metals analysis (SEP Total) for compositional accountability. The laboratory analyzed the metals content of the extracted samples using the method USEPA SW846 6020B “Inductively Coupled Plasma-Mass Spectrometry”, Revision 2 (July 2014).

2.3 Groundwater Assessment Monitoring

Following the installation of a groundwater monitoring system in 2016 and throughout calendar year 2017, Golder collected background groundwater samples and performed Detection Monitoring around the CCR Unit pursuant to the requirements of 40 CFR §257.94. In 2018, Golder performed the first and second Assessment Monitoring sampling events pursuant to the requirements of 40 CFR §257.95. Following the first Assessment Monitoring sampling event, including verification sampling, the constituents that were detected above the groundwater protection standards (GWPS) at SSLs included:

- Cobalt and Lithium at GAMW-08
- Molybdenum at GAMW-18

The GWPS is the larger value of the Maximum Contaminant Level (MCL) or the unit-specific background concentration for each analyte based on a tolerance/prediction limit statistical procedure. However, USEPA amended the CCR Rule (i.e., Phase 1 Part 1 amendment) and created health-based standards for cobalt, lead, lithium, and molybdenum, constituents that do not have MCLs, as of August 29, 2018. Pursuant to 40 CFR §257.95(h)(2), the health-based standards can be used in place of background levels to calculate the GWPS. Consequently, after the second Assessment Monitoring event (October 2018), cobalt in monitoring well GAMW-08 remained as the only constituent detected at an SSL. Arsenic has never been detected above the GWPS or at an SSL, however, Golder also assessed arsenic as part of this evaluation due to sporadic detections at or above the MCL.

[1] Sequential extraction of metals from overburden samples consisted of seven discrete steps for this investigation:

Step 1 - Exchangeable Phase: This extraction includes trace elements that are reversibly adsorbed to overburden minerals, amorphous solids, and/or organic material by electrostatic forces.

Step 2 - Carbonate Phase: This extraction targets trace elements that are adsorbed or otherwise bound to carbonate minerals.

Step 3 – Non-Crystalline Materials Phase: This extraction targets trace elements that are complexed by amorphous minerals (e.g., iron).

Step 4 - Metal Hydroxide Phase: Trace elements bound to hydroxides of iron, manganese, and/or aluminum.

Step 5 - Organic Phase: This extraction targets trace elements strongly bound via chemisorption to organic material.

Step 6 - Acid/Sulfide Fraction: The extraction is used to identify trace elements precipitated as sulfide minerals.

Step 7 - Residual Fraction: Trace elements remaining in the overburden after the previous extractions will be distributed between silicates, phosphates, and refractory oxides.

Although boron is not currently an Appendix IV constituent, USEPA is reportedly considering adding it to the Appendix IV list. The Indiana Department of Environmental Management (IDEM) has, however, established a health-based standard as part of the state cleanup program. Boron is frequently used as a tracer to indicate the extent of a release from a CCR management unit. Due to these characteristics and as a conservative measure, boron was selected by Golder to assess the nature and extent of groundwater impacts at the Site.

The health-based standards, unit-specific background concentration, and groundwater protection standards used in this evaluation are summarized in Table 3.

Table 3: Summary of Health-Based Standards, Background Concentrations, and Groundwater Protection Standards for the Constituents of Interest

Constituent	Health-Based Standard (mg/L)	Background Concentration (mg/L)	Groundwater Protection Standard (mg/L)
Arsenic	0.01	0.091	0.091
Boron	4(1)		
Cobalt	0.006	0.01	0.01
Lithium	0.04	0.01	0.04
Molybdenum	0.1	0.05	0.1

(1) IDEM health-based standard, not currently part of the CCR Rule

2.4 Groundwater and Porewater Geochemical Analysis

2.4.1 Estimation of Attenuation Rates

To evaluate the attenuation of arsenic, boron, cobalt, lithium, and molybdenum in groundwater at the Site and to assess the rate of attenuation, Golder applied the point decay method (USEPA 2011). The point decay method is used to determine the rate at which a constituent's concentrations are increasing or decreasing in groundwater at a single well between sampling events and this method can thus be used to predict when the constituent's concentrations will fall back below regulatory limits. Equation 1 describes first-order decay for a constituent:

$$Ln(C_t) = kt + Ln(C_0) \qquad \text{(Equation 1)}$$

where C_0 is the initial constituent concentration, C_t is the constituent concentration at time t, t is the amount of time in years that has passed since the initial concentration measurement, and k is the first-order decay rate constant (1 per year). Equation 2 shows Equation 1 reorganized to solve for the decay rate constant:

$$k = (Ln(C_t) - Ln(C_0))/t \qquad \text{(Equation 2)}$$

Groundwater water quality data from the background and downgradient wells collected between July 2016 and November 2019 were used to determine the mean first-order decay rate for each constituent of interest. Due to variable detection limits, results that were reported as below detection limits were not used in the point decay analysis. Using Equation 1 and the mean first-order decay rate, Golder calculated the number of years that it would take for constituents of interest concentrations greater than the GWPS to decrease below their respective thresholds.

2.4.2 Geochemical Speciation Modeling Methods

Golder conducted geochemical modeling to evaluate general groundwater and porewater composition, determine the potential for precipitation of sorbent media, evaluate the potential for mineral precipitation or adsorption in the aquifer, and determine the speciation of metals of interest. The geochemical computer code developed by the United States Geological Survey (USGS), PHREEQC (Parkhurst and Appelo 2013), was used for these simulations. PHREEQC version 3.4 is a general-purpose geochemical modeling code used to simulate reactions in water and between water and solid mineral phases (e.g., rocks and sediments). Reactions include aqueous equilibria, mineral dissolution and precipitation, ion exchange, surface complexation, solid solutions, gas-water equilibrium, and kinetic biogeochemical reactions. The widely-accepted thermodynamic database, Minteq.v4, 2017 edition, was used as a basis for the thermodynamic constants required for modeling (USEPA 1998b).

The Geochemist's Workbench version 12 (Bethke 2015) was used to generate graphical representations of geochemical modeling outputs in the form of predominance, or Pourbaix diagrams (also known as Eh-pH diagrams) for the species of interest (i.e. arsenic, boron, cobalt, lithium, and molybdenum) and trilinear plots (also known as Piper plots) displaying the relative abundance of major ions. The Minteq.v4 database was used as the basis for the Pourbaix diagrams.

2.4.3 Predictive Geochemical Modeling Methods

Golder performed geochemical modeling to assess viable attenuation mechanisms and to predict the quantity and stability of the attenuated constituents of concern.

2.4.3.1 Capacity of Adsorption as an Attenuation Mechanism

Adsorption is an important mechanism by which constituents in groundwater can be attenuated. The adsorptive partitioning between dissolved and solid phases was simulated using a two-layer surface complexation model (SCM). The SCM approach is described in Davis and Kent (1990), with additional parameterization based on Dzombak and Morel (1990) and Karamalidis and Dzombak (2011) utilizing iron (hydrous ferric oxide [Hfo]) as ferrihydrite [$Fe(OH)_{3(am)}$], and aluminum (hydrous aluminum oxide [Hao]) as gibbsite [$Al(OH)_{3(am)}$], as adsorbing surfaces.

The amount of Hfo and Hao available at the site for attenuation was based on the amorphous and metal hydroxide phase iron and aluminum concentrations measured in the SEP as described in Section 3.2.2. The minimum, mean, and maximum concentrations in soil borings were used in the adsorption models to capture the range of expected site concentrations. The Hfo and Hao surface properties (i.e., surface area, site density, and types of sites) from Dzombak and Morel (1990) and Karamalidis and Dzombak (2011) were used to quantify the iron and aluminum adsorption sites per mole of mineral.

The calculation methodology of Appelo and Postma (2010) was used to determine the specific quantity of sites on each mineral surface type as a function of the amount of mineral available to participate in these reactions. The methodology assumes the number of surface sites (sites) equals the product of the moles of iron ([Fe]) and the moles of surface sites per mole of iron ([sites]/[Fe]= 0.2 moles of sites per mole of iron). For the amount of ferrihydrite available for sorption, the Appelo and Postma methodology further assumes the mass of ferrihydrite (M_{HFO}) in grams (g) available equals the product of the [Fe] and the molecular weight of ferrihydrite (MW_{HFO} = 88.85 g/mole). The same approach was used to calculate the number of sites from gibbsite, assuming the [sites]/[Al] is 0.41 moles of sites per mole of aluminum and the molecular weight of gibbsite is 78.003 g/mole.

The geochemical thermodynamic database Minteq V.4 was used to conduct adsorption modeling. However, new and updated thermodynamic data have been released in scientific literature. These new data are important to include in the geochemical modeling exercises for certain elements or minerals as they allow further refinement of potential reactions, or for correction of previous data that may have been less accurate or more broadly defined. For groundwater modeling at the Site, Golder made numerous updates to the Minteq V.4 database, including the addition of data relating to partitioning coefficients for metals on gibbsite, developed by Karamalidis and Dzombak (2011). Of the five constituents of interest, the database did not contain partitioning coefficients for ferrihydrite or gibbsite for lithium, so its potential for adsorption could not be assessed.

To quantify current levels of adsorption, the concentration of constituents that adsorb in soils (as milligram (mg) of constituent/kilogram (kg) of soil) was modeled for the minimum, maximum, and mean Hfo and Hao contents when equilibrated with the range of groundwater qualities observed at the Site. To quantify the capacity of soil to adsorb additional amounts of each constituent, Golder simulated a step-wise increase in arsenic, boron, cobalt, and molybdenum concentrations (similar in concept to a titration, using the mean proportions observed in porewater) into the range of observed groundwater qualities while allowing equilibration with the sorption surfaces in soils (minimum, maximum and mean Hfo and Hao). The model was then used to predict the quantity of each constituent that would adsorb with this titration of additional arsenic, boron, cobalt, and molybdenum.

2.4.3.2 Mineral Precipitation and Co-precipitation

The potential for mineral precipitation was assessed in PHREEQC using a saturation index (SI) calculated according to Equation 3.

$$SI = \log (IAP/Ksp) \quad \text{(Equation 3)}$$

The saturation index is the ratio of the ion activity product (IAP) of a mineral to the solubility product (Ksp). An SI value greater than zero indicates that the solution is supersaturated with respect to a particular mineral phase and, therefore, precipitation of this mineral may occur. An evaluation of precipitation kinetics is then required to determine whether the supersaturated mineral will indeed form. An SI value less than zero indicates the solution is undersaturated with respect to a particular mineral phase. An SI value close to zero indicates equilibrium conditions exist between the mineral and the solution. SI values between -0.5 and 0.5 are considered to represent ‘equilibrium’ in this report to account for the uncertainties inherent in the analytical methods and geochemical modeling.

Co-precipitation was evaluated based on published literature and known association between minerals and constituents of concern. For example, cobalt is known to coprecipitate with iron oxyhydroxides as well as adsorb to Hfo (Norstrom and Alpers 1999). Therefore, to evaluate co-precipitation, minerals identified by PHREEQC to be at equilibrium (SI > -0.5) were evaluated for their potential to host arsenic, boron, cobalt, lithium, and molybdenum.

2.4.3.3 Capacity of Dilution and Dispersion as Attenuation Mechanisms

Dilution and dispersion are physical mechanisms of attenuation by which concentrations of constituents in groundwater decrease with migration along groundwater flowpaths.

To assess the potential for dilution and dispersion downgradient of the CCR Unit, Golder used MODPATH (Pollack 1989) and the calibrated Site Groundwater Flow model (discussed in Section 4.0 and Appendix B) to simulate travel times for particles released from the MCWB. The length of the particle traces produced by

MODPATH along with travel time estimates were used to calculate average groundwater velocities for the following flow paths: (see Figure 1):

- GAMW-16 to GAMW-53
- GAMW-18 to GAMW-55
- GAMW-17 to GAMW-54
- GAMW-09 to GAMW-54

The results of these flow path travel time simulations are presented in Table 4.

Golder estimated the capacity of dilution and dispersion to attenuate constituent concentrations from the CCR Unit using ratios of concentrations measured in monitoring wells along these flow paths, as presented in Table 8. For example, along the flow path from GAMW-16 to GAMW-53, concentrations of boron decreased from 9.7 milligram per liter (mg/L) to 3.1 mg/L, representing an estimated 68% decrease in concentration along the flow path due to dilution and attenuation.

2.4.3.4 Long Term Stability of Attenuated Constituents

Three sensitivity analyses were performed to assess the stability of adsorbed constituents under variable pH, redox, and ionic strength conditions. Variations in pH, redox, and ionic strength are the most likely types of changes that will occur in an aquifer over time affecting the stability of the constituents of interest (ITRC 2010). The sensitivity analyses were conducted applying the minimum, mean, and maximum Hfo and Hao contents determined for the Site soils, equilibrated with the groundwater qualities observed at the Site at the measured pH and redox conditions. For each sensitivity analysis, a single parameter was varied:

- **pH -** Hydrochloric acid or sodium hydroxide addition was modeled to vary the pH between 4 and 12 standard units (SU). A pH range of 4 to 10 is the typical range considered for evaluating metal speciation.
- **Redox -** DO addition was simulated to adjust reduction potential (Eh) values between -200 and +700 millivolts (mV) based on the historical and anticipated range of Eh in the region.
- **Ionic Strength -** Total dissolved solids (TDS) concentrations were increased by titrating in calcium, magnesium, sodium, potassium, chloride, and sulfate in the proportions observed in porewater. TDS concentrations were evaluated up to 10,000 mg/L, which is approximately four times higher than the highest TDS concentration observed in groundwater at the CCR Unit.

2.4.4 Geochemical Modeling Assumptions and Data Handling

Geochemical modeling assumptions and data handling included the following:

- **Groundwater continuity:** Three or four groundwater quality samples were collected from each well during sampling events conducted between September 2018 and November 2019. Samples from this period were selected for the geochemical modeling because all wells related to the CCR Unit were sampled and analyzed for the full suite of parameters described in Section 2.1.2 and the resulting data are assumed to provide a comprehensive overview of groundwater conditions. Temporal trend analysis for arsenic, boron, cobalt, lithium, and molybdenum made use of all available sampling events between July 2016 and November 2019.

- **Porewater chemistry:** Porewater samples collected from GAPIEZ-06 (three samples total in August, September, and October 2018), DAPZ-02A (one sample collected in March 2020), and DAPZ-02B (one sample collected in March 2020) were assumed to be representative of porewater found in the CCR Unit. Data from three sampling events from GAPIEZ-06 were used to evaluate porewater trends.
- **Redox values:** ORP values measured in the field were converted to Eh by adding 200 mV to the field-measured values as per YSI Tech Note (YSI 2015).
- **Non-detect values:** Constituents with concentrations less than their respective method reporting limits were assumed to have a concentration equal to half the reporting limit in model simulations.
- **Total recoverable concentrations:** Total recoverable fraction results were used for geochemical modeling.
- **Charge balance:** Groundwater and porewater compositions with charge balance errors less than 10% were considered valid. Compositions with charge balance errors greater than 10% were flagged as potentially less reliable, but still included in the geochemical modeling effort.

3.0 SUPPLEMENTAL ASSESSMENT RESULTS

3.1 Groundwater and Porewater

3.1.1 Groundwater Characterization

Groundwater quality data for background, downgradient, and Assessment Monitoring wells used for this evaluation were collected from September 2016 to November 2019. Non-regulated (per the CCR Rule) groundwater parameters (e.g., alkalinity, potassium, sodium) are only available from September 2018 to November 2019. The assessment of trends in arsenic, boron, cobalt, lithium, and molybdenum concentrations in groundwater included observations of all validated data collected during that time frame. Groundwater quality monitoring data are presented in Appendix A and can be summarized as follows:

- **Charge balance error:** Charge balance errors could only be assessed for samples for which the full suite of cations and anions was reported. Eleven groundwater samples had charge balance errors greater than 10%. Eight out of the eleven samples (GAMW-07 in November 2019, GAMW-07B in November 2019, GAMW-08B October 2018, GAMW-08B in November 2019, GAMW-18 in October 2018, GAMW-18B in October 2018, GAMW-18B in November 2019 and GAMW-56B in April 2019) reported charge balance errors between 10% and 15%. Only samples from GAMW-07B in September 2018, GAMW-18B in April 2019, and GAMW-56 in April 2019 had a charge balance error greater than 40%. All eleven results were flagged (Table 5) and retained, with the understanding that they may be somewhat less reliable. Upon subsequent sampling, charges balance errors decreased to <10 % in these wells.
- **pH:** Groundwater pH across background, downgradient, and Assessment Monitoring wells ranged from 5.2 to 8.7. The geometric mean pH across all wells was 7.2. GAMW-07B, GAMW-52B, GAMW-54B were the only wells that produced samples with a pH exceeding 8.0.
- **ORP (Redox):** Field-measured redox, corrected to Eh (+200 millivolts [mV]) values, ranged from -115 to +335 mV in the background monitoring well, downgradient monitoring well, Assessment Monitoring well, and porewater samples collected between September 2018 to November 2019. There was no apparent trend in redox conditions based on sample location or depth.

- **Total Dissolved Solids:** Groundwater TDS concentrations were variable. Generally, the lowest TDS concentrations (less than 400 mg/L) were measured in groundwater at Assessment Monitoring wells (GAMW-46, GAMW-46B, GAMW-52, GAMW-53) while TDS concentrations up to an order of magnitude higher were determined in groundwater at wells located immediately downgradient of the CCR Unit (e.g., GAMW-08B). In general, deep wells demonstrated higher TDS concentrations than shallower companion wells at the same locations.

- **Major ion chemistry:** A Piper plot was generated for all porewater samples and groundwater samples from background, downgradient, and Assessment Monitoring wells to facilitate the identification of water types and changes in major ion chemistry over time (Figure 2a-c). The majority of background, downgradient, and porewater samples are calcium-sulfate dominated. In general, deep wells have a higher proportion of sodium and sulfate than the shallower companion wells. The differences between shallow and deep companion wells are more pronounced in the Assessment Monitoring wells. Except for GAMW-54 and GAMW-55, the shallow samples from the assessment wells are calcium-(bi)carbonate dominated and plot in a different location on the Piper plot than background, downgradient, and porewater samples. Shallow wells GAMW-54 and GAMW-55, along with all the deep Assessment Monitoring wells, are calcium-sulfate dominated and plot with background, downgradient, and porewater samples. The water types have remained generally unchanged between September 2018 and November 2019. Generally, this indicates that groundwater types are consistent. However, based on major ion chemistry, there are different water types on the site that are likely influenced by variable site geology.

- **Arsenic:** Arsenic concentrations in groundwater samples collected from downgradient monitoring and Assessment Monitoring wells between September 2016 to November 2019 ranged from non-detect (<0.005 mg/L) to 0.022 mg/L (Figure 4a-c). The highest measured arsenic concentration in groundwater at the CCR Unit (0.091 mg/L) was reported in a sample collected from background well GAMW-15 in September 2018 (Figure 4a). No downgradient monitoring well has ever exceeded the GWPS of 0.091 mg/L designated for the CCR Unit. Arsenic concentrations in groundwater appear to be stable or decreasing in all downgradient monitoring wells (Figure 4b). Arsenic concentrations in the CCR Unit porewater (GAPIEZ-06) ranged from 0.011 to 0.012 mg/L in August and October 2018 (Appendix A-2). Arsenic concentrations collected from the Drying Area in March 2020 (DAPZ-02A and DAPZ-02B) were an order of magnitude lower (<0.0010 and 0.0018 mg/L, respectively). Based on the observed pH and Eh conditions, arsenic predominately occurs as an oxidized arsenate (As^{+5}) species, with arsenic in only a small number of samples present as a reduced arsenite (As^{+3}) species (Figure 3a). Arsenite is less readily adsorbed than arsenate and is thus generally regarded to be more mobile in natural environments (Nordstrom 2014).

- **Boron:** Boron concentrations in downgradient groundwater samples collected between September 2016 to November 2019 ranged from 0.056 mg/L to 25 mg/L (Figure 5a-c). The highest boron concentration (25 mg/L) was measured in monitoring well GAMW-09B in September 2017. Two background wells (GAMW-07B and GAMW-15B), seven downgradient wells (GAMW-08B, GAMW-09, GAMW-09B, GAMW-16B, GAMW-17, GAMW-17B, and GAMW-18B) and two Assessment Monitoring wells (GAMW-54B and GAMW-55B) reported boron concentrations greater than the health-based standards (4 mg/L). Boron concentrations in porewater were between 7.4 mg/L and 13.8 mg/L. Based on pH conditions on the Site, boron in all wells occurs predominately in the form of protonated boric acid (H_3BO_3) (Figure 3b). Generally, boron concentrations in the background and downgradient wells have remained stable or has decreased. This is also the case for all assessment and boundary well except for GAMW-55B, where boron has increased slightly. GAMW-55B is a deep well and heavily influenced by bedrock.

- **Cobalt:** Cobalt concentrations ranged from non-detect (<0.001 mg/L) to 0.059 mg/L in groundwater samples collected between September 2016 to November 2019 at the CCR Unit (Figure 6a-c). GAMW-08 had the highest cobalt concentration of all monitoring wells (0.059 mg/L in November 2016) and generally reported a decreasing trend thereafter (Figure 6b). The second highest concentration (0.010 mg/L in June 2017 and October 2018) occurred in GAMW-07, a background well (Figure 6a). GAMW-08 is the only well on Site to have reported a historic cobalt level greater than the GWPS (0.010 mg/L). Cobalt in porewater ranged from below the laboratory reporting limit (<0.0010 mg/L) to 0.0022 mg/L. Cobalt in all wells occurs predominately as the divalent cation Co^{+2}, based on pH and Eh conditions (Figure 3c). Cobalt concentrations appear to be stable or decreasing in groundwater samples collected from the upgradient, downgradient, and Assessment Monitoring wells.
- **Lithium:** Lithium concentrations in groundwater ranged from non-detect (<0.008 mg/L) to 0.025 mg/L between September 2016 to November 2019 (Figure 7a-c). Two downgradient wells, GAMW-18B and GAMW-08, located directly downgradient of the MCWB, have historically had the highest lithium concentrations (Figure 7b). Lithium concentrations historically have not exceeded 0.040 mg/L, the health-based standard. Lithium levels in GAMW-08 appear generally consistent over time, and a trend cannot be determined for GAMW-18B, as the well was recently installed and fewer than four sampling events have been conducted. Lithium concentrations in groundwater at all other wells downgradient of the CCR Unit appear to be stable. Lithium was not detected above the laboratory reporting limit (0.008 mg/L) in the CCR Unit porewater (GAPIEZ-06). Lithium concentrations collected from the Drying Area in March 2020 (DAPZ-02A and DAPZ-02B) were <0.008 mg/L and 0.016 mg/L, respectively. Lithium predominately occurs as the monovalent cationic species Li^{+} based on field pH and Eh conditions (Figure 3d).
- **Molybdenum:** Molybdenum concentrations in groundwater ranged from non-detect (<0.010 mg/L) to 0.18 mg/L (Figure 8a-c). Although GAMW-18 has reported historical levels of up to 0.18 mg/L, concentrations have been below 0.1 mg/L (the health-based standard) since August 2017. No other CCR Unit monitoring wells have reported concentrations exceeding 0.1 mg/L. The molybdenum concentration in porewater has ranged from 0.063 mg/L to 0.81 mg/L. Molybdenum is predominately present in the form of the divalent anionic molybdate (MoO_4^{-2}) species based on field-measured pH and Eh conditions (Figure 3e).
- **Iron:** Total (un-filtered) iron concentrations were variable, ranging from non-detect (<0.1 mg/L) to 13 mg/L between September 2018 and November 2019 (Appendix A-1). The highest concentration of 13 mg/L was observed in the groundwater sample collected from Assessment Monitoring well GAMW-56. No geographical trend is apparent; however, deeper “B wells” generally tended to have higher total iron contents. Ferric iron (Fe^{+3}) concentrations were higher than ferrous iron (Fe^{+2}) concentrations in all samples, except for those collected from wells GAMW-15, GAMW-55B, and GAMW-56.
- **Nutrients:** Total nitrogen (nitrate + nitrite) was measured in groundwater samples collected in October 2018 and was present at low levels (i.e. less than 2.8 mg/L). Nitrate concentrations were measured in samples collected in 2019 and concentrations ranged from below the detection limit (<0.05 mg/L) to 7.7 mg/L. The highest reported nitrate concentration was found in GAMW-08 in May 2019 (7.7 mg/L-N). The presence of low-level nitrate confirms oxidized conditions surround the CCR Unit. Phosphate concentrations exceeding 1 mg/L were detected in groundwater samples from GAMW-15 and GAMW-16. Phosphate concentrations were below detection in groundwater samples collected from 18 of the 25 wells between September 2018 and November 2019. No geographical or temporal trend is apparent in the phosphate concentrations related to the CCR Unit (Appendix A).

The monitoring data also indicate that sulfate generally occurs at the highest concentrations immediately downgradient of the CCR Unit and in background monitoring wells (Figure 9a-c). As identified in Figure 2a-c, considering major groundwater chemistry and sulfate, the CCR Unit is likely influencing groundwater quality in Assessment Monitoring wells GAMW-54/54B and GAMW-55/55B. However, while affected by the CCR Unit, these wells report low concentrations of arsenic, cobalt, lithium, and molybdenum below health-based standards or below detection limits. Boron concentrations were elevated above its GWPS in both upgradient and downgradient wells, suggesting elevated concentrations are naturally occurring or due to an alternate source at the Site.

3.1.2 Evaluation of Attenuation Rates

The results of the point decay analysis for groundwater at background and downgradient wells (including Assessment Monitoring wells) between September 2016 and November 2019 are provided in Table 6, as mean site attenuation rates. This evaluation reveals that, despite concentrations generally increasing in background wells over time (as indicated by positive point decay constants), boron, cobalt, lithium, and molybdenum concentrations in downgradient wells have decreased (negative point decay constants) over that same monitoring period. The mean downgradient decay rates can be used to estimate the number of years it would take for elevated groundwater concentrations to decrease to the GWPS. Maximum concentrations of boron, cobalt and molybdenum observed in downgradient monitoring wells over the period of monitoring would take approximately 41 years, 39 years, and 20 years, respectively, to attenuate to concentrations below GWPS (or health-based standard for boron) based on these decay rates. The durations required to achieve regulatory standards for arsenic and lithium were not calculated because there are no exceedances of the GWPS for these constituents.

The positive mean point decay rate for arsenic in downgradient monitoring wells indicates that, on average, concentrations are increasing. Given the low concentrations in the porewater samples (≤ 0.012 mg/L), this trend is unlikely to be caused by the CCR Unit. Low-level increasing arsenic concentrations in Assessment Monitoring wells GAMW-52B, GAMW-53B, GAMW-54, and GAMW-54B are driving the positive point decay rate, but the arsenic concentrations in these wells remain sufficiently low (≤ 0.005 mg/L) and are likely caused by natural variability. Although an increasing trend of arsenic at these wells currently may exist, it is unlikely this trend will continue given the potential for attenuation (e.g., through sorption and dilution) to maintain arsenic concentrations below the GWPS.

3.1.3 Mineralogical Controls in Groundwater and Porewater

The results of speciation modeling of groundwater data from background, downgradient, and Assessment Monitoring wells between September 2018 and November 2019 are provided in Table 5, including saturation indices for relevant minerals. Mineral saturation can play an important role in attenuation of metals, either directly by their removal through mineral precipitation, or indirectly by providing sorptive surfaces or opportunities for co-precipitation.

- **Iron-bearing minerals:** Ferrihydrite was indicated to be at equilibrium with groundwater or oversaturated in nearly all samples, indicating a strong potential for ongoing precipitation of solid-phase iron oxides. Only two samples from Assessment Monitoring well GAMW-53 (April 2019 and November 2019) were modeled to be undersaturated with respect to ferrihydrite. Thus, it is assumed that iron (hydr)oxides are prevalent in the Site aquifers.
- **Other minerals:** Nearly all groundwater samples, with the exception of samples from GAMW-07 and GAMW-52, were simulated to be in equilibrium or oversaturated with respect to barite ($BaSO_4$). Fluorite

(CaF_2) equilibrium was indicated in wells GAMW-07B, GAMW-08/08B, GAMW-17, and GAMW-52B. Gypsum ($CaSO_4.2H_2O$) was modeled to be in equilibrium in seven wells (GAMW-07B, GAMW-08B, GAMW-15B, GAMW-16B, GAMW-18, GAMW-18B, and GAMW-55B), most of which were deeper "B-wells" nearer to bedrock. Calcite ($CaCO_3$) equilibrium was indicated in all wells except GAMW-53.

In summary, several mineral phases likely control groundwater composition at some or all wells: barite, calcite, fluorite, ferrihydrite, and gypsum. In the case of ferrihydrite, the dissolved concentrations of constituents of interest can be reduced through its ability to act as a substrate for adsorption.

3.2 Overburden Soil

3.2.1 Mineralogical Composition

Quantitative XRD with Rietveld refinement was used to identify and quantify minerals in five overburden soil samples collected during the drilling activities (Table 7). Three of the samples were collected from the Assessment Monitoring well's soil borings and two samples were collected from the downgradient soil boring (OW-9). These samples were obtained to better understand the mineralogical composition of the aquifer system and identify any minerals that would potentially influence attenuation of constituents of interest. In addition, and in contrast, the presence of certain minerals could also indicate a potential for naturally occurring release of metals into groundwater, for instance due to oxidation of sulfide minerals.

The mineralogical analysis identified the iron sulfide minerals pyrite and marcasite at low levels in three of the five overburden soil samples, at concentrations up to 0.6 wt.%. These minerals can oxidize in the presence of even trace amounts of dissolved oxygen, which would lead to the liberation of trace metals or metalloids known to associate with sulfide minerals (e.g., arsenic, cobalt, and molybdenum) into groundwater (Smith and Huyck 1997). In addition, the associated release of iron creates the potential for formation of minerals with the ability to sorb trace elements.

The presence of the oxidized iron mineral hematite (Fe_2O_3) at 0.3 to 0.6 wt.% in three of the five overburden soil samples in the presence of reduced iron sulfide minerals indicates a spectrum of oxidation occurring in overburden soil samples. As pyrite or marcasite is oxidized, intermediate amorphous iron phases, such as ferrihydrite, would likely occur first. Over time, crystallization would progress, forming iron oxide-oxyhydroxides such as hematite or goethite (FeOOH). Therefore, it is likely a range of iron solid phases is present in the overburden soil, and the potential exists over time for an increased presence of amorphous and crystallized iron oxides-oxyhydroxides with a strong affinity to attenuate certain metals and metalloids (Dzombak and Morel 1990).

The mineralogical analysis also identified the carbonate minerals calcite ($CaCO_3$) and dolomite ($CaMg(CO_3)_2$) in all overburden soil samples, with combined concentrations between 9 and 16 wt.%. Carbonate minerals are known to adsorb cobalt (Brady et al. 2003) while sorption and uptake of arsenic are possible as well (e.g., Romero et al. 2004). Carbonate minerals can dissolve when exposed to sulfuric acid formed by oxidation of sulfide minerals and release associated trace metals and metalloids (Section 3.2.2) into groundwater. Iron can also be released as carbonate minerals dissolve and potentially form metal hydroxide minerals.

3.2.2 Chemical Composition and Sequential Extraction

Chemical analysis and sequential extraction were conducted to determine the chemical composition and the distribution of constituents of interest over various operationally defined fractions of the overburden soil. This testing was completed per Table 2 on nine overburden soil samples from eight monitoring well locations, two samples from the OW-9 borehole, and one sample from within the Drying Area (reported in Table 8). Soil samples

from soil borings that correspond to well locations were collected from within the screened depth (except SB-53B 25'-27' which was collected above the screened depth).

A description of the individual fractions determined by sequential extraction is presented in Section 2.2.2, footnote 1. Metals extracted in steps 1 through 5 are considered environmentally available, whereas metals extracted in steps 6 and 7 are present in refractory fractions and are not expected to be released under conditions typically encountered in aquifers (Tessier et al. 1979). The sum of metal concentrations from the sequential extraction steps is expressed as "SEP SUM" in Table 8 and does not represent an analytically determined value. The concentration measured by total metals analysis is referred to as "SEP Total" in Table 8. Boron was not included in the SEP analysis due to method limitations.

The results from the chemical analysis and sequential extraction can be summarized as follows:

- **Iron:** Iron was present in all twelve samples analyzed, varying from 3,400 milligram per kilogram (mg/kg) (DA-14) to 9,900 mg/kg (SB-54B). In all samples, the refractory sulfide and residual fractions accounted for the largest proportion of total iron and, as such, most of the iron is not environmentally available (Figure 10). The labile fraction in steps 1 through 5 can generally be considered representative of the amount of iron in the overburden that may be available as a sorbing medium. While not a constituent of interest, iron and its minerals commonly represent the most important reservoir for metal/metalloid attenuation in soils or overburden. The labile fraction calculated from sequential extraction, therefore, can be used as a proxy for determining the total number of adsorption sites available for attenuation of arsenic, boron, cobalt, and molybdenum in the environment.
- **Arsenic:** Total arsenic in the soil overburden samples ranged from 1.9 to 6.2 mg/kg while the environmentally-available fraction ranged from 0.44 mg/kg in SB-55B to 3.0 mg/kg in SB-53B, representing from 31% to 59% of total arsenic (Figure 11). The majority of arsenic was present in the refractory fraction, predominantly associated with sulfide minerals. The amorphous metal and metal hydroxide fractions hosted all arsenic that was environmentally available except in SB-52B, where the carbonate fraction represented 8.5% of total arsenic. The highest concentrations of environmentally-available arsenic occurred in sample SB-56B, and the lowest concentrations were encountered in samples DA-14, SB-53B and SB-55B. The Drying Area sample (DA-14) had the second lowest environmentally-available arsenic concentrations (0.45 mg/kg) of all samples analyzed. Arsenic in DA-14 predominantly occurred in the sulfide and insoluble fractions.
- **Cobalt:** Total cobalt in soil borings ranged from 2.5 mg/kg to 6.1 mg/kg while the environmentally-available fraction ranged from 1.1 mg/kg in OW-9 to 2.9 mg/kg in SB-53B, representing from 27% to 60% of total cobalt (Figure 12). Those samples downgradient of the CCR Unit had similar total cobalt in the environmentally-available fraction as the background samples. In all boring samples, cobalt was most abundant in the metal hydroxide, sulfide, and residual fractions. Cobalt was also present in the carbonate phase in the nine soil bore samples (5% to 14% of total). Cobalt in the carbonate phase is most likely sorbed onto or coprecipitated with the calcite that was indicated to be in equilibrium with groundwater in geochemical modeling. Cobalt was not detected in the exchangeable phase. DA-14 reported the lowest total and environmentally-available cobalt concentrations (0.87 mg/L and 0.39 mg/L, respectively) of all samples analyzed, predominantly in the metal hydroxide and sulfide fractions.
- **Lithium:** Total lithium ranged from 4.2 to 11 mg/kg while the environmentally-available fraction ranged from 0.5 mg/kg in DA-14 to 11.4 mg/kg in SB-18B, representing from 12% to 74% of total lithium (Figure 13). The

majority of lithium was present in either the organic or the refractory fraction. The organic, carbonate, and metal hydroxide fractions hosted all lithium that was environmentally available. The highest concentrations of environmentally-available lithium occurred in samples SB-18B, SB-54B, SB-55B and SB-56B, and the lowest amount was encountered in SB-53B. Lithium concentrations in DA-14 were generally lower than in background and downgradient monitoring wells, with the majority of the lithium present in the sulfide and residual fractions.

- **Molybdenum:** Total molybdenum in overburden ranged from 0.15 to 3.8 mg/kg while the environmentally-available fraction ranged from non-detect to 2.83 mg/kg, in SB-53B (25'-27'), and accounted for 100% of all molybdenum in SB-18B and SB-53B (30'-32') (Figure 14). Molybdenum was most commonly present in the amorphous and metal hydroxide fractions. Notably, in background boring SB-07B and in SB-08B, a downgradient boring in close proximity of the CCR Unit, molybdenum was non-detect in overburden soil samples. The soil boring with the highest total molybdenum content, SB-53B, is located further downgradient from the CCR Unit. The Drying Area sample (DA-14) had the highest concentrations (15 mg/kg) of all samples analyzed. Molybdenum in DA-14 was present predominantly in the exchangeable fraction.

In summary, no definitive trends were present for arsenic, cobalt, lithium or molybdenum that indicated a higher concentration immediately downgradient of the CCR Unit relative to background locations or locations further downgradient. Based on the above results, attenuation by adsorption of all four constituents of interest is likely occurring, with the carbonates, amorphous metal oxides, and metal hydroxide fractions accounting for the majority of the attenuation.

4.0 GROUNDWATER MODELING RESULTS

Through standard numerical groundwater modeling procedures, Golder developed a steady state groundwater flow model for the Site that is considered calibrated and verified. Details of the flow model development are presented in Appendix B. This model was utilized to inform the natural attenuation study by simulating travel times for particles released from the MCWB, as presented in Table 4.

5.0 GEOCHEMICAL MODELING RESULTS

5.1 Identification and Capacity of Attenuation Mechanisms

5.1.1 Adsorption to Iron and Aluminum Oxyhydroxides

The Hfo and Hao surface area and sorption site calculations for the minimum, mean, and maximum soil boring iron and aluminum concentrations are presented in Table 10. Adsorption modeling in PHREEQC revealed a large range of adsorption capacities expected for the different constituents at the site. Figure 15 displays the predicted trajectories of aqueous concentrations before and after adsorption onto Hfo and Hao in soils (minimum, mean and maximum Hfo and Hao), as additional arsenic, boron, cobalt, and molybdenum are titrated into solution. The bold lines display the geometric means for all groundwater scenarios within each soil scenario and the grey area represents the range for the 5th to 95th percentile of all soil scenarios. As mentioned in Section 2.4.3.1.2, lithium adsorption to iron and aluminum oxyhydroxides was not modeled due to a lack of available thermodynamic data.

The predicted trajectories are compared against the GWPS and porewater concentrations. On the plots, the further the predicted trajectories are to the right of the 1:1 line, the larger the amount of the constituent that has sorbed to Hfo and Hao surface sites in soils and is no longer predicted to reside in the aqueous phase. For boron, little to no adsorption is predicted by the model, so aqueous concentration before adsorption are almost identical to concentrations after adsorption. For arsenic, a large proportion is expected to adsorb, with a capacity to bring

average arsenic concentrations to below 0.01 mg/L when concentrations are at approximately 10 mg/L or lower prior to adsorption. At higher arsenic concentrations (> 10 mg/L), the relative sorption capacity is diminished as sorption sites are filled and aqueous concentrations after adsorption are predicted to increase above its GWPS. For cobalt and molybdenum, the trajectories run parallel to the 1:1 line, indicating that sorption capacity is directly proportional to the concentration before adsorption. The modeling results suggest that adsorption has the capacity to reduce cobalt concentrations below approximately 0.1 mg/L down to the GWPS of 0.01 mg/L and molybdenum concentrations below approximately 0.2 mg/L down to the GWPS of 0.1 mg/L. The 95th percentile of modeled trajectories show that a minority of pH and redox conditions at site were less favorable for attenuating cobalt or molybdenum, as seen by the proximity to the 1:1 line.

5.1.2 Co-precipitation

In addition to adsorption, co-precipitation or the direct incorporation of trace metals such as cobalt into precipitated iron oxide-oxyhydroxides has been well studied in literature (Butt et al. 2000; Dzombak and Morel 1990; Smith 1999). For the soils analyzed by sequential extraction (Section 3.2.2), all samples had higher concentrations of cobalt in the amorphous and metal hydroxide phases than indicated by adsorption modeling. This suggests that cobalt concentrations also may be attenuated during the formation of ferrihydrite (Butt et al. 2000; Tebo et al. 2004). Cobalt was also identified by SEP to be associated with carbonate minerals, likely due to co-precipitation with the dolomite or calcite identified by mineralogical analysis. Arsenic co-precipitation with amorphous phases of iron and other metal oxyhydroxides is also considered possible. However, per the SEP results, no arsenic was found to be associated with carbonate minerals. Co-precipitation is either not likely or relevant for boron, lithium, and molybdenum.

5.1.3 Physical Attenuation

Table 9 presents the predicted concentrations at Assessment Monitoring wells, assuming the minimum and maximum amount of dilution and dispersion downgradient of the CCR Unit (Section 4.0). The highest concentrations of arsenic, boron, cobalt, lithium, and molybdenum measured in porewater were “diluted” in the geochemical simulations with the maximum concentrations observed in side-gradient wells GAMW-52, GAMW-52B, GAMW-56, and GAMW-56B to provide a conservative estimate of dilution and dispersion.

For arsenic, cobalt, and lithium, the maximum concentrations in porewater were below the GWPS. Dilution and dispersion with groundwater from side-gradient wells generally resulted in a further decrease below the GWPS. At GAMW-56, arsenic and cobalt concentrations were elevated over those in porewater. Consequently, dilution/dispersion of porewater with water from GAMW-56 resulted in higher concentrations relative to porewater, though still below GWPS.

For boron the maximum porewater concentrations were elevated above the health-based standard (345%) and for molybdenum, the maximum porewater concentrations were elevated above the GWPS (810%). The 32 to 63 percent reduction in concentrations by dilution and dispersion alone was not sufficient to bring the maximum porewater concentrations below the relevant standards. For boron, concentrations in background monitoring well GAMW-15 were twice as high as those in porewater. Due to this background source, boron concentrations in side-gradient wells are also relatively high and limit the effectiveness of dilution to reduce boron concentrations downgradient of the CCR Unit. For molybdenum, concentrations in monitoring wells have been below GWPS since March 2018, indicating additional dilution/dispersion or other attenuating processes have reduced porewater concentrations between the CCR Unit and the monitoring wells. As a consequence, molybdenum concentrations will likely remain below the GWPS.

5.2 Long-Term Stability of Attenuated Constituents

The expected variations in dissolved concentration as a function of pH, Eh, and TDS are presented in Figures 16, 17, and 18, respectively. Results are presented along with GWPS values and the range of pH, Eh, or TDS values (5th percentile to 95th percentile) observed at the Site. Responses to changes in pH, Eh, and TDS vary widely by constituent. The results of the adsorption stability modeling for arsenic, boron, cobalt, and molybdenum can be summarized as follows:

- **Arsenic:** For the range of pH values observed at the site, greater than 95% of the arsenic is expected to sorb to Hfo and Hao (Figure 16a). At pH values below 6.0, a conversion of arsenate to arsenite is modeled to release the adsorbed arsenic into groundwater. For alkaline pH values between 8.0 and 10.0, there is a small amount of additional capacity for arsenic to adsorb. At extremely alkaline conditions (pH greater than 10.0), higher proportions of negatively-charged sorption sites on Hfo and Hao limit the effectiveness of sorption of anionic species, resulting in higher amounts of desorbed arsenic. Under reducing conditions (Eh less than -100 mV), arsenic is largely present as arsenite and sorption is limited (Figure 17a). Over intermediate redox conditions (Eh between 0 and 500 mV), adsorbed arsenic is relatively stable. Above 500 mV, arsenic is expected to desorb again. Under increasing TDS concentrations (Figure 18a), arsenic sorption declines as other anions compete with and replace arsenic from sorption surfaces. For arsenic, TDS concentrations at the Site could quadruple relative to observed values before aqueous concentrations increase above the GWPS.
- **Boron:** Based on the relatively small proportion of boron that can be adsorbed to Hfo and Hao surface sites, changes in pH, Eh, and TDS concentrations are modeled to have only a minor impact on aqueous concentrations, as evidenced by the horizontal trends in Figures 16b, 17b, and 18b.
- **Cobalt:** The pH response of cobalt (Figure 16c) is broadly similar to that of arsenic, with cobalt being nearly completely in dissolved form under acidic conditions but generally sorbed under alkaline conditions. Cobalt was generally modeled to be unresponsive to changes in redox conditions (Figure 17c), with little additional cobalt sorbing or desorbing over the range of tested Eh conditions. Cobalt was also not responsive to increases in TDS concentrations (Figure 18c), with sorption remaining relatively unchanged as TDS concentrations increased 4- to 40-fold above the commonly-observed range at the Site.
- **Molybdenum:** For molybdenum, lower pH values (more acidic conditions) were generally more favorable for adsorption (Figure 16d). At alkaline pH values (pH greater than 10), nearly all molybdenum is desorbed and present in the dissolved phase. Over the range of common Eh values at site (Figure 17d), molybdenum sorption is relatively stable. Highly reducing conditions are predicted to increase molybdenum adsorption and highly oxidizing conditions are predicted to reduce adsorption. Molybdenum adsorption is generally insensitive to increases in TDS concentrations (Figure 18d), with TDS concentrations up to 10,000 mg/L less than doubling the aqueous concentrations due to desorption.

6.0 TIER I EVALUATION

The potential for natural attenuation of arsenic, boron, cobalt, lithium, and molybdenum was evaluated in accordance with recommended practices and guidance promulgated by the USEPA and the ITRC (USEPA 2007a; USEPA 2007b; ITRC 2010). According to USEPA (USEPA 2007a), the purpose of the Tier 1 evaluation is to “Demonstrate that the groundwater plume is not expanding and that sorption of the contaminant onto aquifer solids is occurring where immobilization is the predominant attenuation process.” Based on this definition, the following observations support MNA as a viable corrective measure for the CCR Unit:

- **Plume Stability:** Based on the water quality monitoring data presented in this Assessment Monitoring, groundwater concentrations of arsenic, boron, cobalt, lithium, and molybdenum outside of the CCR Unit appear to be stable or decreasing. Evaluation of trend charts generally did not reveal increasing trends in wells downgradient of the CCR Unit (Figures 4 to 8), including for parameters such as boron and sulfate, which are considered common indicators of CCR leaching (Figures 5 and 10). These observations indicate that the distribution of arsenic, boron, cobalt, lithium, and molybdenum in the aquifer is stable.
- **Magnitude of Exceedances:** Arsenic has remained below the CCR Unit GWPS (0.091 mg/L) in all downgradient monitoring wells. Boron concentrations exceed the health-based standard (4 mg/L) in nine of the downgradient (Downgradient Monitoring and Assessment Monitoring) wells, but concentrations are generally within the range of background monitoring well concentrations, suggesting naturally-elevated levels or an alternative source of boron causing the concentrations in groundwater at the Site. The cobalt concentration in groundwater at GAMW-08, the only downgradient monitoring well exceeding the GWPS, has shown a decreasing trend since 2016. The most recent concentration of cobalt (0.011 mg/L in November 2019) was just 0.001 mg/L above the GWPS of 0.010 mg/L. No wells exceed the health-based lithium standard (0.04 mg/L). Molybdenum concentrations in all wells have been consistently below the health-based standard of 0.1 mg/L since August 2017, indicating a low likelihood of a future exceedances based on historical trends.
- **CCR Unit Porewater:** The CCR Unit at RMSGS was placed into service in 1976 and historical records are not available for ash additions or porewater concentrations over the CCR Unit's lifespan. However, based on recent porewater data, the arsenic concentration in the CCR Unit (0.011 mg/L to 0.018 mg/L) is well below the GWPS of 0.091 mg/L. Cobalt and lithium concentrations in porewater in the CCR Unit were low and only detected above their laboratory reporting limit in a single sample (0.0022 mg/L and 0.016 mg/L, respectively). This indicates that the CCR Unit is not a potential source for these metals. Boron concentrations in the porewater (8.3 mg/L to 13.8 mg/L) are elevated above the health-based standard of 4 mg/L but are below levels observed in the two deep background monitoring wells GAMW-07B (15-23 mg/L) and GAMW-15B (13-18 mg/L). Molybdenum in the CCR Unit was measured at concentrations up to 0.81 mg/L, above its GWPS. Even so, molybdenum concentrations in groundwater downgradient of the CCR Unit are currently below the GWPS.
- **Groundwater Chemistry:** The groundwater monitoring results and the findings of the geochemical modeling support the potential for natural attenuation of arsenic, boron, cobalt, lithium, and molybdenum. Equilibrium of groundwater with the mineral phase ferrihydrite was modeled to occur in all groundwater samples and calcite equilibrium was indicated in all downgradient monitoring wells except GAMW-53. This is consistent with the results from the sequential extraction analysis that indicate carbonate, amorphous, and metal hydroxide fractions sequester arsenic, boron, cobalt, lithium, and molybdenum.
- **Confirmation of Attenuation/Immobilization:** Based on both mineralogical and chemical analysis, it is evident that attenuation of arsenic, cobalt, lithium, and molybdenum by aquifer materials is occurring. Iron, capable of forming (hydr)oxide phases that facilitate metals attenuation (Dzombak and Morel 1990), was identified in all overburden samples. Mineralogical analysis confirmed iron was present as an oxide phase in the form of hematite in all overburden samples. Arsenic, cobalt, lithium, and molybdenum demonstrated a high degree of immobilization due to attenuation on carbonate, amorphous, and metal hydroxide fractions. This indicates that these phases have been and are scavenging or attenuating constituents that were once present in solution. Groundwater samples from Assessment Monitoring wells GAMW-53/53B, GAMW-

54/54B, GAMW-55/55B, and GAMW-56/56B report a similar major ion signature as groundwater in monitoring wells proximal to the CCR Unit. However, no arsenic, cobalt, lithium, or molybdenum has been detected in these wells above background levels. In addition, soil borings from these wells contained significant proportions of constituents attenuated in various phases, especially in the case of lithium. As a result, the groundwater concentrations of these constituents are maintained at low levels, demonstrating attenuation.

Based on these findings, arsenic, boron, cobalt, lithium, and molybdenum were considered candidates for an MNA remedy application and were deemed to meet the criteria for Tier I MNA in accordance with USEPA guidance (USEPA 2007a,b).

7.0 TIER II EVALUATION

The purpose of the Tier II evaluation is to "Identify mechanisms and rates of the operative attenuation process." Based on this definition, the following modeling results and observations support MNA as a viable corrective measure for the CCR Unit:

- **Adsorption Capacity Modeling:** PHREEQC modeling results show that adsorption is likely attenuating arsenic, cobalt and, to a lesser degree, molybdenum downgradient of the CCR Unit. This is concluded based on equilibration of site-specific groundwater compositions with the range of Hfo and Hao concentrations observed in SEP results of Site overburden soils. Minor amounts of boron are also expected to attenuate. The sorbing capacity of Hfo and Hao surface sites is partially dependent on the concentrations of the constituents of interest in groundwater. The titration modeling (Figure 15) shows how the soil's capacity to adsorb constituents increases if groundwater concentrations of arsenic, boron, cobalt, and molybdenum were to increase above current levels. In addition to metal oxyhydroxides, clay minerals and/or particular organics can also act as a substrate for attenuation (Goldberg et al. 1993; Goldberg and Forster 1996), but this mechanism was not included in the current evaluation.

  The findings from the modeling are supported by the results of the sequential extraction testing. The presence of arsenic, cobalt, lithium, and molybdenum in the amorphous and metal oxyhydroxide fractions of soils indicates that adsorption is occurring spatially across the monitored area downgradient of the CCR Unit.

- **Co-precipitation:** In addition to adsorption, co-precipitation or the direct incorporation of trace metals such as cobalt into precipitated iron oxide-oxyhydroxides has been well studied in literature (Butt et al. 2000; Dzombak and Morel 1990; Smith 1999). For the soils analyzed by sequential extraction (Section 3.2.2), all samples had higher concentrations of cobalt in the amorphous and metal hydroxide phases than indicated by adsorption modeling. This suggests that cobalt concentrations also may be attenuated during the formation of ferrihydrite (Butt et al. 2000; Tebo et al. 2004). Cobalt was also identified by SEP to be associated with carbonate minerals, likely the result of co-precipitation with dolomite or calcite, which were identified by mineralogical analysis. Arsenic co-precipitation with amorphous phases of iron and other metal oxyhydroxides is also possible. However, there was no arsenic associated with carbonate minerals as identified by SEP. Co-precipitation is either not likely or relevant for boron, lithium, and molybdenum.

- **Estimated Site Attenuation Rates:** Concentrations of boron, cobalt, lithium, and molybdenum are decreasing in downgradient monitoring wells, resulting in negative calculated point decay rates. A positive point decay rate for arsenic suggests that its concentrations are increasing, but low concentrations in porewater indicate that the trend does not imply an impact from the CCR Unit. Increasing arsenic concentrations in Assessment Monitoring wells GAMW-52B, GAMW-53B, GAMW-54, and GAMW-54B are

driving the positive point decay rate, but the arsenic concentrations in these wells are low (less than 0.005 mg/L) and are likely driven by natural variability. Using the mean decay rate, maximum concentrations of boron, cobalt and molybdenum observed in downgradient and Assessment monitoring wells would take approximate 41 years, 39 years, and 20 years, respectively, to attenuate to below GWPS. Arsenic and lithium concentrations in downgradient and Assessment Monitoring wells are already below the GWPS.

- **Advanced Groundwater Modeling:** Groundwater flow results indicate between 32% and 63% dilution and dispersion of groundwater at monitoring wells with upgradient and side-gradient water as it flows towards the Assessment Monitoring wells. This dilution and dispersion attenuate concentrations along the flow paths. Arsenic, cobalt, and lithium concentrations in porewater are already below GWPS in the available monitoring data (August 2018 to March 2020). Dilution and dispersion with groundwater from side-gradient Assessment Monitoring wells (GAMW-52/52B and GAMW-56/56B) would further reduce these concentrations relative to the GWPS. Boron and molybdenum concentrations are elevated above the health-based standards in porewater (and in background wells for boron). As such, while dilution and dispersion reduce concentrations by about 30% to 60%, this is insufficient to dilute porewater to such a degree that the resulting boron and molybdenum concentration decline to below the health-based standards. The concentrations of molybdenum measured in downgradient groundwater at Assessment Monitoring wells have remained below the GWPS, so additional physical and/or chemical attenuation is likely occurring between the CCR Unit and the Assessment Monitoring wells. Modeled groundwater velocities indicate that travel times between downgradient and Assessment Monitoring wells are between 4.5 and 31 years. The modeling results also indicate that groundwater would take between 27 and 130 years to travel from the downgradient monitoring wells to the property boundary (GAMW-46/46B).

Based on these findings, arsenic, boron, cobalt, lithium, and molybdenum were considered to be candidates for an MNA remedy application and deemed to meet the criteria for Tier II MNA in accordance with USEPA guidance (USEPA 2007a and 2007b).

8.0 TIER III EVALUATION

According to USEPA (USEPA 2007a), the purpose of the Tier III evaluation is to eliminate sites for an MNA remedy where (1) “Capacity of the aquifer is insufficient to attenuate the COC mass to regulatory standards” and/or (2) “Stability of the immobilized COC is insufficient to prevent remobilization due to future changes in groundwater chemistry”. Based on this definition, the following observations support MNA as a viable corrective measure for the CCR Unit:

- **Adsorption Capacity Modeling:** For arsenic, titration modeling shows that groundwater concentrations could increase up to approximately 2.5 mg/L before exceeding the capacity of soils (95th percentile of scenarios) to attenuate arsenic below the GWPS (0.091 mg/L). Groundwater arsenic concentrations up to 10 mg/L are predicted to attenuate below the GWPS for the average soil capacity scenario. Similarly, cobalt concentrations in groundwater could increase up to approximately 0.02 mg/L before exceeding the capacity of soils (95th percentile of scenarios) to attenuate cobalt below the GWPS (0.01 mg/L). Under the average soil capacity scenario, the aquifer has the capacity to reduce cobalt concentrations as high as 0.1 mg/L to below the GWPS.

  For boron and molybdenum, modeling suggests that adsorption can reduce a portion of the dissolved load, but that there is not sufficient adsorption capacity alone to reduce the concentrations observed in porewater below the health-based standard. However, current molybdenum concentrations observed in downgradient

and Assessment Monitoring wells indicate that the combined long-term attenuation from sorption, dilution, and dispersion is sufficient to reduce concentrations below health-based standards. In addition to iron oxyhydroxides, molybdenum and boron (as well as arsenic and cobalt) are known to adsorb to other metal (hydr)oxides (e.g., manganese, aluminum), clay minerals and particulate organic matter, providing additional sorption capacity in the soils.

- **Stability Modeling for Adsorbed Constituents:** Stability modeling indicates that for the conditions (i.e. pH, Eh, and TDS ranges) determined in groundwater at the Site, adsorbed species of arsenic, boron, cobalt, and molybdenum are relatively stable and remain attenuated. The modeling results further suggest that the adsorption of arsenic, cobalt, and molybdenum could be reversed with sufficiently large fluctuations in pH and Eh conditions at the Site, but there is no historical basis to expect such occurrences. Based on the mineralogical test results for Site soils, carbonate minerals are widely distributed downgradient of the CCR Unit. Groundwater that is in contact with carbonate minerals is typically buffered against large fluctuations in pH. Total alkalinity concentrations in groundwater at the Site (generally between 50 and 410 mg $CaCO_3$/L) support the notion that the groundwater has significant buffering capacity.

  Modeling results also indicate that increasing TDS concentrations could result in an increase in aqueous concentrations of arsenic, cobalt, and molybdenum due to competition for sorption sites. However, the impact is predicted to be relatively minor over the range of TDS concentrations observed at the site. The maximum TDS concentration measured in porewater was 3,830 mg/L and even at those levels, there is sufficient attenuation capacity from the soils to maintain arsenic, boron, cobalt, and molybdenum concentrations below GWPS

9.0 CONCLUSIONS

Golder performed a supplemental Assessment Monitoring followed by an attenuation evaluation, which serve as the Tier I, II, and III evaluation of MNA feasibility at RMSGS for arsenic, boron, cobalt, lithium, and molybdenum with respect to the CCR Unit. This evaluation has been completed in accordance with guidance and best practices promulgated by the USEPA (USEPA 2007a and 2007b) and the ITRC (ITRC 2010). Based on the results of this evaluation, Golder makes the following assessment for the individual parameters:

- Arsenic: Physical and chemical attenuation is occurring and co-precipitation is possible, levels are stable, and the aquifer has the capacity to attenuate arsenic. Arsenic is a candidate for MNA at the RMSGS Site.
- Boron: Physical attenuation of boron is occurring at the RMSGS based on substantial decreases of boron in assessment wells. However, the high levels of boron upgradient of the CCR impoundments make it difficult to determine if the evaluation of if MNA will be successful. An alternative or natural source of boron should be further investigated prior to making a MNA determination for boron based on current findings.
- Cobalt: Chemical and physical attenuation is occurring and co-precipitation is possible, levels are stable, and the aquifer has the capacity to attenuate arsenic. Cobalt is a candidate for MNA at the RMSGS Site.
- Lithium: Physical attenuation is occurring, levels are stable, and the aquifer has the capacity to attenuate arsenic. Lithium is a candidate for MNA at the RMSGS Site.
- Molybdenum: Physical and some chemical attenuation is occurring, levels are stable, and the aquifer has the capacity to attenuate arsenic. Molybdenum is a candidate for MNA at the RMSGS Site.

Therefore, it is recommended that a Tier IV evaluation be completed to design a long-term monitoring plan and contingent remedy for arsenic, boron, cobalt, lithium, and molybdenum.

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https://golderassociates.sharepoint.com/sites/nipscoccrgwmonitoring/shared documents/rmsgs/reports/mna report/2020_11_mna_rmsgs.docx

Tables

Table 4: Summary of Travel Time Simulations and Attenuation Estimates
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

	Shallow Flow Paths				Deep Flow Paths			
Starting Well	**GAMW-16**	**GAMW-18**	**GAMW-17B**	**GAMW-09B**	**GAMW-16B**	**GAMW-18B**	**GAMW-17B**	**GAMW-09B**
Ending Well	**GAMW-53**	**GAMW-55**	**GAMW-54B**	**GAMW-54B**	**GAMW-53B**	**GAMW-55B**	**GAMW-54B**	**GAMW-54B**
Distance (ft)	**1521**	**1964**	**1200**	**1714**	**1521**	**1964**	**1200**	**1714**
Effective Porosity = 16%								
Travel Time (years)	4.8	11.0	4.5	8.9	5.0	11.0	5.5	9.0
Velocity (ft/year)	317	179	267	193	304	179	218	190
Time to Davis Ditch (years)	5.5	-	-	-	6	-	-	-
Time to property boundry near GAMW46B (years)	-	27	49	41	-	28.5	45	41
Effective Porosity = 30%								
Travel Time (years)	8.5	19.8	8.0	16.0	8.9	20.0	10.0	16.5
Velocity (ft/year)	179	99	150	107	171	98	120	104
Time to Davis Ditch (years)	10	-	-	-	9.9	-	-	-
Time to property boundry near GAMW46B (years)	-	49.8	79	75	-	51.5	80	76
Effective Porosity = 46%								
Travel Time (years)	13.0	31.0	12.0	25.0	13.5	29.0	15.0	25.0
Velocity (ft/year)	117	63	100	69	113	68	80	69
Time to Davis Ditch (years)	15	-	-	-	15	-	-	-
Time to property boundry near GAMW46B (years)	-	76.8	122	117	-	77	130	120
Estimate of Dilution/Attenuation Along Flow Path								
Starting concentration (mg/L)	9.7	13	12	12	9.7	13	12	12
End concentration (mg/L)	3.1	8.2	6.4	6.4	3.1	8.2	6.4	6.4
End Concentration as % of starting concentration	32%	63%	53%	53%	32%	63%	53%	53%
Dilution/Attenuation along flow path	68%	37%	47%	47%	68%	37%	47%	47%

Notes:
ft = feet
mg/L = milligrams per liter

Prepared by: GOL
Checked by: PJN
Reviewed by: RWB

Table 5: Groundwater Geochemical Modeling Results
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Parameter	Units	GAPIEZ06 08-2018	GAPIEZ06 09-2018	GAPIEZ06 10-2018	DAPZ-02A 03-2020	DAPZ-02B 03-2020	GAMW04 10-2018	GAMW04 04-2019	GAMW04 11-2019	GAMW07 10-2018	GAMW07 05-2019	GAMW07 11-2019	GAMW07B 09-2018	GAMW07B 10-2018	GAMW07B 05-2019	GAMW07B 11-2019
Charge Balance	% error	-3.9	-1.3	-5.5	-7.8	-4.3	5.1	-1.3	-9.0	-3.7	-3.7	**-10.8**	**82.8**	-6.8	-7.0	**-10.1**
MINERAL PHASES - Saturation Indices [a]																
Otavite	$CdCO_3$	-2.3	-2.3	-1.1	-3.2	-2.6	-2.9	-3.1	-2.4	-3.8	-2.3	-2.1	-1.5	-3.2	-2.4	-2.8
Ferrihydrite	$Fe(OH)_3$	**2.1**	**2.1**	**3.1**	**0.5**	**2.2**	**2.9**	**1.4**	**0.5**	-6.6	**1.9**	**0.4**	**3.6**	-1.6	**4.2**	**-0.2**
Siderite	$FeCO_3$	**-0.1**	**-0.1**	-0.8	**-0.4**	-0.7	-2.1	**0.5**	-1.7	-3.3	-3.6	-1.4	**1.1**	-0.5	-0.7	**-0.3**
Melanterite	$FeSO_4$ $7H_2O$	-4.9	-5.0	-7.2	-4.5	-5.1	-6.1	-4.0	-6.5	-6.7	-8.3	-6.5	-6.8	-4.4	-5.3	-4.5
Anglesite	$PbSO_4$	-4.5	-4.5	-6.1	-4.2	-4.4	-4.0	-4.2	-4.5	-4.2	-4.5	-4.7	-7.4	-4.0	-4.3	-4.1
Gypsum	$CaSO_4$:$2H_2O$	-0.6	-0.6	-0.6	-0.7	-1.0	**0.0**	**-0.4**	-0.7	-0.6	-0.7	-0.7	-2.5	**-0.2**	**-0.2**	**-0.2**
Jarosite-H	$(H_3O)Fe_3(SO_4)_2(OH)_6$	-7.1	-6.9	-11.4	-7.6	-5.6	-3.6	-8.9	-10.7	-26.4	-6.7	-12.2	-10.2	-15.0	-0.7	-12.1
Jarosite-K	$KFe_3(SO_4)_2(OH)_6$	**-0.4**	**-0.3**	-3.0	-2.1	**1.3**	**4.5**	-1.3	-4.3	-21.4	**0.2**	-5.3	-2.2	-8.4	**6.8**	-5.1
Jarosite-Na	$NaFe_3(SO_4)_2(OH)_6$	-2.5	-2.4	-4.9	-5.0	-1.8	**1.6**	-3.0	-6.7	-24.5	-3.0	-8.6	-4.3	-10.6	**4.5**	-7.6
Calcite	$CaCO_3$	**0.3**	**0.2**	**1.8**	-0.6	**-0.4**	**0.0**	**0.1**	**0.1**	-1.2	**0.2**	**0.4**	**1.3**	**-0.3**	**0.4**	**0.0**
Magnesite	$MgCO_3$	-0.9	-1.0	**0.5**	-2.1	-1.7	-1.5	-1.4	-1.3	-2.6	-1.1	-0.9	**0.0**	-1.5	-0.8	-1.3
Barite	$BaSO_4$	**0.7**	**0.6**	**0.7**	**1.0**	**0.9**	**0.9**	**1.1**	**0.9**	**0.9**	**0.9**	**0.7**	-1.2	**1.2**	**1.1**	**1.0**
Witherite	$BaCO_3$	-3.8	-3.9	-2.3	-4.4	-3.9	-4.4	-3.7	-3.6	-5.1	-3.7	-3.5	-2.7	-4.3	-3.6	-4.1
Fluorite	CaF_2	-1.0	-0.8	-1.0	-2.0	-2.4	-2.3	-1.5	-2.1	-1.1	-0.8	-1.0	**0.8**	**-0.4**	-0.6	-0.6
CoCO3	$CoCO_3$	-4.2	-4.4	-2.9	-4.3	-4.2	-4.1	-4.2	-4.3	-4.3	-3.1	-3.0	-3.2	-5.0	-4.2	-4.6
Cerrusite	$PbCO_3$	-2.0	-2.1	-2.1	-2.6	-2.0	-2.2	-2.0	-2.1	-3.2	-2.0	-2.0	-1.9	-2.5	-2.0	-2.2
Carbon Dioxide	$pCO_2(g)$ [b]	-2.3	-2.2	-4.5	-1.0	-1.8	-2.4	-2.4	-1.7	**-0.3**	-1.8	-2.1	-3.2	-1.6	-2.4	-2.0

Notes:
Charge balances errrors highlighted in **red** are greater than +/-10%
Non-detect values assumed equal to 1/2 analytical detection limit
Redox converted from field ORP to Eh by +200 mV
[a] Saturation indices greater than -0.5 are identified by bold type and grey shading
[b] pCO2(g) values presented at 10^^value atm

Table 5: Groundwater Geochemical Modeling Re
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Parameter	Units	GAMW08 10-2018	GAMW08 05-2019	GAMW08 11-2019	GAMW08B 09-2018	GAMW08B 10-2018	GAMW08B 05-2019	GAMW08B 11-2019	GAMW09 10-2018	GAMW09 05-2019	GAMW09 11-2019	GAMW09B 09-2018	GAMW09B 10-2018	GAMW09B 05-2019	GAMW09B 11-2019
Charge Balance	% error	-2.9	-3.7	-6.6	-9.7	**-12.2**	-8.3	**-11.7**	-5.0	-5.0	-6.0	-5.7	-6.7	-3.0	-6.5
MINERAL PHASES - Saturation Indices [(a)]															
Otavite	$CdCO_3$	-2.5	-2.1	-2.0	-2.3	-2.5	-2.5	-2.2	-3.0	-2.8	-2.8	-2.4	-2.3	-2.2	-2.2
Ferrihydrite	$Fe(OH)_3$	**1.7**	**2.3**	**2.4**	**1.8**	**3.1**	**4.1**	**3.6**	**0.2**	**1.3**	**0.7**	**2.0**	**2.5**	**3.7**	**2.2**
Siderite	$FeCO_3$	-1.8	-2.2	-2.1	**0.2**	**0.1**	**-0.4**	**0.1**	-2.3	-3.1	-2.5	**-0.2**	**-0.1**	**-0.2**	**0.1**
Melanterite	$FeSO_4\ 7H_2O$	-6.7	-7.3	-7.2	-4.5	-4.4	-4.9	-4.6	-6.7	-7.3	-7.0	-5.1	-5.1	-5.2	-5.0
Anglesite	$PbSO_4$	-4.6	-4.8	-4.8	-4.4	-4.2	-4.2	-4.4	-4.3	-4.2	-4.3	-4.5	-4.6	-4.7	-4.7
Gypsum	$CaSO_4{:}2H_2O$	-0.7	-0.6	-0.5	**-0.2**	**-0.2**	**-0.2**	**-0.2**	-0.7	-0.6	-0.8	-0.8	-0.7	-0.8	-0.9
Jarosite-H	$(H_3O)Fe_3(SO_4)_2(OH)_6$	-6.6	-6.5	-6.5	-8.4	-3.5	-0.9	-3.6	-10.6	-8.2	-10.1	-6.8	-6.1	-2.6	-7.3
Jarosite-K	$KFe_3(SO_4)_2(OH)_6$	**0.0**	**0.9**	**1.0**	-1.3	**3.4**	**6.2**	**4.0**	-4.3	-1.3	-3.7	**-0.3**	**0.5**	**4.2**	-0.7
Jarosite-Na	$NaFe_3(SO_4)_2(OH)_6$	-2.9	-2.1	-1.9	-3.1	**1.4**	**4.3**	**2.0**	-7.1	-4.2	-6.5	-2.2	-1.5	**2.1**	-2.9
Calcite	$CaCO_3$	**0.2**	**0.5**	**0.7**	**0.6**	**0.3**	**0.3**	**0.6**	**-0.3**	**-0.3**	**-0.4**	**0.0**	**0.3**	**0.2**	**0.2**
Magnesite	$MgCO_3$	-1.2	-0.7	-0.6	-0.9	-1.1	-1.2	-0.8	-2.0	-1.8	-2.0	-1.0	-0.8	-0.8	-0.8
Barite	$BaSO_4$	**0.7**	**0.9**	**1.0**	**1.0**	**0.9**	**0.8**	**0.8**	**0.6**	**0.8**	**0.6**	**0.8**	**0.8**	**0.7**	**0.5**
Witherite	$BaCO_3$	-3.7	-3.3	-3.2	-3.6	-4.0	-4.0	-3.7	-4.3	-4.2	-4.3	-3.7	-3.6	-3.6	-3.7
Fluorite	CaF_2	**-0.4**	**-0.1**	**-0.2**	**-0.4**	**-0.5**	**-0.2**	**-0.3**	-1.9	-1.9	-1.9	-0.5	-0.6	-0.6	-0.6
CoCO3	$CoCO_3$	-2.9	-2.8	-2.5	-4.0	-4.4	-4.3	-4.0	-4.8	-4.7	-4.8	-4.1	-4.3	-4.4	-4.0
Cerrusite	$PbCO_3$	-2.2	-1.9	-1.9	-2.0	-2.1	-2.1	-1.9	-2.4	-2.2	-2.3	-2.1	-2.0	-2.0	-2.0
Carbon Dioxide	$pCO_2(g)$ [(b)]	-1.5	-1.8	-2.0	-2.6	-2.3	-2.5	-2.7	-1.7	-2.1	-2.0	-2.1	-2.2	-2.2	-2.4

Notes:

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[(a)] Saturation indices greater than -0.5 are identified by bold type and grey shading

[(b)] pCO2(g) values presented at $10^{\wedge value}$ atm

Table 5: Groundwater Geochemical Modeling Re
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Parameter	Units	GAMW15 10-2018	GAMW15 05-2019	GAMW15 11-2019	GAMW15B 09-2018	GAMW15B 10-2018	GAMW15B 05-2019	GAMW15B 11-2019	GAMW16 10-2018	GAMW16 05-2019	GAMW16 11-2019	GAMW16B 09-2018	GAMW16B 10-2018	GAMW16B 05-2019	GAMW16B 11-2019
Charge Balance	% error	0.4	-4.5	-7.1	-5.7	-3.8	-5.0	-5.3	-0.7	-7.5	8.2	-3.0	-2.7	-4.4	-8.7
MINERAL PHASES - Saturation Indices [a]															
Otavite	$CdCO_3$	-4.3	-2.6	-2.3	-2.0	-3.0	-2.5	-2.3	-2.3	-2.2	-4.1	-1.8	-2.7	-2.4	-2.1
Ferrihydrite	$Fe(OH)_3$	-6.2	**2.7**	**2.5**	**3.3**	-2.6	**3.8**	**1.1**	**0.0**	**3.3**	**4.1**	**4.1**	**0.5**	**4.2**	**3.8**
Siderite	$FeCO_3$	-1.6	**0.1**	**0.2**	**0.0**	-0.9	-0.8	**0.0**	**-0.3**	-0.7	-3.0	**0.6**	**-0.1**	**-0.1**	**0.5**
Melanterite	$FeSO_4\ 7H_2O$	-4.7	-4.4	-4.9	-5.1	-5.0	-5.2	-4.8	-5.3	-5.6	-6.2	-4.8	-4.6	-4.8	-4.5
Anglesite	$PbSO_4$	-4.3	-4.4	-4.7	-4.7	-4.1	-4.2	-4.5	-4.6	-4.5	-4.1	-4.9	-4.3	-4.4	-4.6
Gypsum	$CaSO_4{:}2H_2O$	-1.1	-0.9	-1.1	-0.6	-0.6	**-0.3**	**-0.4**	-0.9	-0.6	-0.6	**-0.4**	**-0.4**	**-0.3**	**-0.3**
Jarosite-H	$(H_3O)Fe_3(SO_4)_2(OH)_6$	-23.5	-4.2	-5.9	-4.8	-18.1	-1.4	-10.2	-13.0	-3.6	-2.5	-2.9	-9.9	-0.7	-3.0
Jarosite-K	$KFe_3(SO_4)_2(OH)_6$	-19.4	**2.5**	**0.5**	**2.3**	-12.0	**5.9**	-3.2	-6.6	**3.4**	**4.5**	**4.3**	-3.7	**6.4**	**4.3**
Jarosite-Na	$NaFe_3(SO_4)_2(OH)_6$	-21.9	**-0.1**	-2.0	**0.3**	-13.9	**3.9**	-5.3	-9.1	**0.8**	**1.9**	**2.1**	-5.9	**4.1**	**2.6**
Calcite	$CaCO_3$	-2.1	**-0.3**	**-0.1**	**0.6**	**-0.4**	**0.2**	**0.4**	**0.1**	**0.3**	-1.5	**0.9**	**0.1**	**0.4**	**0.7**
Magnesite	$MgCO_3$	-3.4	-1.4	-1.3	-0.8	-1.8	-0.9	-1.0	-1.4	-1.1	-3.0	**-0.5**	-1.4	-0.9	-0.7
Barite	$BaSO_4$	**0.5**	**0.8**	**0.5**	**1.1**	**1.0**	**1.4**	**1.0**	**0.5**	**0.7**	**0.6**	**1.0**	**1.0**	**1.2**	**1.1**
Witherite	$BaCO_3$	-5.8	-4.0	-3.8	-3.1	-4.2	-3.5	-3.5	-3.9	-3.7	-5.6	-3.0	-3.9	-3.4	-3.2
Fluorite	CaF_2	-1.3	-1.5	-1.3	-1.4	-1.3	-1.0	-0.9	-0.8	-0.8	-0.8	-1.0	-1.1	-1.0	-0.9
CoCO3	$CoCO_3$	-5.5	-3.6	-3.6	-4.0	-4.8	-4.3	-4.1	-4.1	-4.0	-5.8	-3.6	-4.5	-4.2	-3.9
Cerrusite	$PbCO_3$	-3.7	-2.1	-2.1	-1.9	-2.4	-2.0	-2.0	-2.1	-2.0	-3.4	-1.9	-2.3	-2.0	-2.0
Carbon Dioxide	$pCO_2(g)$ [b]	**0.1**	-1.9	-2.1	-2.6	-1.5	-2.2	-2.4	-2.0	-2.2	-4.8	-2.7	-1.7	-2.3	-2.6

Notes:

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at $10^{\wedge value}$ atm

Table 5: Groundwater Geochemical Modeling Re
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Parameter	Units	GAMW17 10-2018	GAMW17 05-2019	GAMW17 11-2019	GAMW17B 09-2018	GAMW17B 10-2018	GAMW17B 05-2019	GAMW17B 11-2019	GAMW18 10-2018	GAMW18 04-2019	GAMW18 11-2019	GAMW18B 09-2018	GAMW18B 10-2018	GAMW18B 04-2019	GAMW18B 11-2019
Charge Balance	% error	0.8	-0.5	-6.6	-3.6	1.1	0.6	-4.3	**-10.9**	-6.4	-9.2	-3.2	**-10.4**	**-48.7**	**-10.9**
MINERAL PHASES - Saturation Indices [a]															
Otavite	$CdCO_3$	-2.8	-2.2	-1.9	-2.0	-2.2	-2.3	-2.0	-3.0	-3.0	-2.5	-2.0	-2.9	-4.7	-2.1
Ferrihydrite	$Fe(OH)_3$	-2.9	**2.5**	**2.9**	**3.3**	**0.1**	**3.6**	**4.3**	-0.7	**1.7**	**0.9**	**2.8**	**0.6**	**2.1**	**2.2**
Siderite	$FeCO_3$	-2.1	-2.6	-2.6	**0.4**	**0.3**	**0.1**	**-0.1**	-2.5	-2.9	-1.8	**0.6**	-0.5	-5.1	**0.1**
Melanterite	$FeSO_4\ 7H_2O$	-6.8	-7.7	-8.1	-5.0	-4.9	-5.0	-5.5	-6.7	-6.8	-6.4	-4.5	-4.7	-7.3	-4.9
Anglesite	$PbSO_4$	-4.5	-4.8	-5.0	-4.9	-4.8	-4.8	-4.9	-4.3	-4.1	-4.3	-4.6	-4.1	-3.7	-4.6
Gypsum	$CaSO_4{:}2H_2O$	-0.8	-1.0	-1.1	-0.9	-0.9	-1.0	-0.9	-0.6	**-0.4**	**-0.3**	**-0.4**	**-0.5**	**-0.4**	-0.6
Jarosite-H	$(H_3O)Fe_3(SO_4)_2(OH)_6$	-19.9	-6.7	-6.3	-4.5	-13.3	-2.1	-1.6	-12.0	-5.3	-9.3	-5.6	-8.8	-5.3	-7.6
Jarosite-K	$KFe_3(SO_4)_2(OH)_6$	-14.0	**0.2**	**0.6**	**2.5**	-6.5	**4.7**	**5.5**	-6.4	**0.8**	-2.8	**1.6**	-2.6	**1.1**	-0.5
Jarosite-Na	$NaFe_3(SO_4)_2(OH)_6$	-16.7	-2.4	-2.1	**0.2**	-8.8	**1.8**	**2.9**	-9.0	-1.7	-5.3	**-0.3**	-4.4	-2.5	-2.4
Calcite	$CaCO_3$	**-0.2**	**0.1**	**0.4**	**0.5**	**0.3**	**0.2**	**0.4**	**-0.4**	**-0.4**	**0.3**	**0.6**	**-0.3**	-2.1	**0.4**
Magnesite	$MgCO_3$	-1.4	-0.8	-0.7	-0.9	-1.0	-0.9	-0.7	-2.2	-2.1	-1.5	-0.6	-1.5	-4.6	-0.7
Barite	$BaSO_4$	**0.8**	**0.6**	**0.6**	**0.7**	**0.8**	**0.9**	**0.8**	**0.7**	**0.9**	**1.0**	**1.0**	**0.9**	**1.0**	**0.6**
Witherite	$BaCO_3$	-4.0	-3.6	-3.3	-3.2	-3.4	-3.3	-3.2	-4.5	-4.5	-3.8	-3.3	-4.3	-6.0	-3.7
Fluorite	CaF_2	**-0.5**	-0.6	-0.6	-1.1	-1.3	-1.3	-1.3	-3.3	-2.9	-2.3	-1.2	-1.3	-0.9	-1.0
CoCO3	$CoCO_3$	-4.6	-4.0	-3.8	-4.0	-4.0	-4.2	-3.8	-4.8	-5.2	-4.3	-4.1	-5.0	-6.8	-4.3
Cerrusite	$PbCO_3$	-2.4	-2.0	-2.0	-2.0	-2.0	-2.1	-2.0	-2.5	-2.4	-2.1	-2.0	-2.3	-3.8	-2.0
Carbon Dioxide	$pCO_2(g)$ [b]	-1.6	-2.4	-2.6	-2.3	-2.1	-1.7	-2.4	-1.2	-1.5	-1.8	-2.4	-1.5	-3.9	-2.4

Notes:

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at $10^{\wedge value}$ atm

Table 5: Groundwater Geochemical Modeling Re
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Parameter	Units	GAMW52 09-2018	GAMW52 10-2018	GAMW52 05-2019	GAMW52 11-2019	GAMW52B 09-2018	GAMW52B 10-2018	GAMW52B 05-2019	GAMW52B 11-2019	GAMW53 09-2018	GAMW53 10-2018	GAMW53 04-2019	GAMW53 11-2019	GAMW53B 09-2018	GAMW53B 10-2018
Charge Balance	% error	-2.9	3.4	4.0	-1.3	-7.2	1.1	-1.7	-6.4	3.9	2.9	-1.5	1.3	-0.7	-1.6
MINERAL PHASES - Saturation Indices [a]															
Otavite	$CdCO_3$	-1.9	-2.7	-2.3	-1.9	-1.6	-2.9	-2.3	-2.4	-3.5	-3.0	-4.0	-3.5	-2.2	-2.2
Ferrihydrite	$Fe(OH)_3$	**2.9**	**2.2**	**2.3**	**2.3**	**3.4**	**1.5**	**3.8**	**2.0**	**-0.1**	-1.9	-0.8	-1.1	**1.1**	**1.3**
Siderite	$FeCO_3$	-1.0	-2.7	-3.1	-1.3	**1.2**	**-0.1**	**-0.4**	**-0.1**	-1.4	-1.1	-2.9	-2.3	**0.1**	**0.1**
Melanterite	$FeSO_4\ 7H_2O$	-6.9	-8.4	-8.9	-7.3	-5.2	-5.3	-5.7	-5.3	-5.9	-6.0	-6.7	-6.7	-5.1	-5.1
Anglesite	$PbSO_4$	-5.4	-5.3	-5.5	-5.5	-5.9	-4.9	-5.0	-4.8	-4.4	-4.6	-4.5	-4.7	-4.8	-4.7
Gypsum	$CaSO_4{:}2H_2O$	-1.6	-2.0	-2.3	-1.7	-1.2	-1.2	-1.3	-1.1	-2.0	-1.9	-2.4	-2.3	-0.8	-0.7
Jarosite-H	$(H_3O)Fe_3(SO_4)_2(OH)_6$	-6.2	-7.4	-7.9	-8.7	-7.5	-8.4	-2.7	-7.4	-9.6	-16.9	-11.6	-13.6	-9.8	-9.2
Jarosite-K	$KFe_3(SO_4)_2(OH)_6$	**0.3**	-1.3	-1.7	-2.0	**0.1**	-1.9	**4.2**	-0.7	-5.0	-11.7	-6.6	-8.6	-3.6	-2.8
Jarosite-Na	$NaFe_3(SO_4)_2(OH)_6$	-2.4	-4.1	-4.5	-4.7	-1.8	-3.8	**2.2**	-2.6	-7.9	-14.6	-9.6	-11.7	-5.6	-4.8
Calcite	$CaCO_3$	**0.2**	**-0.4**	**-0.4**	**0.2**	**1.1**	**0.0**	**0.1**	**0.1**	-1.7	-1.1	-2.6	-2.0	**0.3**	**0.3**
Magnesite	$MgCO_3$	-1.1	-1.6	-1.5	-1.0	**-0.2**	-1.3	-1.1	-1.2	-2.9	-2.4	-3.5	-3.0	-1.3	-1.3
Barite	$BaSO_4$	**0.0**	-0.6	-0.8	**-0.3**	**1.1**	**1.1**	**1.1**	**1.3**	**-0.3**	**-0.3**	**-0.3**	**-0.3**	**0.6**	**0.7**
Witherite	$BaCO_3$	-3.5	-4.3	-4.3	-3.7	-1.9	-3.1	-2.8	-2.9	-5.3	-4.8	-5.9	-5.3	-3.5	-3.5
Fluorite	CaF_2	-2.0	-2.2	-2.4	-2.1	**0.4**	-2.4	-2.4	-2.3	-2.8	-2.7	-4.8	-4.7	-1.5	-1.6
CoCO3	$CoCO_3$	-3.7	-4.4	-4.2	-3.8	-3.2	-4.5	-4.0	-4.1	-5.1	-4.6	-5.9	-5.4	-4.0	-4.0
Cerrusite	$PbCO_3$	-2.0	-2.1	-2.0	-2.0	-2.0	-2.2	-2.0	-2.1	-2.6	-2.3	-3.1	-2.8	-2.1	-2.1
Carbon Dioxide	$pCO_2(g)$ [b]	-2.1	-1.8	-1.9	-2.3	-3.0	-1.8	-2.1	-2.1	-0.9	-1.3	-1.2	-1.3	-1.9	-2.0

Notes:

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at $10^{\wedge value}$ atm

Table 5: Groundwater Geochemical Modeling Re
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Parameter	Units	GAMW53B 04-2019	GAMW53B 11-2019	GAMW54 09-2018	GAMW54 10-2018	GAMW54 04-2019	GAMW54 11-2019	GAMW54B 09-2018	GAMW54B 10-2018	GAMW54B 05-2019	GAMW54B 11-2019	GAMW55 09-2018	GAMW55 10-2018	GAMW55B 09-2018	GAMW55B 10-2018
Charge Balance	% error	-2.8	-2.7	-1.7	2.0	-3.0	-3.0	-1.5	1.8	-6.0	-3.8	-1.3	0.7	-6.0	-2.6
MINERAL PHASES - Saturation Indices [a]															
Otavite	$CdCO_3$	-2.1	-2.1	-3.3	-1.7	-2.8	-2.3	-2.7	-1.2	-2.4	-2.4	-2.8	-2.5	-2.6	-2.5
Ferrihydrite	$Fe(OH)_3$	**4.1**	**3.3**	**1.5**	**-0.3**	**1.4**	**1.0**	**1.0**	**2.9**	**3.4**	**2.8**	**2.1**	**0.9**	**1.2**	**1.7**
Siderite	$FeCO_3$	**-0.4**	**0.1**	-2.5	-0.6	-2.1	-1.1	**-0.1**	**1.5**	**0.1**	**0.1**	-1.2	-1.4	**-0.1**	**0.0**
Melanterite	$FeSO_4\ 7H_2O$	-5.8	-5.3	-6.7	-6.6	-6.6	-6.5	-4.7	-4.7	-4.8	-4.7	-5.8	-6.1	-4.7	-4.7
Anglesite	$PbSO_4$	-4.9	-4.9	-4.5	-5.4	-4.5	-5.1	-4.3	-5.8	-4.5	-4.5	-4.4	-4.5	-4.4	-4.4
Gypsum	$CaSO_4{:}2H_2O$	-0.9	-1.0	-1.3	-1.4	-1.2	-1.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.5	-0.5	**-0.5**
Jarosite-H	$(H_3O)Fe_3(SO_4)_2(OH)_6$	-1.4	-4.2	-4.8	-17.1	-7.5	-10.3	-8.3	-9.7	-2.4	-3.8	-4.3	-9.0	-7.9	-6.8
Jarosite-K	$KFe_3(SO_4)_2(OH)_6$	**5.2**	**2.4**	**0.0**	-10.5	-1.7	-4.4	-2.1	-1.6	**4.2**	**2.7**	**1.7**	-2.6	-1.7	**-0.4**
Jarosite-Na	$NaFe_3(SO_4)_2(OH)_6$	**3.0**	**0.2**	-2.4	-12.9	-4.1	-7.0	-4.0	-3.6	**2.2**	**0.7**	-0.9	-5.2	-3.6	-2.3
Calcite	$CaCO_3$	**0.4**	**0.3**	-1.1	**0.5**	-0.7	**-0.2**	**-0.1**	**1.6**	**0.2**	**0.2**	**-0.1**	**0.1**	**0.1**	**0.2**
Magnesite	$MgCO_3$	-1.1	-1.2	-2.5	-0.8	-1.8	-1.5	-1.5	**0.2**	-1.1	-1.1	-1.7	-1.4	-1.4	-1.2
Barite	$BaSO_4$	**0.5**	**0.7**	**0.4**	**0.3**	**0.4**	**-0.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.0**	**0.9**	**1.3**	**1.2**
Witherite	$BaCO_3$	-3.5	-3.3	-4.8	-3.2	-4.4	-4.0	-3.7	-2.1	-3.5	-3.5	-3.8	-3.7	-3.5	-3.4
Fluorite	CaF_2	-1.5	-1.3	-2.6	-2.6	-2.7	-2.2	-1.7	-1.5	-1.4	-1.3	-1.4	-1.5	-2.0	-2.1
CoCO3	$CoCO_3$	-3.9	-3.9	-5.1	-3.5	-4.6	-4.2	-4.5	-3.0	-4.2	-4.2	-3.5	-3.4	-4.6	-4.3
Cerrusite	$PbCO_3$	-2.0	-2.1	-2.8	-2.0	-2.2	-2.1	-2.3	-2.0	-2.1	-2.1	-2.4	-2.2	-2.3	-2.2
Carbon Dioxide	$pCO_2(g)$ [b]	-2.0	-2.2	-1.0	-2.7	-1.6	-1.7	-1.6	-3.5	-1.9	-1.8	-1.4	-1.7	-1.7	-1.9

Notes:

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at $10^{\wedge value}$ atm

Table 5: Groundwater Geochemical Modeling Re
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Parameter	Units	GAMW55B 05-2019	GAMW55B 11-2019	GAMW55R 11-2019	GAMW56 09-2018	GAMW56 10-2018	GAMW56 04-2019	GAMW56 11-2019	GAMW56B 09-2018	GAMW56B 10-2018	GAMW56B 04-2019	GAMW56B 11-2019
Charge Balance	% error	-5.4	-6.2	-5.5	4.4	-1.6	**61.8**	3.5	0.7	2.6	**-13.1**	-4.8
MINERAL PHASES - Saturation Indices [a]												
Otavite	$CdCO_3$	-2.4	-2.2	-2.3	-2.4	-2.0	-2.7	-2.2	-2.3	-2.3	-2.3	-2.3
Ferrihydrite	$Fe(OH)_3$	**3.0**	**2.0**	**1.4**	**1.5**	**2.5**	**2.9**	**1.7**	**1.2**	**2.0**	**3.7**	**1.7**
Siderite	$FeCO_3$	**0.0**	**0.2**	-1.9	**0.5**	**0.8**	-0.7	**0.1**	**0.2**	**0.1**	**0.2**	**0.1**
Melanterite	$FeSO_4\ 7H_2O$	-4.8	-4.8	-6.9	-5.1	-5.1	-5.9	-5.6	-5.0	-5.2	-4.8	-4.9
Anglesite	$PbSO_4$	-4.5	-4.6	-4.6	-5.4	-5.5	-5.1	-5.4	-5.0	-5.1	-4.7	-4.7
Gypsum	$CaSO_4{:}2H_2O$	-0.6	-0.6	-0.8	-1.7	-1.7	-1.9	-1.7	-1.2	-1.3	-1.0	-0.9
Jarosite-H	$(H_3O)Fe_3(SO_4)_2(OH)_6$	-3.6	-7.1	-8.6	-8.3	-6.6	-4.3	-8.7	-8.8	-6.6	-1.5	-7.8
Jarosite-K	$KFe_3(SO_4)_2(OH)_6$	**2.9**	**-0.5**	-1.9	-2.5	**-0.4**	**2.4**	-2.6	-2.6	**-0.4**	**4.6**	-1.2
Jarosite-Na	$NaFe_3(SO_4)_2(OH)_6$	**1.0**	-2.4	-4.4	-5.4	-3.2	**0.4**	-5.7	-5.0	-2.7	**1.7**	-3.5
Calcite	$CaCO_3$	**0.2**	**0.4**	**0.2**	**-0.1**	**0.2**	-0.6	**0.1**	**0.0**	**0.0**	**0.0**	**0.1**
Magnesite	$MgCO_3$	-1.1	-1.0	-1.2	-1.5	-1.1	-1.2	-1.2	-1.2	-1.1	-1.3	-1.1
Barite	$BaSO_4$	**1.0**	**1.0**	**0.6**	**0.0**	**0.0**	**-0.1**	**-0.1**	**0.6**	**0.4**	**0.8**	**0.9**
Witherite	$BaCO_3$	-3.5	-3.4	-3.8	-3.7	-3.5	-4.2	-3.7	-3.6	-3.6	-3.5	-3.5
Fluorite	CaF_2	-2.0	-2.0	-1.3	-0.8	-1.0	-1.7	-1.2	-1.7	-1.9	-1.7	-1.7
CoCO3	$CoCO_3$	-4.2	-4.0	-4.1	-3.8	-2.9	-3.4	-2.9	-4.2	-4.2	-4.2	-4.2
Cerrusite	$PbCO_3$	-2.1	-2.1	-2.1	-2.2	-2.0	-2.2	-2.1	-2.1	-2.1	-2.0	-2.0
Carbon Dioxide	$pCO_2(g)$ [b]	-2.0	-2.1	-2.0	-1.2	-1.6	-1.6	-1.6	-1.4	-1.3	-1.6	-1.8

Notes:

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at 10^value atm

Prepared by: GOL
Checked by: PJN
Reviewed by: RV

Table 6: Average Point Decay Rates in Background and Downgradient Wells
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Constituent	Units	Point Decay Constants (first-order decay)	
		Background Wells	All Downgradient Wells (including Assessment Wells)
Arsenic	yr^{-1}	-0.33	**0.11**
Boron	yr^{-1}	0.04	**-0.04**
Cobalt	yr^{-1}	0.36	**-0.05**
Lithium	yr^{-1}	0.20	**-0.06**
Molybdenum	yr^{-1}	0.28	**-0.03**

Notes:
yr^{-1} = rate per year

Prepared by: GOL
Checked by: PJN
Reviewed by: RV

Table 7: Summary of Rietveld Quantitative Analysis X-Ray Diffraction Results
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Mineral	Mineral Formula	OW-9 18-20' (wt %)	OW-9 10-12' (wt %)	SB-52B-35'-37' (wt %)	SB-54B-30'-32' (wt %)	SB-56B-30'-32' (wt %)
Quartz	SiO_2	69	60	53	61	72
Pyrite	FeS_2	-	-	0.39	0.10	0.12
Marcasite	FeS_2	-	-	0.22	-	-
Muscovite	$KAl_2(AlSi_3O_{10})(OH)_2$	3.6	3.5	7.8	1.7	1.3
Biotite	$K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$	-	-	1.1	0.57	0.16
Chlorite	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$	-	-	2.6	1.0	1.1
Microcline	$KAlSi_3O_8$	5.2	9.1	9.2	7.5	6.6
Orthoclase	$KAlSi_3O_8$	-	-	2.2	0.65	0.57
Hematite	Fe_2O_3	-	-	0.26	0.44	0.57
Dolomite	$CaMg(CO_3)_2$	6.5	9.8	7.9	9.6	5.3
Calcite	$CaCO_3$	4.8	3.6	4.7	5.8	3.9
Albite	$NaAlSi_3O_8$	8.3	11	7.3	9.1	6.4
Epidote	$Ca_2(Al,Fe)Al_2O(SiO_4)(Si_2O_7)(OH)$	1.6	1.5	2.8	2.1	1.9
Anatase	TiO_2	-	-	-	-	-
Cancrinite	$Na_6Ca(CO_3)(AlSiO_4)_6{\cdot}2H_2O$	0.87	1.7	-	-	-
TOTAL		100	100	100	100	100

Notes:

wt % = percent by weight of each mineral

Non-detect minerals within a sample are represented with "-"

Prepared by: GOL
Checked by: PJN
Reviewed by: RV

Table 8: Sequential Extraction Procedure and Total Metal Solids Results
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Sample Location		SB-07B	DA-14	OW-9	OW-9	SB-08B	SB-52B	SB-53B	SB-53B	SB-54B	SB-55B	SB-56B
Sample Start Depth (ft bgs)		35	4	10	18	30	35	25	30	30	30	30
Sample End Depth (ft bgs)		37	6	12	20	32	37	27	32	32	32	32
Well Type		Background	Drying Well	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte	SEP Step											
Aluminum	Total Metal Result	1900	3100 J+	2200 J+	1100	1300	3200	1500	1400	2000	2200	1600
Aluminum	SEP Step 1	52 U	48 U	47 U	47 U	51 U	44 U	48 U	44 U	49 U	48 U	49 U
Aluminum	SEP Step 2	15 J	63 J	16 J	35 UJ	38 UJ	8.8 J	11 J	33 UJ	12 J	36 UJ	5.9 J
Aluminum	SEP Step 3	44	540	60	15	31	33	75	30	34	23	29
Aluminum	SEP Step 4	300	1600	280	160	130	110	130	100	130	100	360
Aluminum	SEP Step 5	200 UJ	80 J	180 U	170 U	190 UJ	28 J	31 J	34 J	180 UJ	180 UJ	180 UJ
Aluminum	SEP Step 6	1000	1600	840	520	1100	1200	750	820	1400	1200	1300
Aluminum	SEP Step 7	22000	11000	23000	15000	23000	25000	16000	19000	23000	21000	25000
Aluminum	SEP SUM	23000	15000	24000	16000	24000	26000	17000	20000	24000	22000	27000
Aluminum	SEP TOTAL	25000	21000	29000	19000	23000	28000	18000	20000	29000	31000	23000
Antimony	Total Metal Result	7.7 U	18 U	17 U	17 U	7 U	6.3 UJ	6.9 UJ	6.6 UJ	7 U	7 U	7 U
Antimony	SEP Step 1	16 U	14 U	14 U	14 U	15 U	13 U	14 U	13 U	15 U	14 U	15 U
Antimony	SEP Step 2	12 U	11 U	11 U	10 U	12 U	10 U	11 U	10 U	11 U	11 U	11 U
Antimony	SEP Step 3	3.9 U	3.6 U	3.5 U	3.5 U	3.8 U	3.3 U	3.6 U	3.3 U	3.7 U	3.6 U	3.6 U
Antimony	SEP Step 4	3.9 U	3.6 U	3.5 U	3.5 U	3.8 U	3.3 U	3.6 U	3.3 U	3.7 U	3.6 U	3.6 U
Antimony	SEP Step 5	59 U	54 U	53 U	52 U	58 U	50 U	53 U	50 U	55 U	54 U	55 U
Antimony	SEP Step 6	3.9 U	3.6 U	3.5 U	3.5 U	3.8 U	3.3 U	3.6 U	3.3 U	3.7 U	3.6 U	3.6 U
Antimony	SEP Step 7	0.45 J	3.6 U	3.5 U	3.5 U	0.54 J	3.3 U	3.6 U	0.16 J	0.29 J	3.6 U	0.3 J
Antimony	SEP SUM	0.45 J	3 U	3 U	3 U	0.54 J	3 U	3 U	0.16 J	0.29 J	3 U	0.3 J
Antimony	SEP TOTAL	0.53 J	3.6 U	3.5 U	3.5 U	0.27 J	3.3 U	3.6 J	3.3 U	0.33 J	3.6 U	0.29 J
Arsenic	Total Metal Result	1.7 J	0.62 J	1.7 J	0.69 J	1.9 J	5.4 J	5	1.3 J	2.3	2 J	5
Arsenic	SEP Step 1	2.6 U	2.4 U	2.3 U	2.3 U	2.6 U	2.2 U	2.4 U	2.2 U	2.4 U	2.4 U	2.4 U
Arsenic	SEP Step 2	2 U	1.8 UJ	1.8 U	1.7 U	1.9 U	0.46 J	1.8 U	1.7 U	1.8 UJ	1.8 UJ	1.8 UJ
Arsenic	SEP Step 3	0.37 J	0.45 J	0.43 J	0.17 J	0.27 J	0.83	0.83	0.44 J	0.45 J	0.37 J	1.9
Arsenic	SEP Step 4	0.69	0.6 U	0.94	0.73	0.66	0.71 J+	0.59 U	0.56 U	0.68	0.5 J	1.1
Arsenic	SEP Step 5	9.8 U	9 U	8.8 U	8.7 U	9.6 U	8.3 UJ	8.9 UJ	8.3 UJ	9.1 U	9 U	9.1 U
Arsenic	SEP Step 6	1.2	0.3 J	0.56 J	0.54 J	1.7	2.2	1.6	0.89	1.8	1.4	3.8
Arsenic	SEP Step 7	1.3 U	0.7	0.39 J	0.34 J	1.3 U	1.2	1	0.88	1.2 U	0.6 U	1.2 U
Arsenic	SEP SUM	2.2	1.4	2.3	1.8	2.6	5.4	4	2.7	2.9	2.7	7.3
Arsenic	SEP TOTAL	2.1	2.2	1.9	3	3.1	5.4 J	5.6	2.5	4.7	3.9	6.2

Table 8: Sequential Extraction Procedure and Total Metal Solids Results
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Sample Location		SB-07B	DA-14	OW-9	OW-9	SB-08B	SB-52B	SB-53B	SB-53B	SB-54B	SB-55B	SB-56B
Sample Start Depth (ft bgs)		35	4	10	18	30	35	25	30	30	30	30
Sample End Depth (ft bgs)		37	6	12	20	32	37	27	32	32	32	32
Well Type		Background	Drying Well	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte	SEP Step											
Barium	Total Metal Result	6.9 J+	7.3 J+	13	4.1	4.3 J+	8.4 J+	4.6 J+	4.3 J+	6.2	6.1	6.1
Barium	SEP Step 1	13 U	1.1 J	0.58 J	12 U	13 U	11 U	12 U	11 U	12 U	12 U	12 U
Barium	SEP Step 2	0.5 J	1.7 J	0.62 J	8.7 UJ	0.46 J	0.52 J	0.54 J	0.54 J	0.56 J	0.44 J	0.96 J
Barium	SEP Step 3	3.3 U	3.6	2.9 U	2.9 U	3.2 U	2.8 U	3 U	2.8 U	3 U	3 U	3 U
Barium	SEP Step 4	2.2 J	2.6 J	5.3	1.6 J	1.4 J	2.4 J	0.97 J	1.1 J	2.2 J	1.9 J	2.2 J
Barium	SEP Step 5	49 UJ	45 UJ	44 UJ	44 UJ	48 UJ	42 UJ	45 UJ	42 UJ	46 UJ	45 UJ	46 UJ
Barium	SEP Step 6	2.3 J	2.2 J	2.2 J	1.2 J	1.9 J	2 J	1.6 J	1.5 J+	2.3 J	2 J	2.4 J
Barium	SEP Step 7	250	230	350	220	220	250 J	190	220	230	190	260
Barium	SEP SUM	250	240	360	220	230	250	190	220	240	190	260
Barium	SEP TOTAL	270	300	390	210	190	200	170	200	220	200	230
Beryllium	Total Metal Result	1.3 U	0.053 J	0.12 J	0.064 J	1.2 U	0.19 J	1.1 U	1.1 U	1.2 U	1.2 U	1.2 U
Beryllium	SEP Step 1	1.3 U	1.2 U	1.2 U	1.2 U	1.3 U	1.1 U	1.2 U	1.1 U	1.2 U	1.2 U	1.2 U
Beryllium	SEP Step 2	0.98 UJ	0.9 UJ	0.88 UJ	0.87 UJ	0.96 UJ	0.83 UJ	0.89 UJ	0.83 UJ	0.91 UJ	0.9 UJ	0.91 UJ
Beryllium	SEP Step 3	0.33 U	0.026 J	0.021	0.29 U	0.32 U	0.28 U	0.3 U	0.28 U	0.3 U	0.3 U	0.3 U
Beryllium	SEP Step 4	0.33 U	0.026 J	0.024 J	0.02 J	0.32 U	0.28 U	0.3 U	0.28 U	0.3 U	0.3 U	0.03 J
Beryllium	SEP Step 5	4.9 UJ	4.5 UJ	4.4 UJ	4.4 UJ	4.8 UJ	4.2 UJ	4.5 UJ	4.2 UJ	4.6 UJ	4.5 UJ	4.6 UJ
Beryllium	SEP Step 6	0.045 J	0.024 J	0.036 J	0.027 J	0.039 J	0.042 J	0.026 J	0.027 J	0.045 J	0.037 J	0.067 J
Beryllium	SEP Step 7	0.29 J	0.21 J	0.39	0.24 J	0.31 J	0.35	0.23 J	0.28	0.3	0.25 J	0.46
Beryllium	SEP SUM	0.34	0.29	0.47	0.28	0.35	0.39	0.25	0.31	0.34	0.29	0.56
Beryllium	SEP TOTAL	0.37	0.3	0.41	0.28 J	0.26 J	0.35	0.25 J	0.27 J	0.33	0.27 J	0.33
Boron	Total Metal Result	26 U	5.5	7.4	3.6	23 U	21 U	23 U	22 U	23 U	23 U	23 U
Cadmium	Total Metal Result	0.64 U	0.24 U	0.11 J	0.072 J	0.59 U	0.53 U	0.57 U	0.55 U	0.58 U	0.58 U	0.3 J
Cadmium	SEP Step 1	1.3 U	1.2 U	1.2 U	1.2 U	1.3 U	1.1 U	1.2 U	1.1 U	1.2 U	1.2 U	1.2 U
Cadmium	SEP Step 2	0.98 U	0.9 U	0.88 U	0.87 U	0.96 U	0.83 U	0.89 U	0.83 U	0.91 U	0.9 U	0.91 U
Cadmium	SEP Step 3	0.33 U	0.3 UJ	0.29 UJ	0.29 UJ	0.32 U	0.28 UJ	0.3 UJ	0.28 UJ	0.3 UJ	0.3 UJ	0.3 UJ
Cadmium	SEP Step 4	0.077 J	0.059 J	0.09 J	0.083 J	0.076 J	0.086 J	0.08 J	0.076 J	0.069 J	0.065 J	0.059 J
Cadmium	SEP Step 5	4.9 U	4.5 U	4.4 U	4.4 U	4.8 U	4.2 U	4.5 U	4.2 U	4.6 U	4.5 U	4.6 U
Cadmium	SEP Step 6	0.33 U	0.3 U	0.29 U	0.29 U	0.32 U	0.28 U	0.3 U	0.28 U	0.026 J	0.013 J	0.3 U
Cadmium	SEP Step 7	0.33 U	0.3 U	0.29 U	0.29 U	0.32 U	0.28 U	0.3 U	0.28 U	0.3 U	0.3 U	0.3 U
Cadmium	SEP SUM	0.077 J	0.11 J	0.09 J	0.083 J	0.076 J	0.086 J	0.08 J	0.076 J	0.095 J	0.077 J	0.059 J
Cadmium	SEP TOTAL	0.015 J	0.3 U	0.29 U	0.29 U	0.065 J	0.28 U	0.3 U	0.28 U	0.18 J	0.12 J	0.058 J

Table 8: Sequential Extraction Procedure and Total Metal Solids Results
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Sample Location		SB-07B	DA-14	OW-9	OW-9	SB-08B	SB-52B	SB-53B	SB-53B	SB-54B	SB-55B	SB-56B
Sample Start Depth (ft bgs)		35	4	10	18	30	35	25	30	30	30	30
Sample End Depth (ft bgs)		37	6	12	20	32	37	27	32	32	32	32
Well Type		Background	Drying Well	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte	SEP Step											
Chromium	Total Metal Result	4.3	2.9	4.4	2.5	2.8	8.2 J	5.1	3.4	5	6	3.2
Chromium	SEP Step 1	2.6 U	2.4 U	2.3 U	2.3 U	2.6 U	2.2 U	2.4 U	2.2 U	2.4 U	2.4 U	2.4 U
Chromium	SEP Step 2	2 UJ	1.8 U	0.28 J	1.7 U	1.9 UJ	0.37 J	0.37 J	1.7 U	0.31 J	1.8 U	1.8 U
Chromium	SEP Step 3	0.29 J	0.37 J	0.52 J	0.16 J	0.17 J	1.1	0.97	0.27 J	1.1	0.14 J	0.19 J
Chromium	SEP Step 4	1.2	1.1	0.94	0.57 J	0.55 J	0.68	0.58 J	0.51 J	0.73	0.6	1
Chromium	SEP Step 5	9.8 U	9 UJ	1.5 J	1.3 J	9.6 U	8.3 U	8.9 U	8.3 U	9.1 U	9 U	9.1 U
Chromium	SEP Step 6	2.5	0.99	2.1	1.7	3.1	3.5	2.2	2.2	3.7	3.3	3
Chromium	SEP Step 7	5.5	3.7	7.3	5.2	7.2	9	5	7.3	8.5	6.7	13
Chromium	SEP SUM	9.4	8.1	13	8.8	11	15	9.1	10	14	11	17
Chromium	SEP TOTAL	9.5	6.9	11	8.3	8.8	16 J	10	8.7	17	13	9.2
Cobalt	Total Metal Result	3.5 J	1.1	1.8	2.2	2.9 J	5.2 J	5.7	2.6 J	5.7 J	3.9 J	3 J
Cobalt	SEP Step 1	13 U	12 U	12 U	12 U	13 U	11 U	12 U	11 U	12 U	12 U	12 U
Cobalt	SEP Step 2	0.54 J	9 U	8.8 U	8.7 U	0.35 J	0.44 J	0.63 J	0.38 J	0.62 J	0.41 J	0.26 J
Cobalt	SEP Step 3	0.55 J	0.1 J	0.27 J	0.19 J	0.37 J	0.45 J	1.2 J	0.53 J	0.47 J	0.39 J	0.37 J
Cobalt	SEP Step 4	0.83 J	0.29 J	0.87 J	1.2 J	0.97 J	0.71 J	1.1 J	0.66 J	1.6 J	0.91 J	0.76 J
Cobalt	SEP Step 5	49 UJ	45 UJ	44 UJ	44 UJ	48 UJ	42 UJ	45 UJ	42 UJ	46 UJ	45 UJ	46 UJ
Cobalt	SEP Step 6	1.3 J	0.3 J	0.66 J	0.68 J	1.8 J	2.1 J	1.5 J	0.97 J	2.5 J	1.5 J	2.9 J
Cobalt	SEP Step 7	0.8 J	3 U	0.69 J	0.69 J	1.1 J	0.82 J	0.44 J	0.43 J	1.5 J	0.8 J	0.81 J
Cobalt	SEP SUM	4	0.69 J	2.5	2.8	4.6	4.5	4.8	3	6.7	4	5.1
Cobalt	SEP TOTAL	4.2 J	0.87 J	2.5 J	3.2	4.8 J	4.7 J	5.2 J	3.2	6.1	4.3	4.5 J
Iron	Total Metal Result	4900	1500	4400	2600	3400	6800	7900	3700	5800	5900	5600
Iron	SEP Step 1	26 U	24 U	23 U	23 U	26 U	22 U	24 U	22 U	24 U	24 U	24 U
Iron	SEP Step 2	260 J	31 J	61 J	29 J	190 J	130 J	200 J	99 J	280 J	160 J	140 J
Iron	SEP Step 3	950	280	710	150	600	590	2600	470	740	700	1200
Iron	SEP Step 4	1100	770	1700	1100	1000	1200	1100	830	1400	1500	1400
Iron	SEP Step 5	98 UJ	90 UJ	88 UJ	87 UJ	96 UJ	83 UJ	89 UJ	83 UJ	91 UJ	90 UJ	91 UJ
Iron	SEP Step 6	2600	870	2100	1500	2800	3300	2600	2000	3800	3300	4600
Iron	SEP Step 7	1800	1300	2400	2000	2900	2500	2000	2100	3700	2400	3100
Iron	SEP SUM	6700	3200	7100	4700	7600	7700	8500	5500	9900	8100	10000
Iron	SEP TOTAL	6300	3400	7500	5500	7000	8400	8700	5700	9900	8600	6800

Table 8: Sequential Extraction Procedure and Total Metal Solids Results
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Sample Location		SB-07B	DA-14	OW-9	OW-9	SB-08B	SB-52B	SB-53B	SB-53B	SB-54B	SB-55B	SB-56B
Sample Start Depth (ft bgs)		35	4	10	18	30	35	25	30	30	30	30
Sample End Depth (ft bgs)		37	6	12	20	32	37	27	32	32	32	32
Well Type		Background	Drying Well	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte	SEP Step											
Lead	Total Metal Result	4.4	1.4	3.1	1.8	2.9	6.6 J	3.2	2.4	4.2	3.7	3.5
Lead	SEP Step 1	2.6 U	2.4 U	2.3 U	2.3 U	2.6 U	2.2 U	2.4 U	2.2 U	2.4 U	2.4 U	2.4 U
Lead	SEP Step 2	1.9 J	1.8 U	1.8 U	1.7 U	0.92 J	0.85 J	1.8 U	0.66 J	0.86 J	0.82 J	0.75 J
Lead	SEP Step 3	0.66 UJ	0.61 J	0.59 UJ	0.58 UJ	0.64 UJ	0.55 UJ	0.59 UJ	0.56 UJ	0.61 UJ	0.6 UJ	0.61 UJ
Lead	SEP Step 4	1.2	0.65	1.7	1.2	1.4	2.3	1.8	1.5	2.3	1.8	2
Lead	SEP Step 5	9.8 UJ	9 UJ	8.8 UJ	8.7 UJ	9.6 UJ	8.3 UJ	8.9 UJ	8.3 UJ	9.1 UJ	9 UJ	9.1 UJ
Lead	SEP Step 6	1.1	0.67	0.67	0.35 J	0.78	1.8	1.1	0.72	1.6	1.3	3.4
Lead	SEP Step 7	3.2	3.1	5.3	3.2	3.5	3.3	2.5	2.6	2.8	4.7	2.9
Lead	SEP SUM	7.4	5	7.7	4.8	6.6	8.2	5.3	5.5	7.5	8.6	9.1
Lead	SEP TOTAL	7	5.7	7.4	5.6	5	7.5 J	4.9	5.1	6.7	5.6	6.2
Lithium	Total Metal Result	4.6 J	1.4 J	3.6 J	2.2 J	3.3 J	6.6 J+	3.1 J+	3.4 J+	5.4 J	5.2 J	3.5 J
Lithium	SEP Step 1	13 U	12 U	12 U	12 U	13 U	11 U	12 U	11 U	12 U	12 U	12 U
Lithium	SEP Step 2	9.8 U	9 U	8.8 U	8.7 U	9.6 U	8.3 U	8.9 U	8.3 U	0.71 J	0.72 J	9.1 U
Lithium	SEP Step 3	3.3 U	3 U	2.9 U	2.9 U	3.2 U	2.8 U	3 U	2.8 U	3 U	3 U	3 U
Lithium	SEP Step 4	0.78 J	0.5 J	0.81 J	0.55 J	0.62 J	1 J	0.64 J	0.71 J	1.1 J	1 J	1.3 J
Lithium	SEP Step 5	49 U	45 U	44 U	44 U	48 U	42 U	45 U	42 U	46 U	45 U	46 U
Lithium	SEP Step 6	2.3 J	1.1 J	1.8 J	1.2 J	2.2 J	3	1.7 J	1.9 J	3.5	2.9 J	2.8 J
Lithium	SEP Step 7	4.4	2.5 J	3.4	2.1 J	3.8	6.1	2.6 J	3.1	5.6	4.2	7.1
Lithium	SEP SUM	12	4.1	6	3.8	11	14	7.8	5.7	19	18	19
Lithium	SEP TOTAL	8	4.2	6.8	5.4	7.5	10	6	7.5	11	10	7.2
Molybdenum	Total Metal Result	5.1 U	6.3	1.1 U	1.1 U	4.7 U	3.8 J	4 J	4.4 U	0.88 J	4.7 U	2.1 J
Molybdenum	SEP Step 1	10 U	13	9.4 U	9.3 U	10 U	8.9 U	9.5 U	8.9 U	9.8 U	9.6 U	9.7 U
Molybdenum	SEP Step 2	7.9 U	0.51 J	7 U	7 U	7.7 U	6.7 U	7.1 U	6.7 U	7.3 U	7.2 U	7.3 U
Molybdenum	SEP Step 3	2.6 U	1.2 J	2.3 U	2.3 U	2.6 U	0.51 J	2.2 J	0.27 J	0.59 J	2.4 U	0.5 J
Molybdenum	SEP Step 4	2.6 U	1.3 J	2.3 U	2.3 U	2.6 U	0.39 J	0.63 J	0.24 J	0.53 J	2.4 U	0.36 J
Molybdenum	SEP Step 5	39 U	36 U	35 U	35 U	38 U	33 U	36 U	33 U	37 U	36 U	1.7 J
Molybdenum	SEP Step 6	2.6 U	0.13 J	2.3 U	2.3 U	2.6 U	0.21 J	0.13 J	2.2 U	0.18 J	0.2 J	1.5 J
Molybdenum	SEP Step 7	2.6 U	2.4 U	2.3 U	2.3 U	2.6 U	2.2 U	2.4 U	2.2 U	2.4 U	2.4 U	0.16 J
Molybdenum	SEP SUM	2 U	16	2 U	2 U	2 U	1.1 J	3	0.51 J	1.3 J	0.2 J	4.3
Molybdenum	SEP TOTAL	0.94 J	15	0.22 J	0.15 J	0.54 J	2.4	3.8	0.67 J	2.4	0.48 J	2.4

Table 8: Sequential Extraction Procedure and Total Metal Solids Results
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Sample Location		SB-07B	DA-14	OW-9	OW-9	SB-08B	SB-52B	SB-53B	SB-53B	SB-54B	SB-55B	SB-56B
Sample Start Depth (ft bgs)		35	4	10	18	30	35	25	30	30	30	30
Sample End Depth (ft bgs)		37	6	12	20	32	37	27	32	32	32	32
Well Type		Background	Drying Well	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte	SEP Step											
Selenium	Total Metal Result	1.9 U	4.8 U	4.6 U	4.6 U	0.53 J	1.6 U	0.51 J	0.74 J	0.68 J	0.65 J	1.8 U
Selenium	SEP Step 1	2.6 U	2.4 U	2.3 U	2.3 U	2.6 U	2.2 U	2.4 U	2.2 U	2.4 U	2.4 U	2.4 U
Selenium	SEP Step 2	2 U	1.8 U	1.8 U	1.7 U	1.9 U	1.7 U	1.8 U	1.7 U	1.8 UJ	1.8 UJ	1.8 UJ
Selenium	SEP Step 3	0.66 U	0.6 U	0.22 J	0.58 U	0.64 U	0.55 U	0.59 U	0.56 U	0.61 U	0.6 U	0.61 U
Selenium	SEP Step 4	1.1 J	0.6 UJ	0.6 J+	0.75 J+	1.3 J	0.64 J	0.59 UJ	0.56 UJ	0.71 J	0.6 UJ	0.59 J
Selenium	SEP Step 5	9.8 U	9 U	8.8 U	8.7 U	9.6 U	8.3 U	3.3 J	8.3 U	9.1 U	9 U	9.1 U
Selenium	SEP Step 6	0.66 U	0.6 U	0.59 U	0.58 U	0.64 U	0.55 U	0.59 U	0.56 U	0.61 U	0.6 U	0.61 U
Selenium	SEP Step 7	1.3 U	0.6 U	0.59 U	0.58 U	1.3 U	1.1 U	0.59 U	0.56 U	0.74 J	0.6 U	1.2 U
Selenium	SEP SUM	2.7	0.5 U	0.82	0.75	2.5	0.64	3.3	0.5 U	1.5	0.5 U	0.59
Selenium	SEP TOTAL	1.3 U	1.2 U	0.59 U	0.58 U	1.3 U	1.1 U	1.2 U	0.56 U	0.61 U	0.24 J	1.2 U
Thallium	Total Metal Result	4.5 U	7.2 U	6.9 U	6.8 U	4.1 U	3.7 u	4 U	3.9 U	4.1 U	4.1 U	4.1 U
Thallium	SEP Step 1	9.2 U	8.4 U	8.2 U	8.2 U	8.9 U	7.8 U	8.3 U	7.8 U	8.5 U	8.4 U	8.5 U
Thallium	SEP Step 2	6.9 U	6.3 U	6.2 U	6.1 U	6.7 U	5.8 U	6.2 U	5.8 U	6.4 U	6.3 U	6.4 U
Thallium	SEP Step 3	2.3 U	2.1 U	2.1 U	2 U	2.2 U	1.9 U	2.1 U	1.9 U	2.1 U	2.1 U	2.1 U
Thallium	SEP Step 4	2.3 U	2.1 U	2.1 UJ	2 UJ	2.2 U	1.9 U	2.1 U	1.9 U	2.1 U	2.1 U	2.1 U
Thallium	SEP Step 5	34 UJ	31 UJ	31 UJ	31 UJ	34 UJ	29 UJ	31 UJ	29 UJ	32 UJ	32 UJ	32 UJ
Thallium	SEP Step 6	2.3 U	2.1 U	2.1 U	2 U	2.2 U	1.9 U	2.1 U	1.9 U	2.1 U	2.1 U	2.1 U
Thallium	SEP Step 7	0.48 J	2.1 U	0.62 J	0.56 J	1.1 J	3.9 U	2.1 U	1.9 U	0.97 J	0.74 J	1.3 J
Thallium	SEP SUM	0.48 J	1.8 U	0.62 J	0.56 J	1.4 J	1.8 U	1.8 U	1.8 U	0.97 J	0.74 J	1.3 J
Thallium	SEP TOTAL	0.87 J	4.2 U	0.58 J	0.47 J	0.9 J	3.9 U	4.2 U	1.9 U	0.88 J	0.85 J	1.3 J

Notes:
All results displayed in milligram per kilogram (mg/kg).
ft bgs = feet below ground surface
SEP: Sequential Extraction Procedure
Step 1 - Exchangeable Phase: This extraction includes trace elements that are reversibly adsorbed to soil minerals, amorphous solids, and organic material by electrostatic forces.
Step 2 - Carbonate Phase: This extraction targets trace elements that are adsorbed or otherwise bound to carbonate minerals.
Step 3 - Non-Crystalline Materials Phase: This extraction targets trace elements that are complexed by amorphous minerals (e.g. iron).
Step 4 - Metal Hydroxide Phase: This extraction targets trace elements bound to hydroxides of iron, manganese, and/or aluminum.
Step 5 - Organic Phase: This extraction targets trace elements strongly bound via chemisorption to organic material.
Step 6 - Acid/Sulfide Fraction: The extraction is used to identify trace elements precipitated as sulfide minerals.
Step 7 - Residual Fraction: Trace elements remaining in the soil after the previous extractions will be distributed between silicates, phosphates, and refractory oxides.
U= The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
UJ= The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit, the quantitation limit is considered estimated.
J= The analyte was positively identified. The associated numerical value is the approximate concentration.
J+= The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample and biased high.
Total Metal Results are the results of the 6010C analysis

Prepared by: DFSC
Checked by: KMC
Reviewed by: MAH

Table 9: Predicted Range of COI Concentrations in Assessment Wells Assuming Only Dilution and Dispersion
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

Constituent	Units	Site-Specific Groundwater Protection Standard[2]	Health-Based Standard	Maximimum concentration observed in Porewater	Maximimum concentration at side-gradient Assessment Wells:				Concentration at Assessment Wells assuming 32%[3] dilution of porewater with maximum concentration measured at:				Concentration at Assessment Wells assuming 63%[4] dilution of porewater with maximum concentration measured at:			
					GAMW-52	GAMW-52B	GAMW-56	GAMW-56B	GAMW-52	GAMW-52B	GAMW-56	GAMW-56B	GAMW-52	GAMW-52B	GAMW-56	GAMW-56B
Arsenic	mg/L	0.091	0.010	0.012	0.0025	0.0016	0.022	0.0025	0.0090	0.0087	0.015	0.0090	0.0060	0.0054	0.018	0.0060
Boron[1]	mg/L	-	4.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Cobalt	mg/L	0.010	0.0060	0.0022	0.00058	0.00050	0.0084	0.00050	0.0017	0.0017	0.0042	0.0017	0.0012	0.0011	0.0061	0.0011
Lithium	mg/L	0.040	0.040	0.016	0.0062	0.0071	0.0053	0.0062	0.013	0.013	0.013	0.013	0.0098	0.010	0.0093	0.0098
Molybdenum	mg/L	0.10	0.10	0.81	0.0064	0.015	0.013	0.0064	0.55	0.56	0.55	0.55	0.30	0.31	0.31	0.30
Arsenic	Percentage relative to Groundwater Protection Standard	100%	-	13%	3%	2%	24%	3%	10%	10%	17%	10%	7%	6%	20%	7%
Boron		100%	-	345%	80%	33%	7%	80%	260%	245%	237%	260%	178%	148%	132%	178%
Cobalt		100%	-	22%	6%	5%	84%	5%	17%	17%	42%	17%	12%	11%	61%	11%
Lithium		100%	-	40%	16%	18%	13%	16%	32%	33%	31%	32%	25%	26%	23%	25%
Molybdenum		100%	-	810%	6%	15%	13%	6%	553%	556%	555%	553%	304%	309%	308%	304%

Notes:
(1) Boron does not have a groundwater protection standard, results are compated to the health-based standard
(2) The groundwater protection standard is equal to the higher of the background tolerance limit and the relevant health-based standard
(3) 32% dilution was minimum dilution predicted in Table 8
(4) 63% dilution was maximum dilution predicted in Table 8
ft = feet
mg/L = milligrams per liter

Prepared by: GOL
Checked by: PJN
Reviewed by: RV

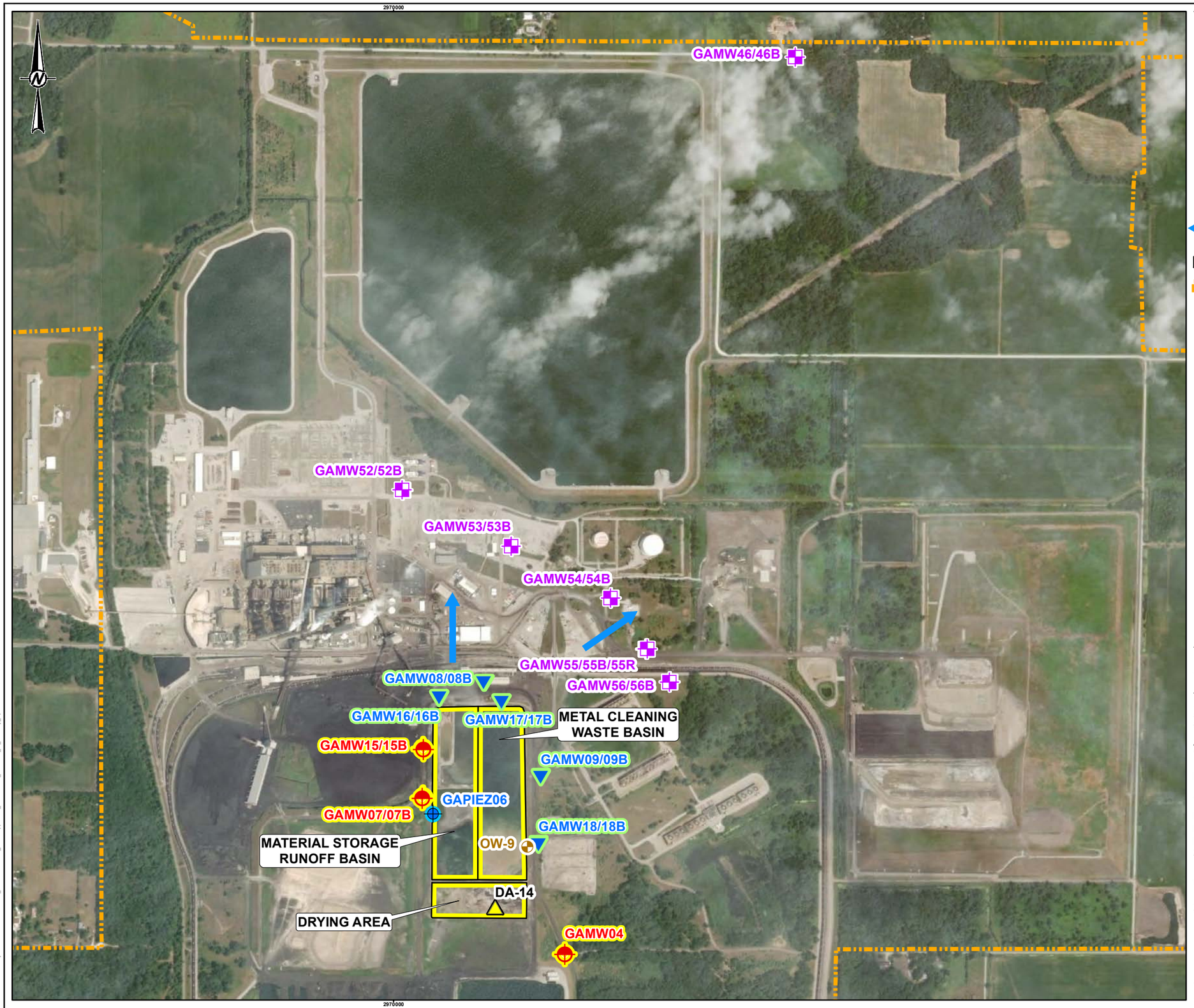
Table 10: Sorption Site and Surface Area Calculations
Monitored Natural Attenuation Evaluation
NIPSCO LLC R. M. Schahfer Generating Station

	Units	Minimum	Mean	Maximum
Ferrihydrite				
Amorphous Iron (Step 3 SEP) + Metal Hydroxide Iron (Step 4 SEP)	Sample Name	SB-18B-32/34	Mean of all samples	SB-53B-25-27
	ppm of Fe	1278	2006	3787
	millimoles of Fe	22.9	35.9	67.8
	moles of Fe	0.0229	0.0359	0.0678
Specific Surface Area	m^2/g	600		
Surface Site Concentration	moles weak sites/ mole of Fe	0.2		
Surface Sites	moles of weak sites	0.00458	0.00719	0.01356
Mass of Ferrihydrite	g	2.03	3.19	6.03
Gibbsite				
Amorphous Aluminum (Step 3 SEP) + Metal Hydroxide Aluminum (Step 4 SEP)	Sample Name	SB-53B-30-32	Mean of all samples	OW-9-10-12
	ppm of Al	130	221	408
	millimoles of Al	4.8	8.2	15.1
	moles of Al	0.0048	0.0082	0.0151
Specific Surface Area	m^2/g	32		
Surface Site Concentration	moles weak sites/ mole of Al	0.41		
Surface Sites	moles of weak sites	0.00198	0.00335	0.00619
Mass of Gibbsite	g	0.38	0.64	1.18

Notes:
ppm = parts per million
m^2/g = meters squared per gram
g = grams

Prepared by: GOL
Checked by: PJN
Reviewed by: RV

Figures



LEGEND

- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- Downgradient Boring Location
- Porewater Sample Location
- CCR Source Material Sample Location
- Generalized Groundwater Flow Direction
- CCR Units
- Approximate Property Line

0 850 1,700

1 " = 850 feet Feet

NOTE(S)

1. THIS FIGURE DEPICTS THE GENERALIZED GROUNDWATER FLOW DIRECTION WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER.

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

MONITORED NATURAL ATTENUATION EVALUATION
MSRB, MCWB, AND DRYING AREA
NIPSCO LLC R. M. SCHAHFER GENERATING STATION

TITLE

SAMPLE LOCATION MAP

CONSULTANT

GOLDER

YYYY-MM-DD	6/16/2020
DESIGNED	DFS
PREPARED	SHL
REVIEWED	JSP
APPROVED	MAH

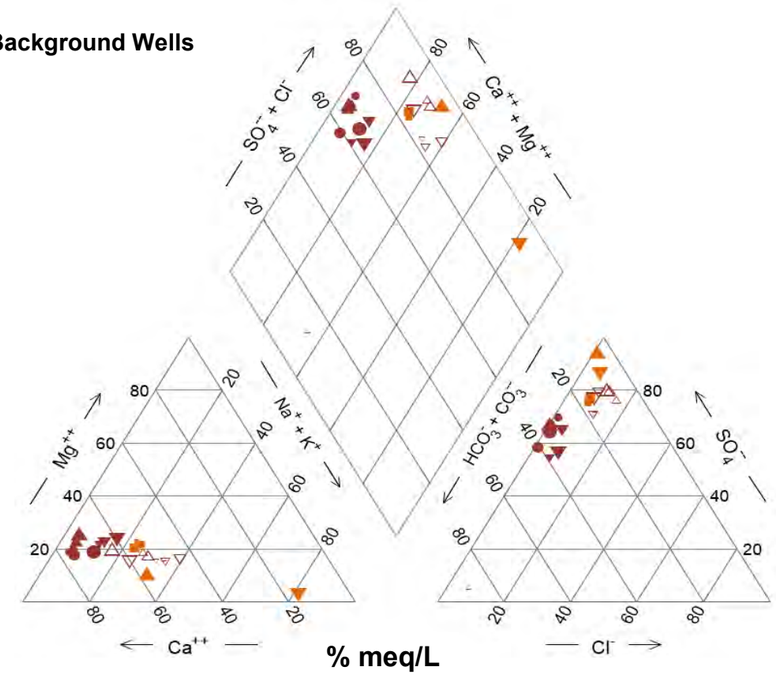
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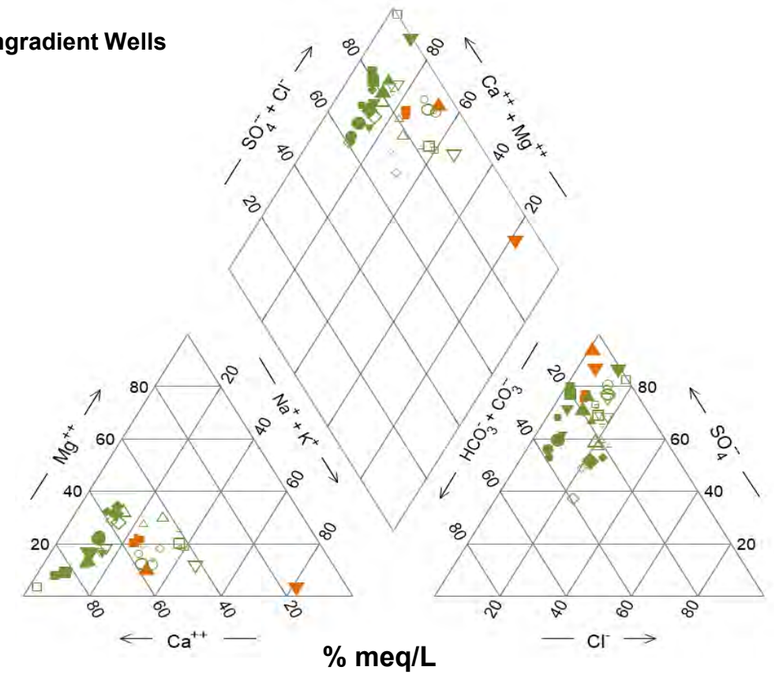
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1 in
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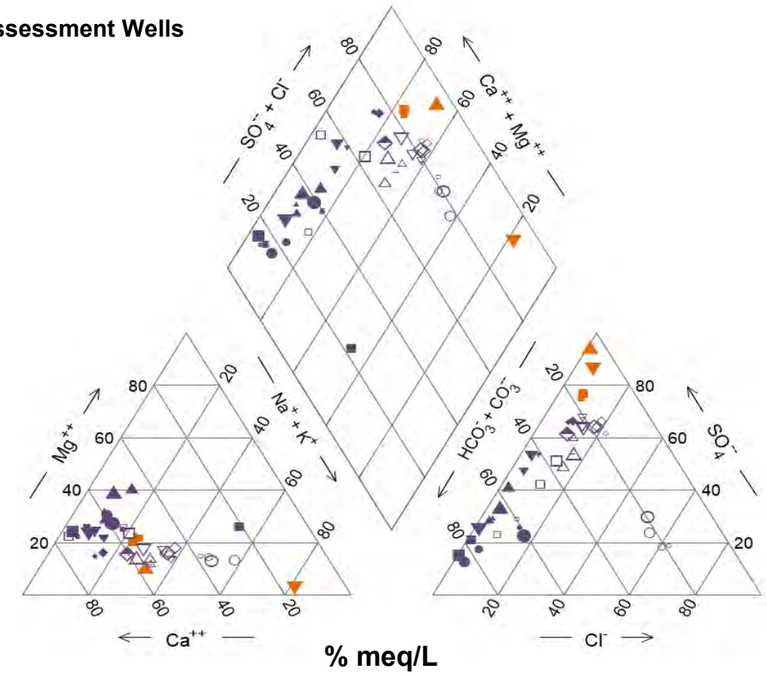
(a) **Background Wells**



(b) **Downgradient Wells**



(c) **Assessment Wells**



Porewater
- GAPIEZ–06
- DAPZ–02A
- DAPZ–02B

Upgradient Wells
- GAMW–04
- GAMW–07
- GAMW–07B
- GAMW–15
- GAMW–15B

Downgradient Wells
- GAMW–08
- GAMW–08B
- GAMW–09
- GAMW–09B
- GAMW–16
- GAMW–16B
- GAMW–17
- GAMW–17B
- GAMW–18
- GAMW–18B

Assessment Wells
- GAMW–52
- GAMW–52B
- GAMW–53
- GAMW–53B
- GAMW–54
- GAMW–54B
- GAMW–55
- GAMW–55R
- GAMW–55B
- GAMW–56
- GAMW–56B

Sample Collection Date

Least Recent → Most Recent

CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

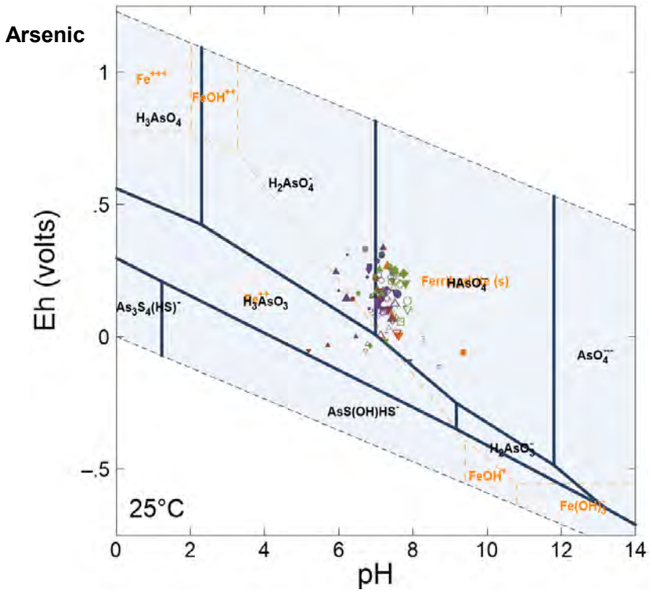
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Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Piper Diagrams - Groundwater Characterization of Background, Monitoring, and Assessment Wells

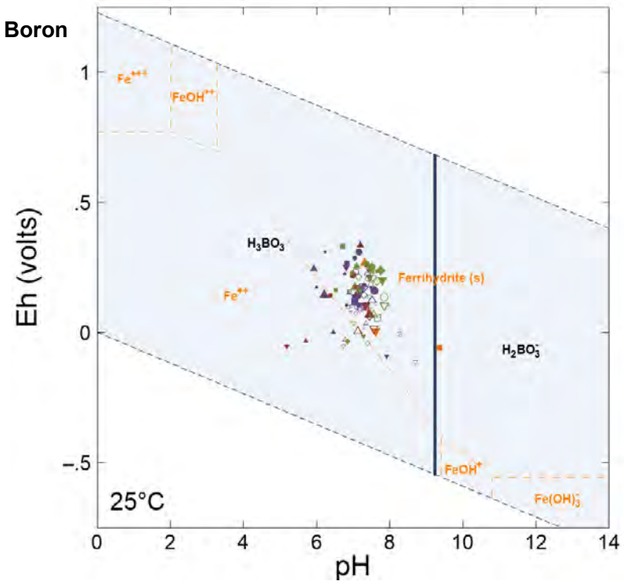
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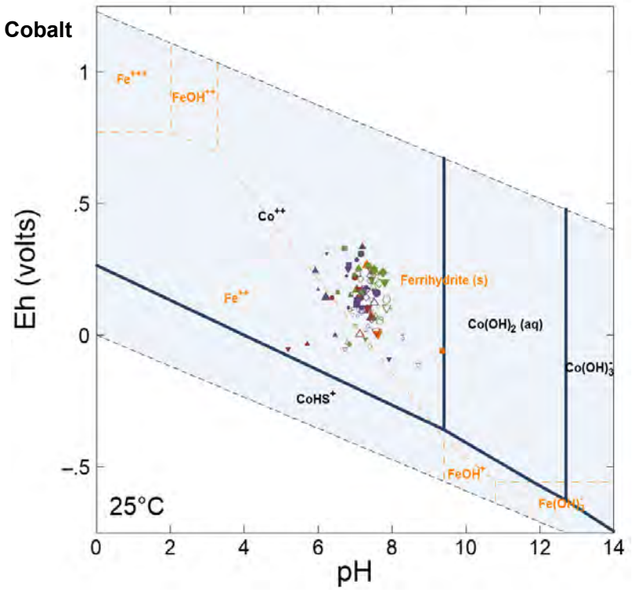
(a) Arsenic



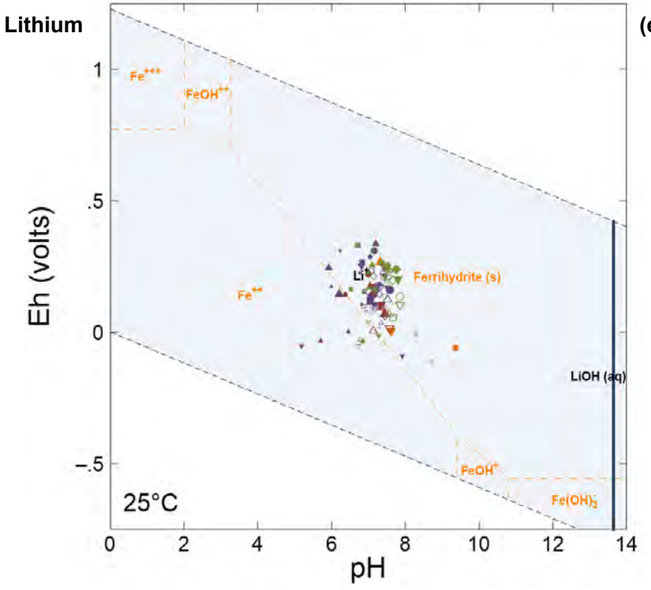
(b) Boron



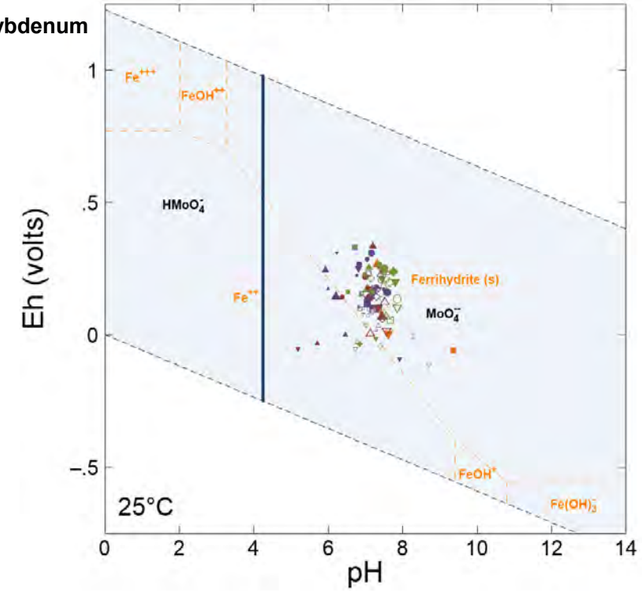
(c) Cobalt



(d) Lithium



(e) Molybdenum



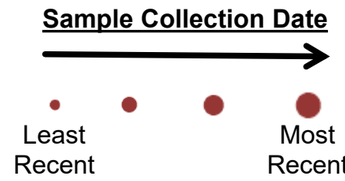
Porewater
- GAPIEZ–06
- DAPZ–02A
- DAPZ–02B

Upgradient Wells
- GAMW–04
- GAMW–07
- GAMW–07B
- GAMW–15
- GAMW–15B

Downgradient Wells
- GAMW–08
- GAMW–08B
- GAMW–09
- GAMW–09B
- GAMW–16
- GAMW–16B
- GAMW–17
- GAMW–17B
- GAMW–18
- GAMW–18B

Assessment Wells
- GAMW–52
- GAMW–52B
- GAMW–53
- GAMW–53B
- GAMW–54
- GAMW–54B
- GAMW–55
- GAMW–55R
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- GAMW–56
- GAMW–56B

Sample Collection Date



CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

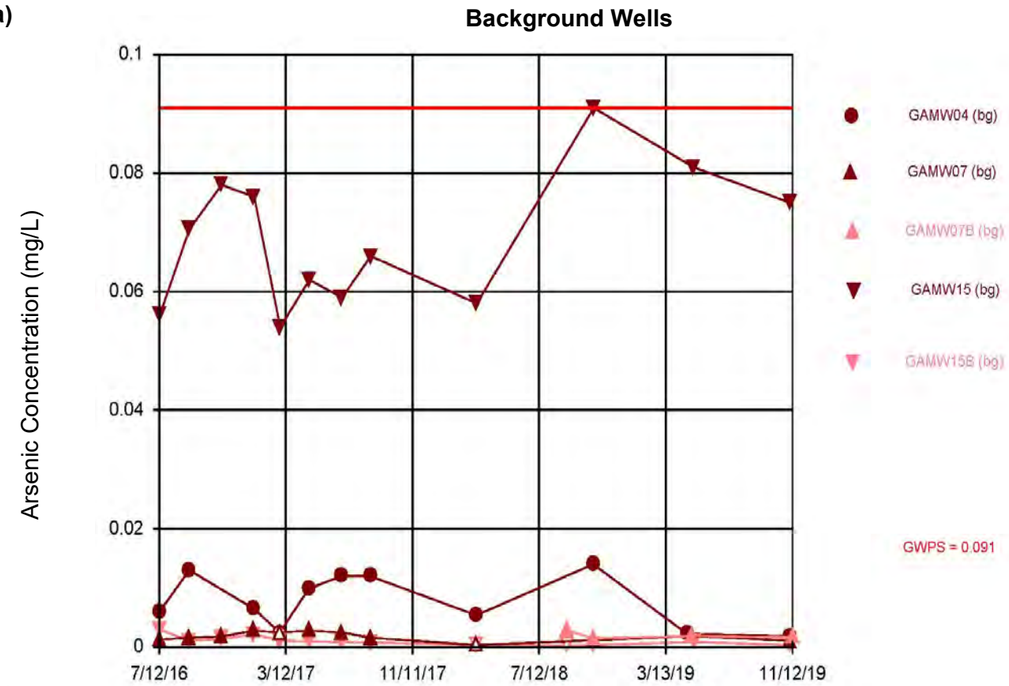
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Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Pourbaix Diagrams For Arsenic, Boron, Cobalt, Lithium, and Molybdenum

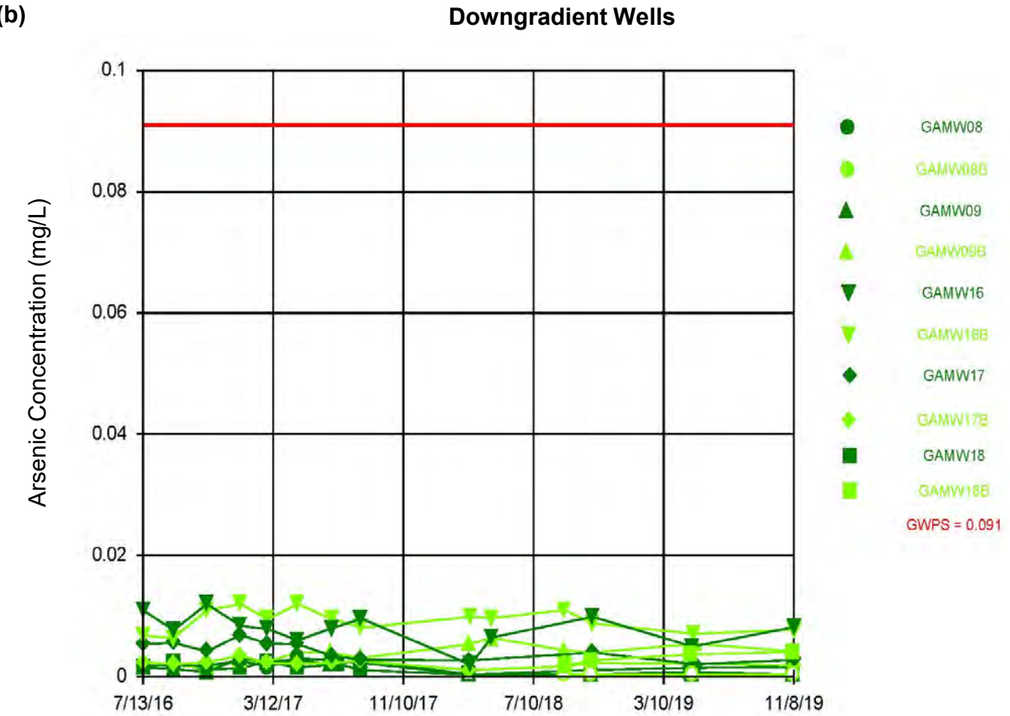
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19121567	192	A	3a-e

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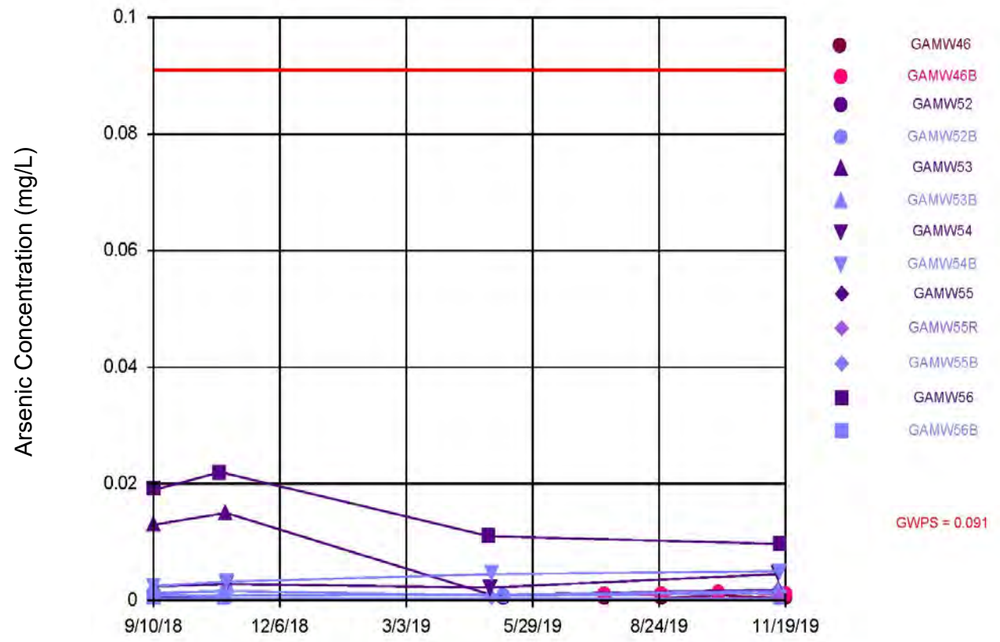
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit.

CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

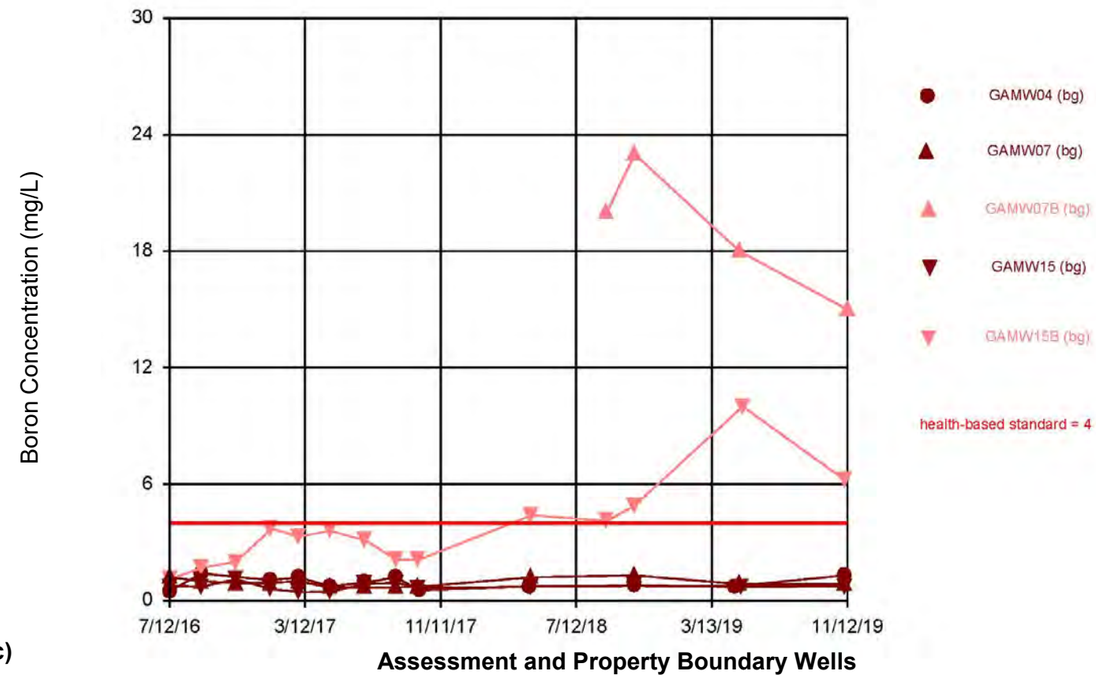
TITLE
Arsenic Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	4a-c

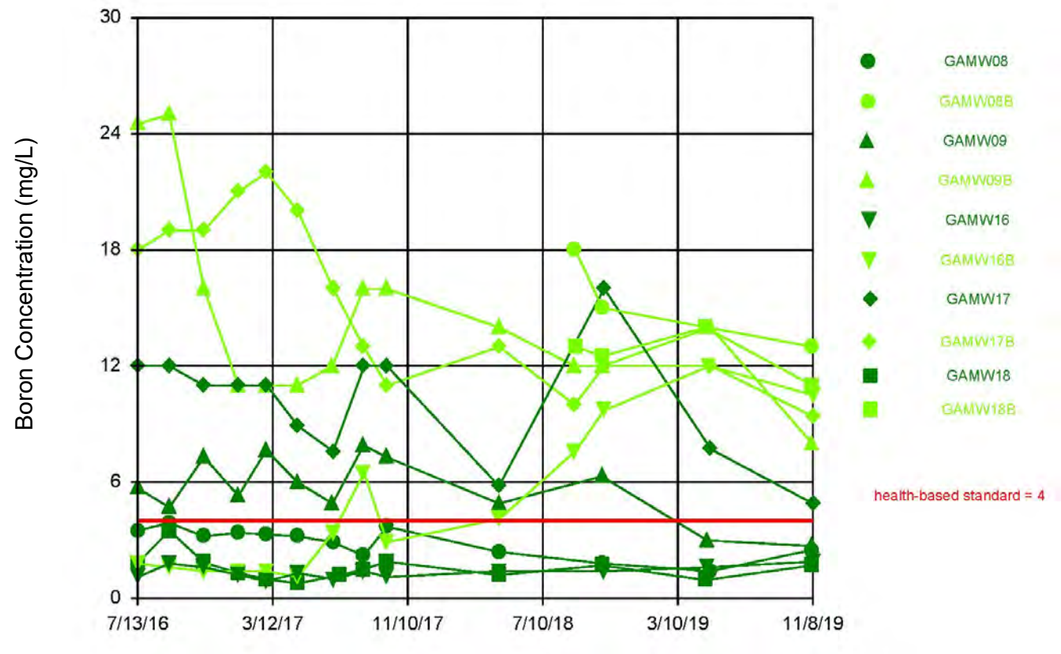
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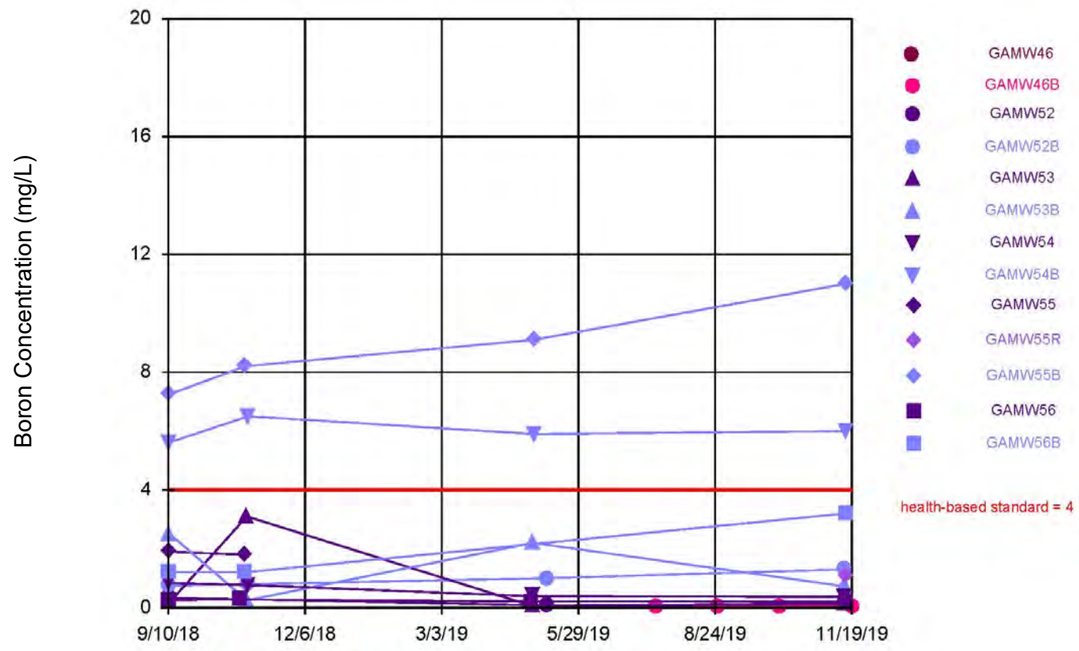
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit

CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

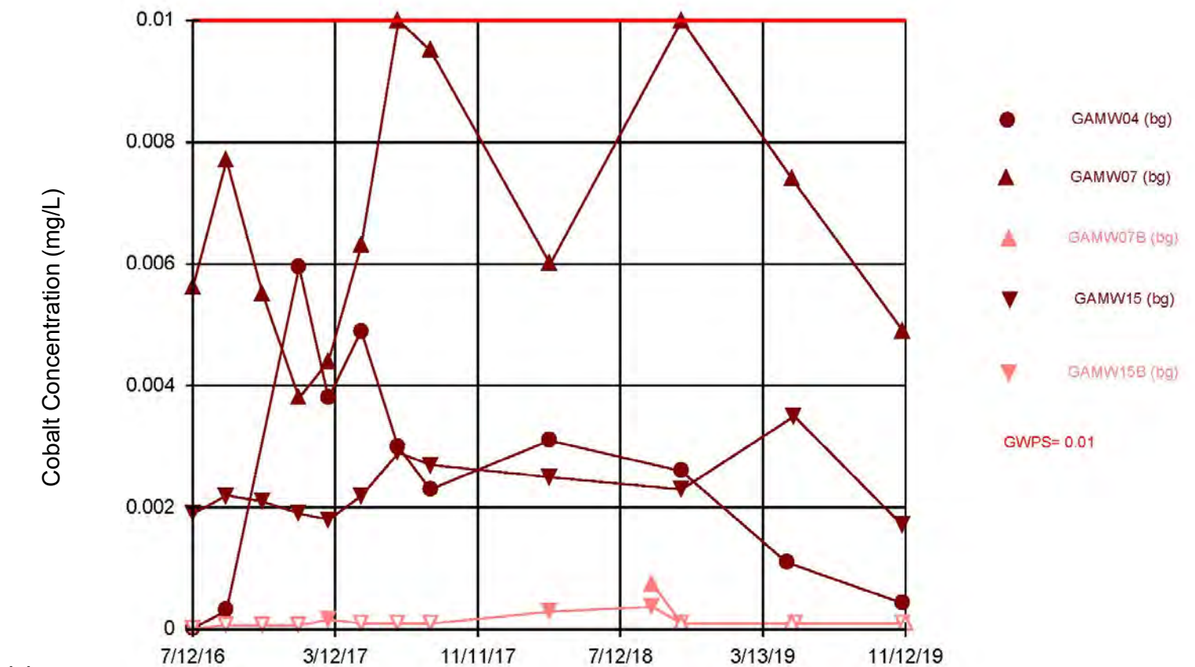
TITLE
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PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	5a-c

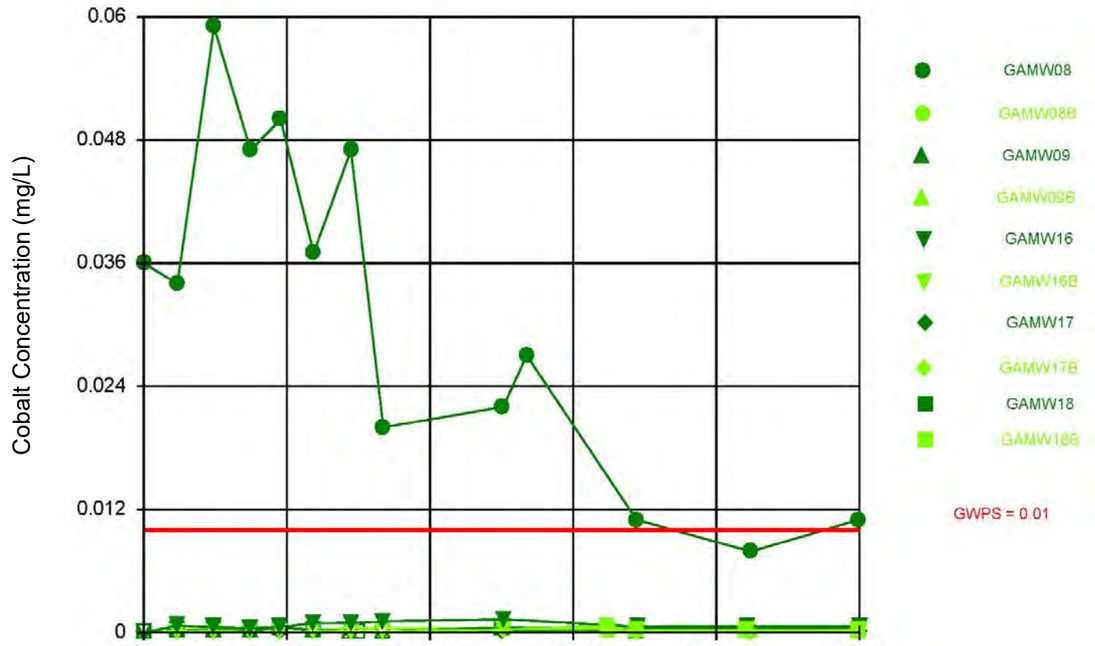
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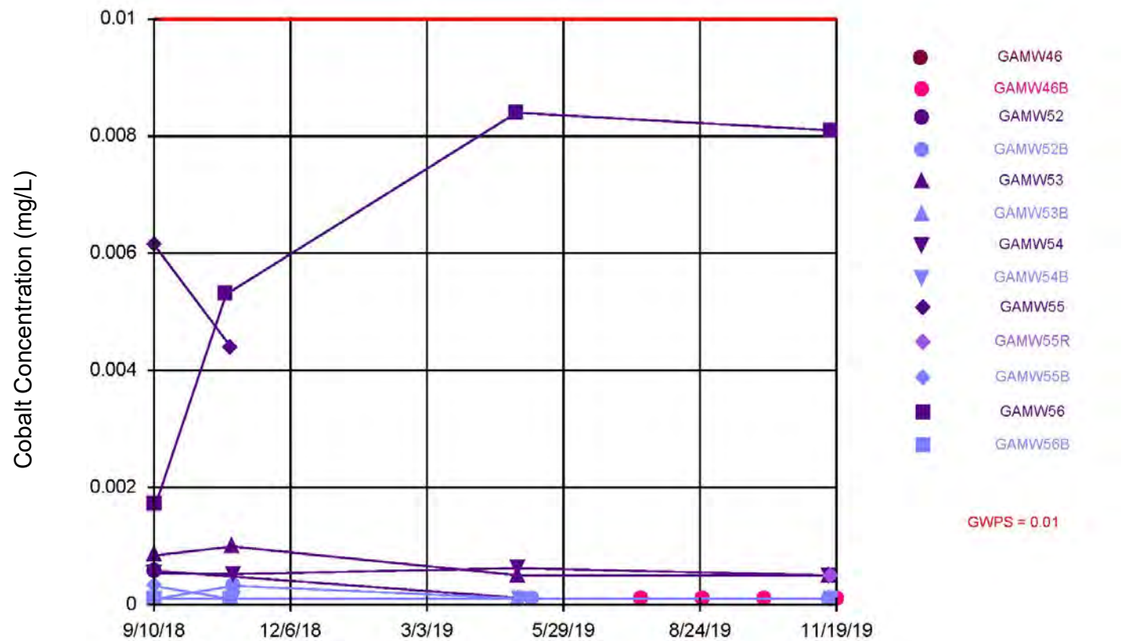
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit

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NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

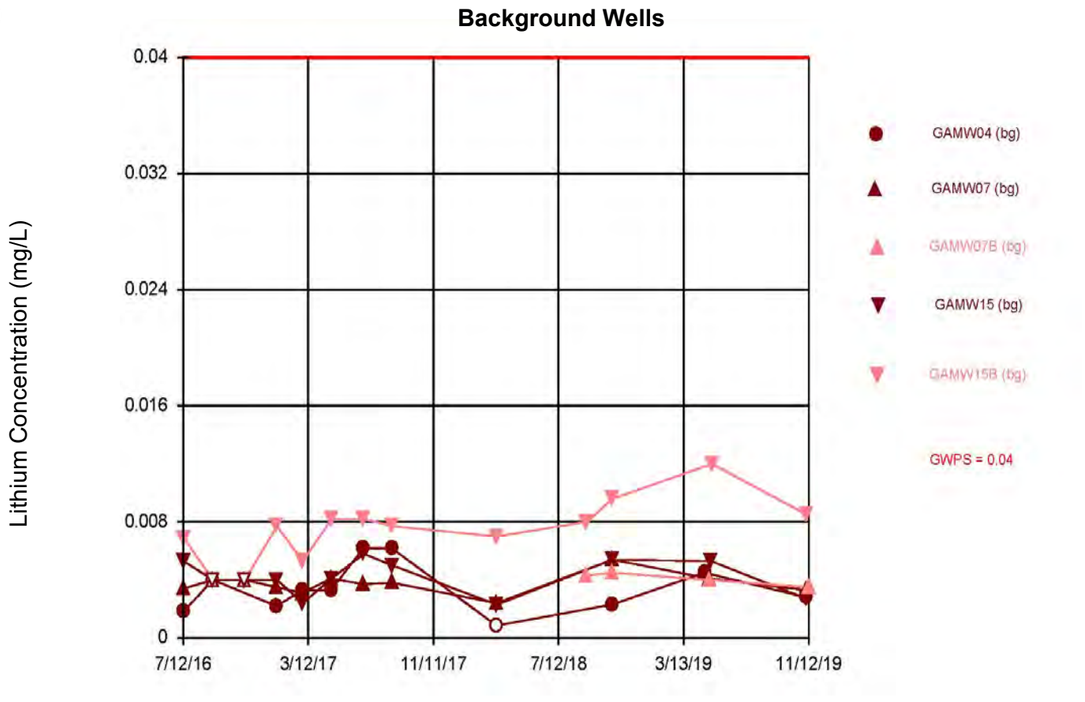
TITLE
Cobalt Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	6a-c

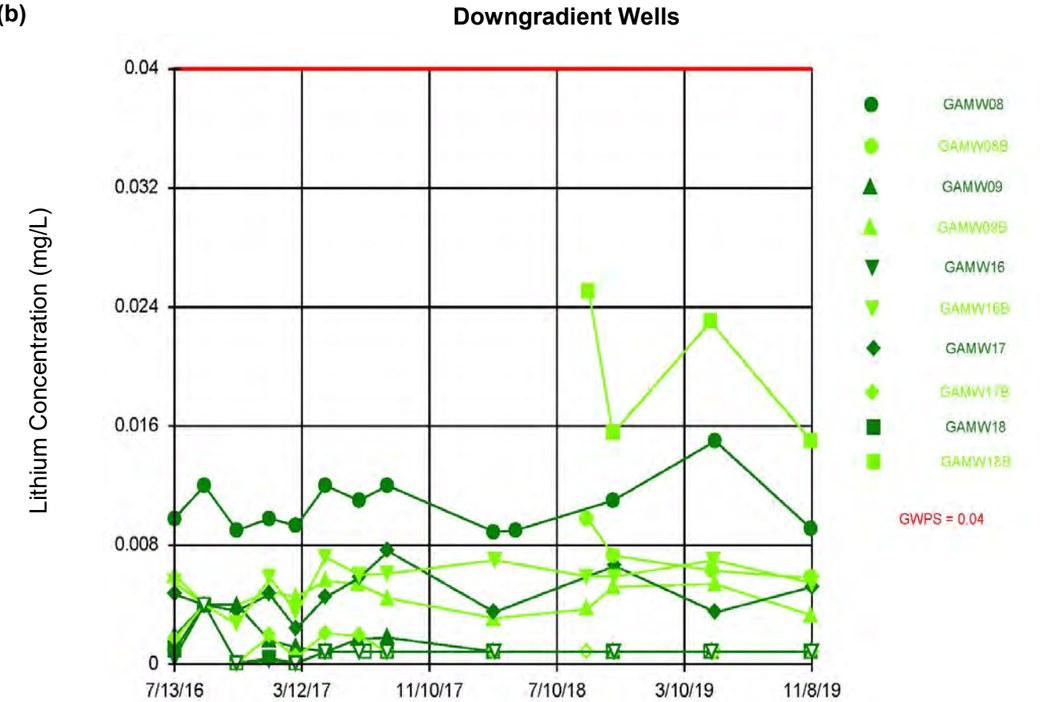
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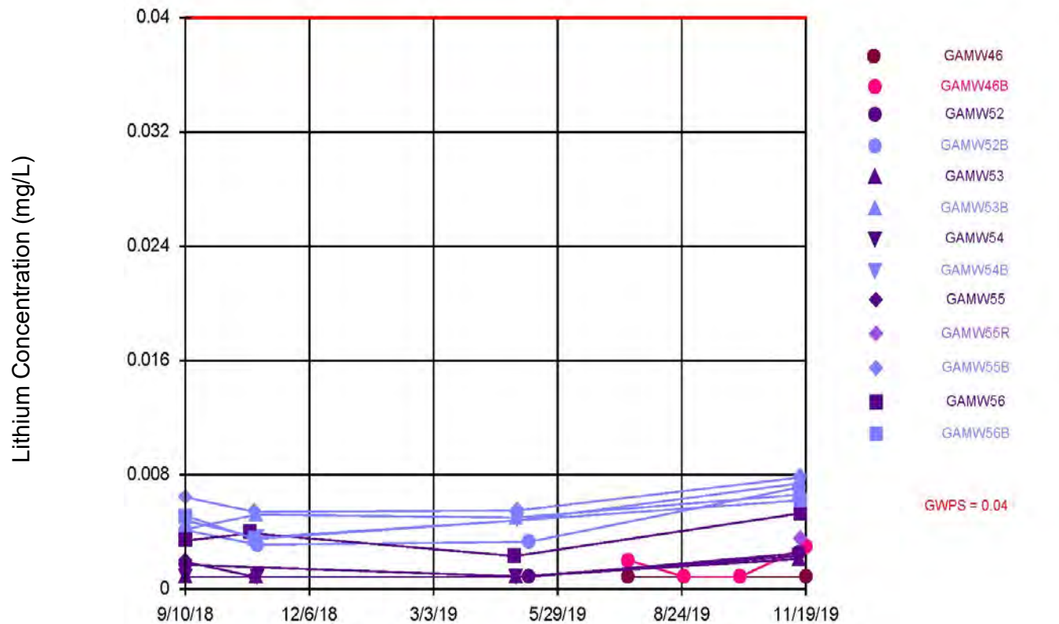
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit

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NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

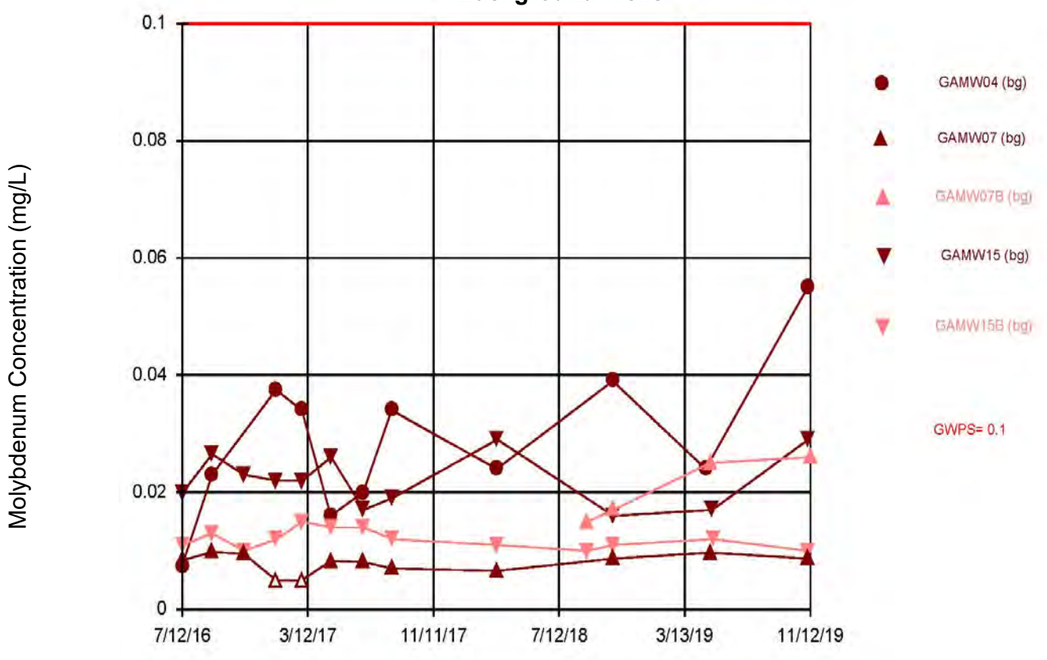
TITLE
Lithium Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	7a-c

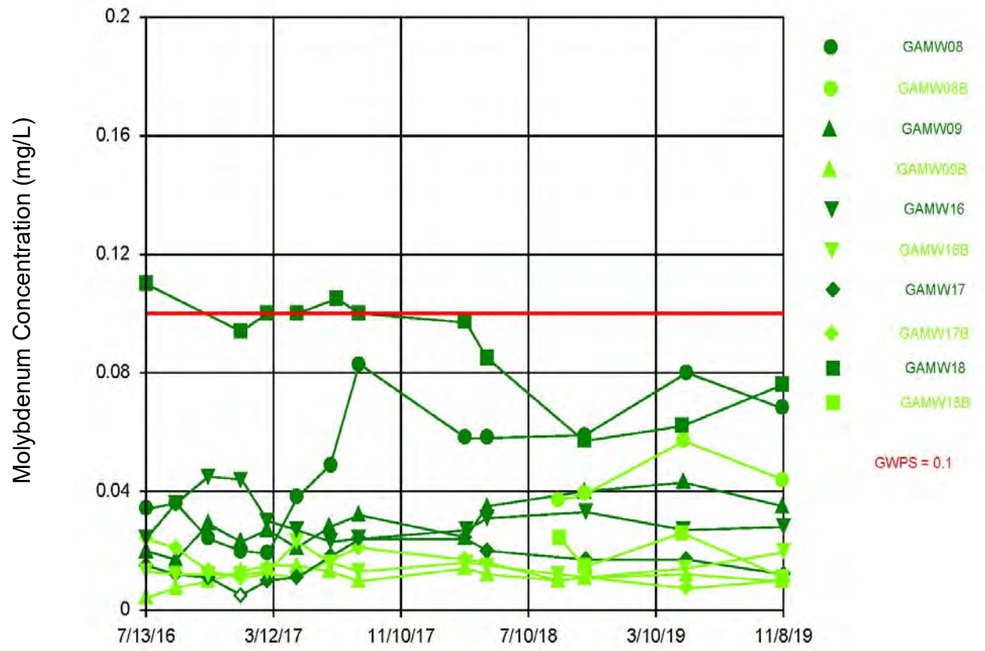
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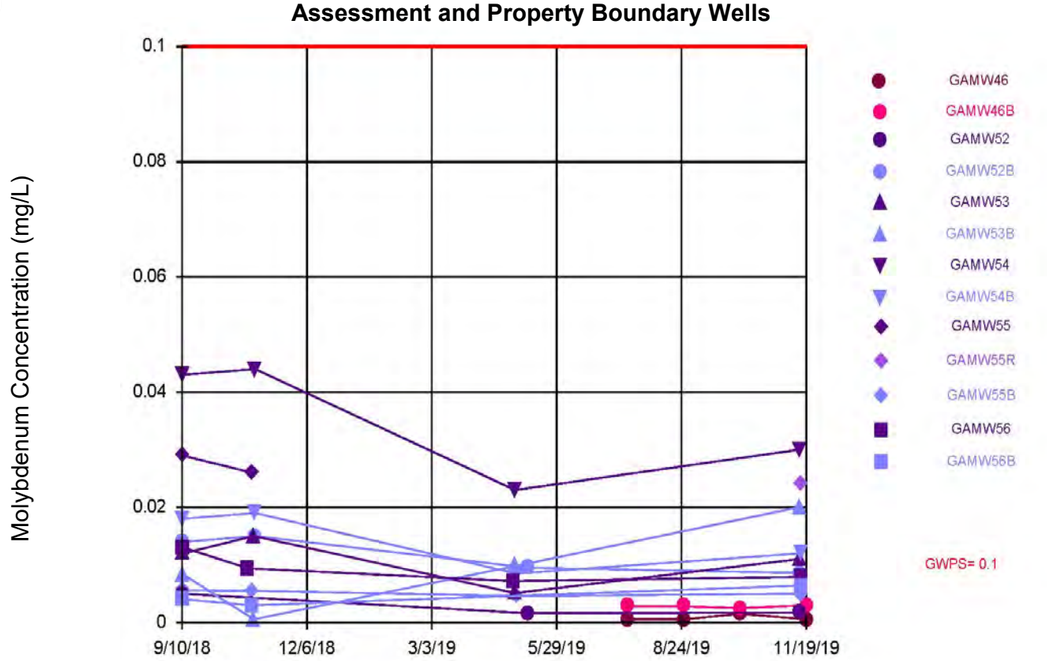
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit

CLIENT
NIPSCO LLC

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GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

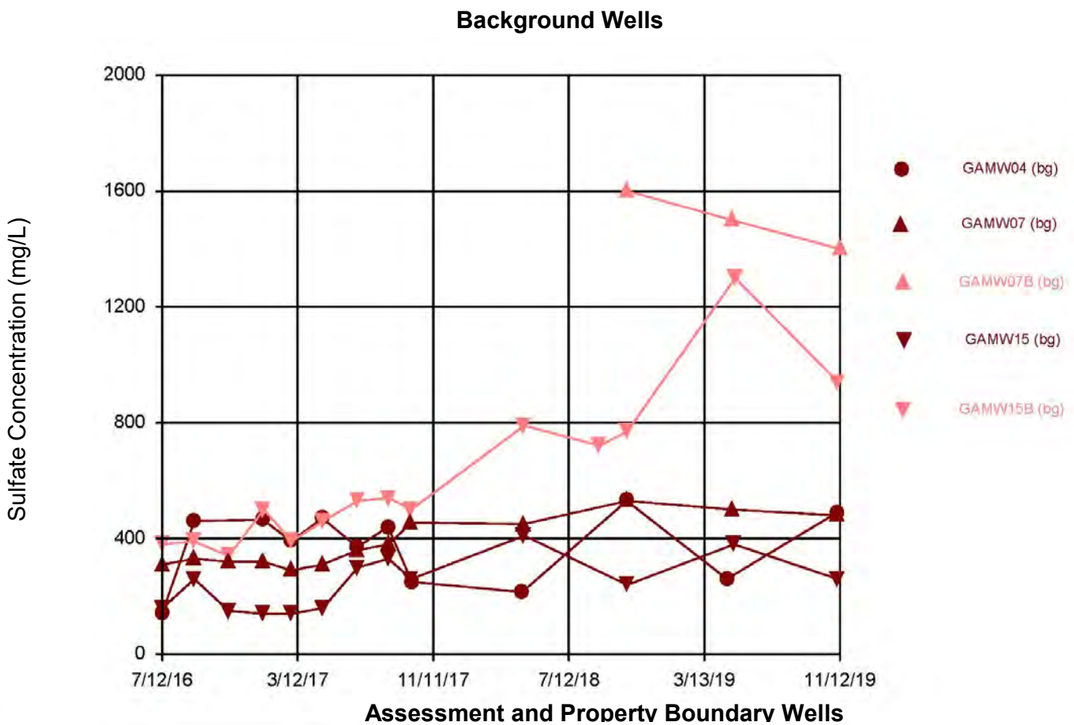
TITLE
Molybdenum Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	8a-c

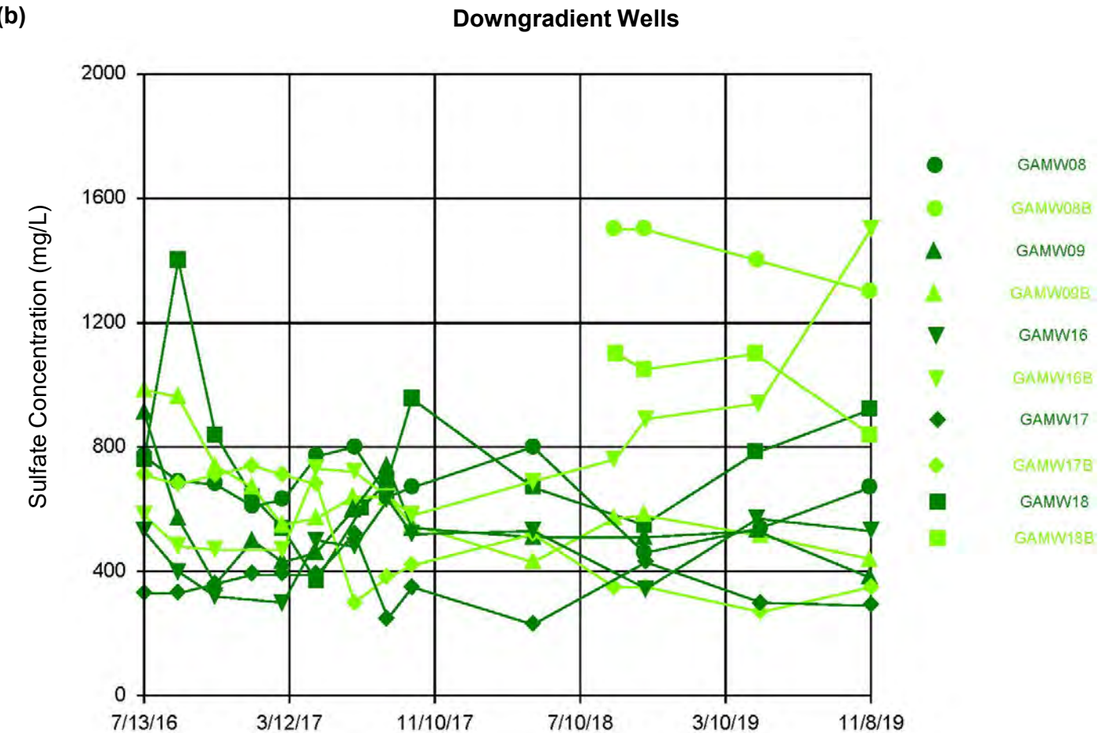
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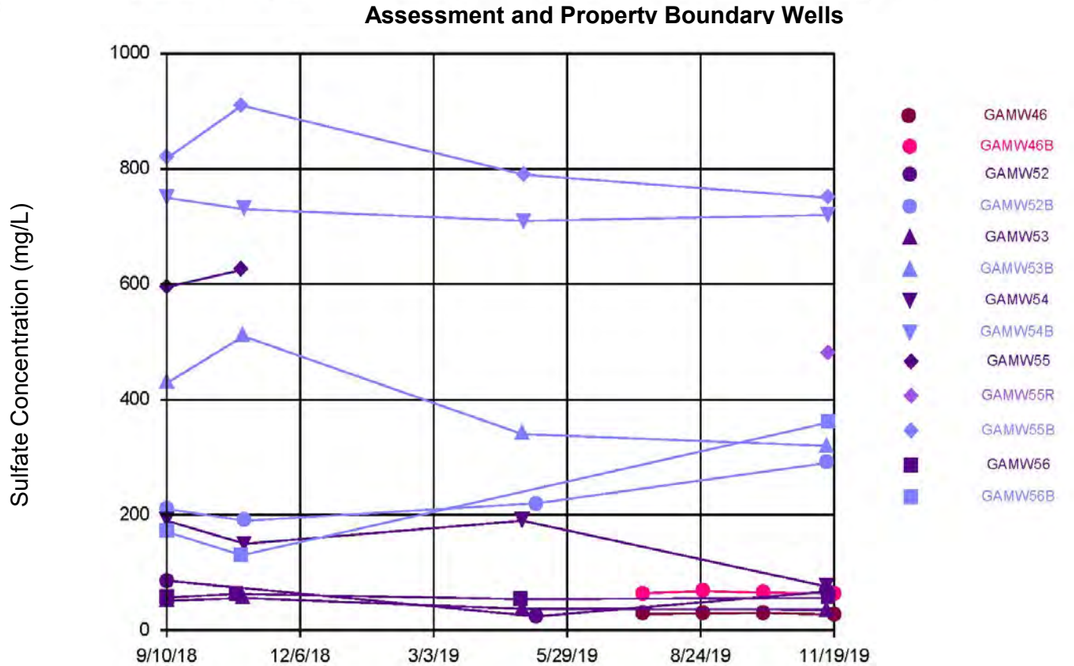
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit

CLIENT
NIPSCO LLC

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GOLDER

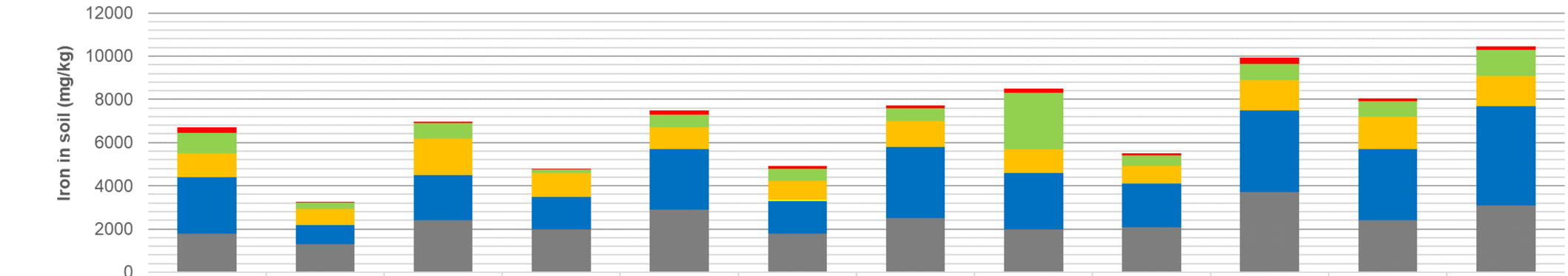
PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Sulfate Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	9a-c

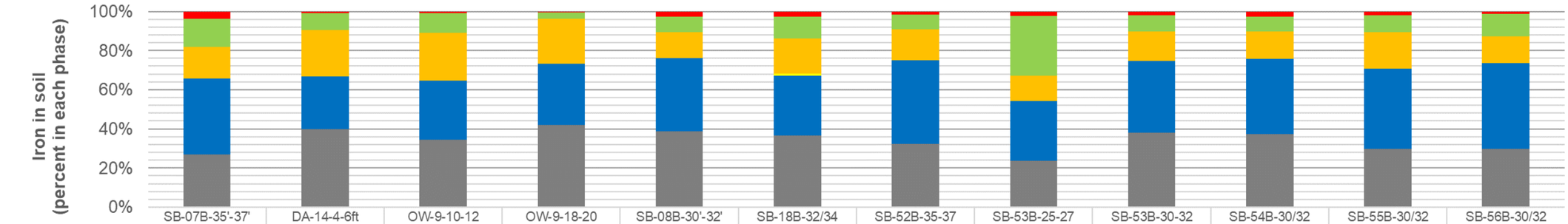
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PATH: https://golderassociates.sharepoint.com/sites/nipscocrgwmonitoring/Shared Documents/RMSGS/Reports/MNA Report | FILE NAME: 2020_11_MNA_RMSGS_Figures.xlsx



	SB-07B-35'-37'	DA-14-4-6ft	OW-9-10-12	OW-9-18-20	SB-08B-30'-32'	SB-18B-32/34	SB-52B-35-37	SB-53B-25-27	SB-53B-30-32	SB-54B-30/32	SB-55B-30/32	SB-56B-30/32
Exchangeable Phase	0	0	0	0	0	0	0	0	0	0	0	0
Carbonate Phase	260	31	61	29	190	130	130	200	99	280	160	140
Amorphous Phase	950	280	710	150	600	550	590	2600	470	740	700	1200
Metal Hydroxide Phase	1100	770	1700	1100	1000	880	1200	1100	830	1400	1500	1400
Organic Phase	0	0	0	0	0	63	0	0	0	0	0	0
Acid/Sulfide Fraction	2600	870	2100	1500	2800	1500	3300	2600	2000	3800	3300	4600
Residual Fraction	1800	1300	2400	2000	2900	1800	2500	2000	2100	3700	2400	3100

Borehole and depth below ground surface (Iron in mg/kg soil)



	SB-07B-35'-37'	DA-14-4-6ft	OW-9-10-12	OW-9-18-20	SB-08B-30'-32'	SB-18B-32/34	SB-52B-35-37	SB-53B-25-27	SB-53B-30-32	SB-54B-30/32	SB-55B-30/32	SB-56B-30/32
Exchangeable Phase	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Carbonate Phase	3.87%	0.95%	0.88%	0.61%	2.54%	2.64%	1.68%	2.35%	1.80%	2.82%	1.99%	1.34%
Amorphous Phase	14.16%	8.61%	10.19%	3.14%	8.01%	11.17%	7.64%	30.59%	8.55%	7.46%	8.68%	11.49%
Metal Hydroxide Phase	16.39%	23.69%	24.39%	23.02%	13.35%	17.88%	15.54%	12.94%	15.09%	14.11%	18.61%	13.41%
Organic Phase	0.00%	0.00%	0.00%	0.00%	0.00%	1.28%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Acid/Sulfide Fraction	38.75%	26.76%	30.12%	31.39%	37.38%	30.47%	42.75%	30.59%	36.37%	38.31%	40.94%	44.06%
Residual Fraction	26.83%	39.99%	34.43%	41.85%	38.72%	36.56%	32.38%	23.53%	38.19%	37.30%	29.78%	29.69%

Borehole and depth below ground surface (Iron in percent of total)

CLIENT
NIPSCO LLC

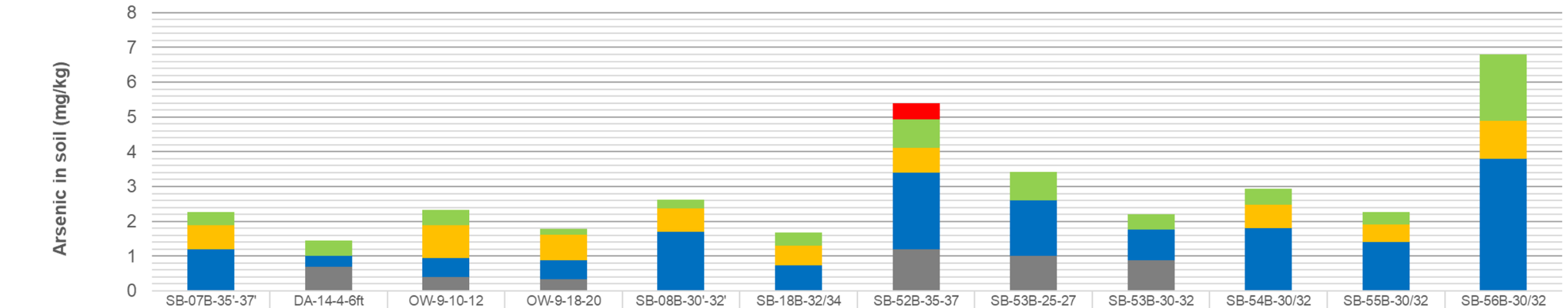
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Iron Sequential Extraction Results

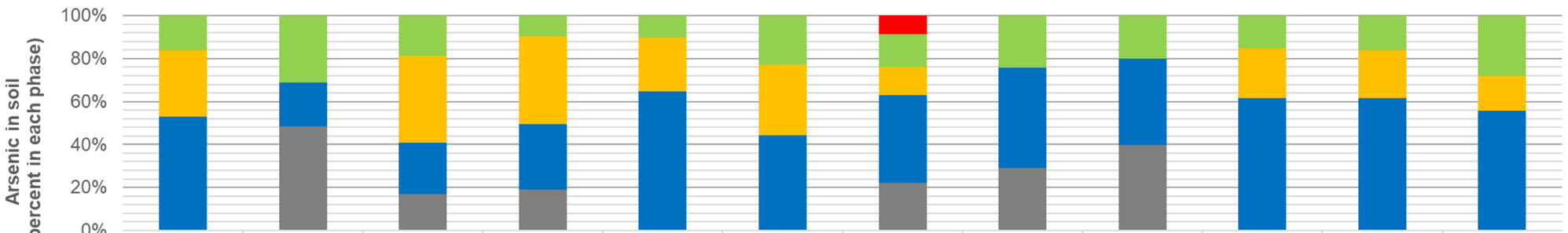
PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	10

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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	SB-07B-35'-37'	DA-14-4-6ft	OW-9-10-12	OW-9-18-20	SB-08B-30'-32'	SB-18B-32/34	SB-52B-35-37	SB-53B-25-27	SB-53B-30-32	SB-54B-30/32	SB-55B-30/32	SB-56B-30/32
Exchangeable Phase	0	0	0	0	0	0	0	0	0	0	0	0
Carbonate Phase	0	0	0	0	0	0	0.46	0	0	0	0	0
Amorphous Phase	0.37	0.45	0.43	0.17	0.27	0.38	0.83	0.83	0.44	0.45	0.37	1.9
Metal Hydroxide Phase	0.69	0	0.94	0.73	0.66	0.55	0.71	0	0	0.68	0.5	1.1
Organic Phase	0	0	0	0	0	0	0	0	0	0	0	0
Acid/Sulfide Fraction	1.2	0.3	0.56	0.54	1.7	0.74	2.2	1.6	0.89	1.8	1.4	3.8
Residual Fraction	0	0.7	0.39	0.34	0	0	1.2	1	0.88	0	0	0

Borehole and depth below ground surface (Arsenic in mg/kg soil)



	SB-07B-35'-37'	DA-14-4-6ft	OW-9-10-12	OW-9-18-20	SB-08B-30'-32'	SB-18B-32/34	SB-52B-35-37	SB-53B-25-27	SB-53B-30-32	SB-54B-30/32	SB-55B-30/32	SB-56B-30/32
Exchangeable Phase	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Carbonate Phase	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	8.52%	0.00%	0.00%	0.00%	0.00%	0.00%
Amorphous Phase	16.37%	31.03%	18.53%	9.55%	10.27%	22.75%	15.37%	24.20%	19.91%	15.36%	16.30%	27.94%
Metal Hydroxide Phase	30.53%	0.00%	40.52%	41.01%	25.10%	32.93%	13.15%	0.00%	0.00%	23.21%	22.03%	16.18%
Organic Phase	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Acid/Sulfide Fraction	53.10%	20.69%	24.14%	30.34%	64.64%	44.31%	40.74%	46.65%	40.27%	61.43%	61.67%	55.88%
Residual Fraction	0.00%	48.28%	16.81%	19.10%	0.00%	0.00%	22.22%	29.15%	39.82%	0.00%	0.00%	0.00%

Borehole and depth below ground surface (Arsenic in percent of total)

CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

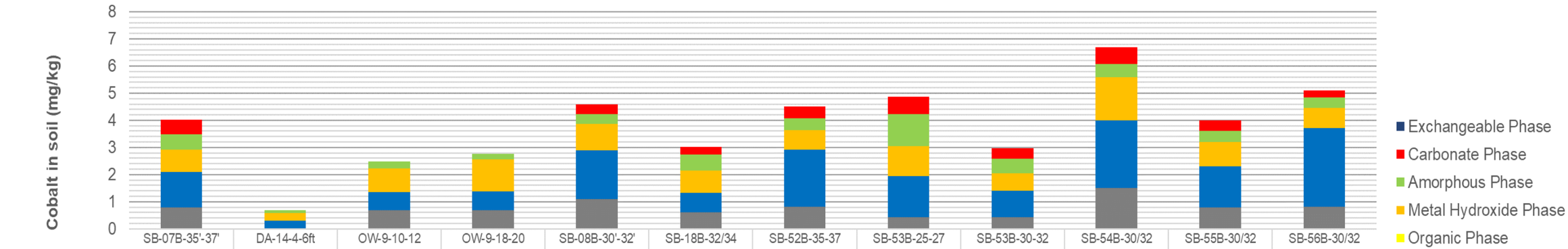
PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Arsenic Sequential Extraction Results

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	11

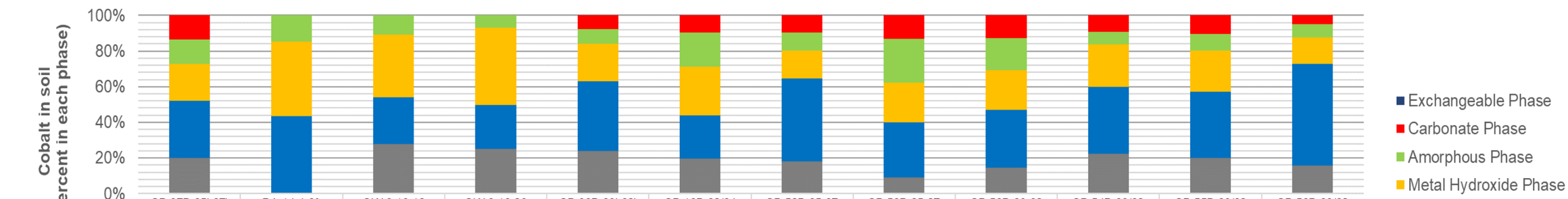
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PATH: https://golderassociates.sharepoint.com/sites/nipscocrgwmonitoring/Shared Documents/RMSGS/Reports/MNA Report | FILE NAME: 2020_11_MNA_RMSGS_Figures.xlsx



	SB-07B-35'-37'	DA-14-4-6ft	OW-9-10-12	OW-9-18-20	SB-08B-30'-32'	SB-18B-32/34	SB-52B-35-37	SB-53B-25-27	SB-53B-30-32	SB-54B-30/32	SB-55B-30/32	SB-56B-30/32
Exchangeable Phase	0	0	0	0	0	0	0	0	0	0	0	0
Carbonate Phase	0.54	0	0	0	0.35	0.29	0.44	0.63	0.38	0.62	0.41	0.26
Amorphous Phase	0.55	0.1	0.27	0.19	0.37	0.58	0.45	1.2	0.53	0.47	0.39	0.37
Metal Hydroxide Phase	0.83	0.29	0.87	1.2	0.97	0.83	0.71	1.1	0.66	1.6	0.91	0.76
Organic Phase	0	0	0	0	0	0	0	0	0	0	0	0
Acid/Sulfide Fraction	1.3	0.3	0.66	0.68	1.8	0.73	2.1	1.5	0.97	2.5	1.5	2.9
Residual Fraction	0.8	0	0.69	0.69	1.1	0.6	0.82	0.44	0.43	1.5	0.8	0.81

Borehole and depth below ground surface (Cobalt in mg/kg soil)



	SB-07B-35'-37'	DA-14-4-6ft	OW-9-10-12	OW-9-18-20	SB-08B-30'-32'	SB-18B-32/34	SB-52B-35-37	SB-53B-25-27	SB-53B-30-32	SB-54B-30/32	SB-55B-30/32	SB-56B-30/32
Exchangeable Phase	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Carbonate Phase	13.43%	0.00%	0.00%	0.00%	7.63%	9.57%	9.73%	12.94%	12.79%	9.27%	10.22%	5.10%
Amorphous Phase	13.68%	14.49%	10.84%	6.88%	8.06%	19.14%	9.96%	24.64%	17.85%	7.03%	9.73%	7.25%
Metal Hydroxide Phase	20.65%	42.03%	34.94%	43.48%	21.13%	27.39%	15.71%	22.59%	22.22%	23.92%	22.69%	14.90%
Organic Phase	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Acid/Sulfide Fraction	32.34%	43.48%	26.51%	24.64%	39.22%	24.09%	46.46%	30.80%	32.66%	37.37%	37.41%	56.86%
Residual Fraction	19.90%	0.00%	27.71%	25.00%	23.97%	19.80%	18.14%	9.03%	14.48%	22.42%	19.95%	15.88%

Borehole and depth below ground surface (Cobalt in percent of total)

CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

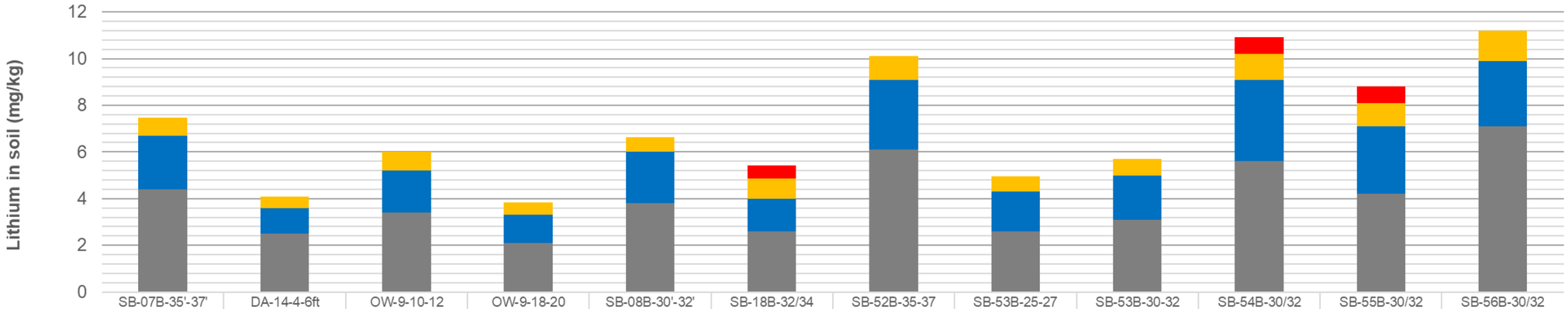
PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Cobalt Sequential Extraction Results

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	12

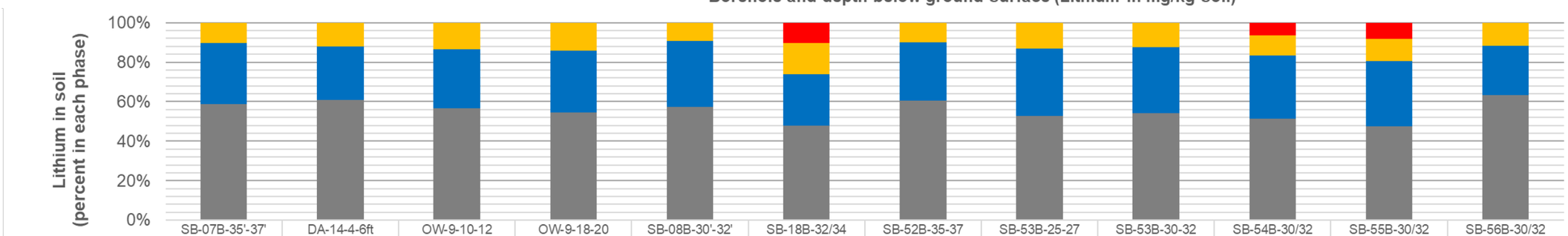
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	SB-07B-35'-37'	DA-14-4-6ft	OW-9-10-12	OW-9-18-20	SB-08B-30'-32'	SB-18B-32/34	SB-52B-35-37	SB-53B-25-27	SB-53B-30-32	SB-54B-30/32	SB-55B-30/32	SB-56B-30/32
Exchangeable Phase	0	0	0	0	0	0	0	0	0	0	0	0
Carbonate Phase	0	0	0	0	0	0.56	0	0	0	0.71	0.72	0
Amorphous Phase	0	0	0	0	0	0	0	0	0	0	0	0
Metal Hydroxide Phase	0.78	0.5	0.81	0.55	0.62	0.86	1	0.64	0.71	1.1	1	1.3
Organic Phase	0	0	0	0	0	0	0	0	0	0	0	0
Acid/Sulfide Fraction	2.3	1.1	1.8	1.2	2.2	1.4	3	1.7	1.9	3.5	2.9	2.8
Residual Fraction	4.4	2.5	3.4	2.1	3.8	2.6	6.1	2.6	3.1	5.6	4.2	7.1

Borehole and depth below ground surface (Lithium in mg/kg soil)



	SB-07B-35'-37'	DA-14-4-6ft	OW-9-10-12	OW-9-18-20	SB-08B-30'-32'	SB-18B-32/34	SB-52B-35-37	SB-53B-25-27	SB-53B-30-32	SB-54B-30/32	SB-55B-30/32	SB-56B-30/32
Exchangeable Phase	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Carbonate Phase	0.00%	0.00%	0.00%	0.00%	0.00%	10.33%	0.00%	0.00%	0.00%	6.51%	8.16%	0.00%
Amorphous Phase	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Metal Hydroxide Phase	10.43%	12.20%	13.48%	14.29%	9.37%	15.87%	9.90%	12.96%	12.43%	10.08%	11.34%	11.61%
Organic Phase	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Acid/Sulfide Fraction	30.75%	26.83%	29.95%	31.17%	33.23%	25.83%	29.70%	34.41%	33.27%	32.08%	32.88%	25.00%
Residual Fraction	58.82%	60.98%	56.57%	54.55%	57.40%	47.97%	60.40%	52.63%	54.29%	51.33%	47.62%	63.39%

Borehole and depth below ground surface (Lithium in percent of total)

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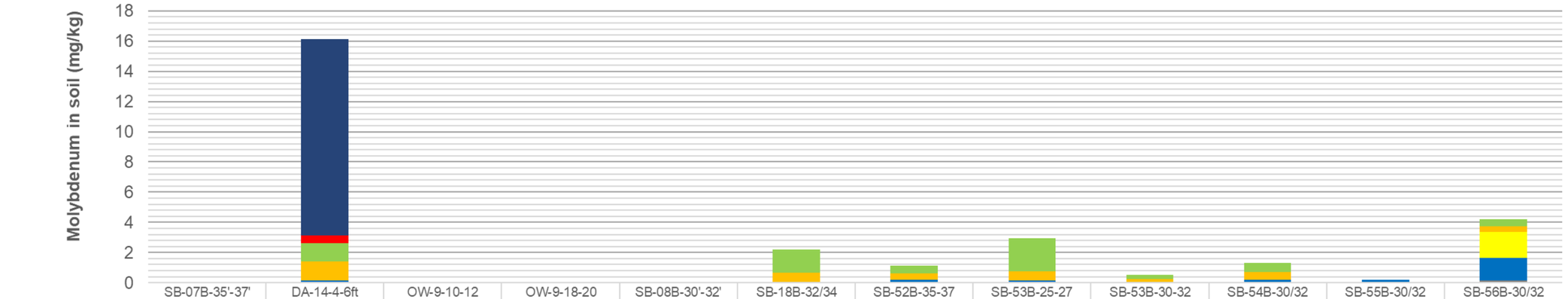
PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Lithium Sequential Extraction Results

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	13

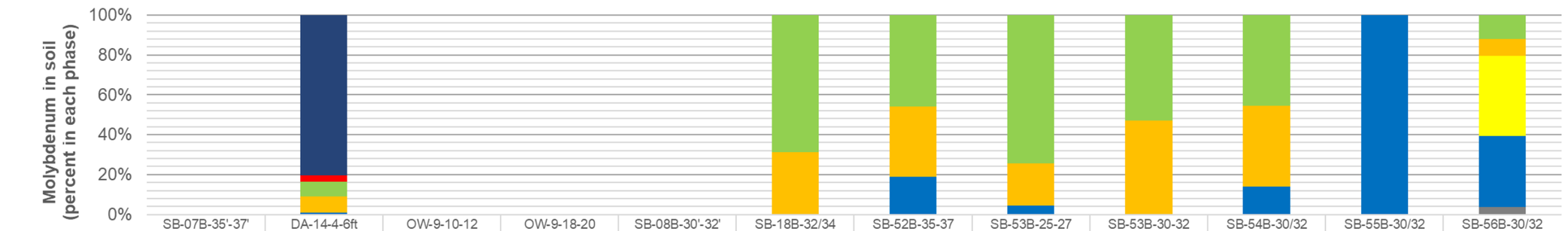
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	SB-07B-35'-37'	DA-14-4-6ft	OW-9-10-12	OW-9-18-20	SB-08B-30'-32'	SB-18B-32/34	SB-52B-35-37	SB-53B-25-27	SB-53B-30-32	SB-54B-30/32	SB-55B-30/32	SB-56B-30/32
Exchangeable Phase	0	13	0	0	0	0	0	0	0	0	0	0
Carbonate Phase	0	0.51	0	0	0	0	0	0	0	0	0	0
Amorphous Phase	0	1.2	0	0	0	1.5	0.51	2.2	0.27	0.59	0	0.5
Metal Hydroxide Phase	0	1.3	0	0	0	0.68	0.39	0.63	0.24	0.53	0	0.36
Organic Phase	0	0	0	0	0	0	0	0	0	0	0	1.7
Acid/Sulfide Fraction	0	0.13	0	0	0	0	0.21	0.13	0	0.18	0.2	1.5
Residual Fraction	0	0	0	0	0	0	0	0	0	0	0	0.16

Borehole and depth below ground surface (Molybdenum in mg/kg soil)



	SB-07B-35'-37'	DA-14-4-6ft	OW-9-10-12	OW-9-18-20	SB-08B-30'-32'	SB-18B-32/34	SB-52B-35-37	SB-53B-25-27	SB-53B-30-32	SB-54B-30/32	SB-55B-30/32	SB-56B-30/32
Exchangeable Phase	0.00%	80.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Carbonate Phase	0.00%	3.16%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Amorphous Phase	0.00%	7.43%	0.00%	0.00%	0.00%	68.81%	45.95%	74.32%	52.94%	45.38%	0.00%	11.85%
Metal Hydroxide Phase	0.00%	8.05%	0.00%	0.00%	0.00%	31.19%	35.14%	21.28%	47.06%	40.77%	0.00%	8.53%
Organic Phase	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	40.28%
Acid/Sulfide Fraction	0.00%	0.81%	0.00%	0.00%	0.00%	0.00%	18.92%	4.39%	0.00%	13.85%	100.00%	35.55%
Residual Fraction	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.79%

Borehole and depth below ground surface (Molybdenum in percent of total)

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PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

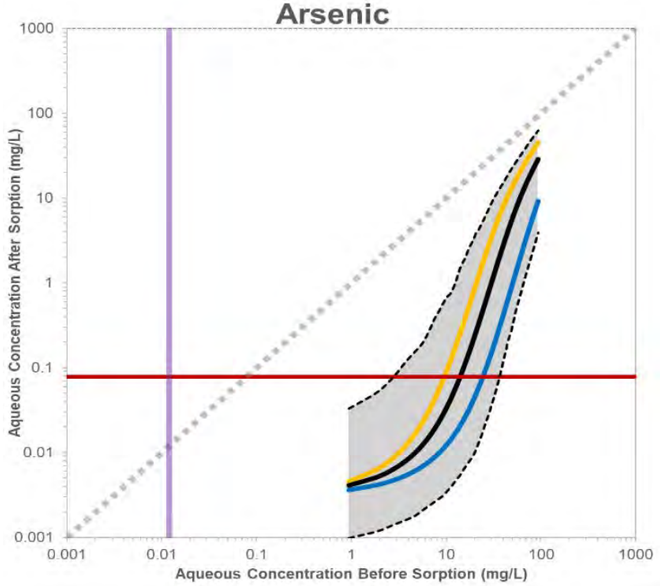
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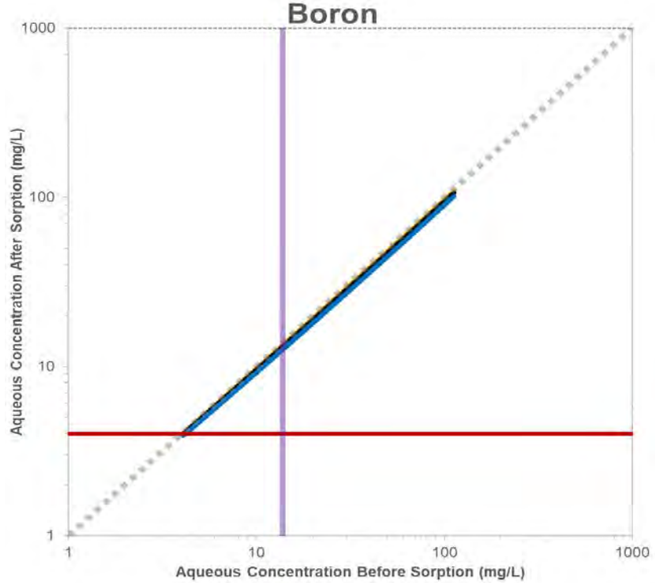
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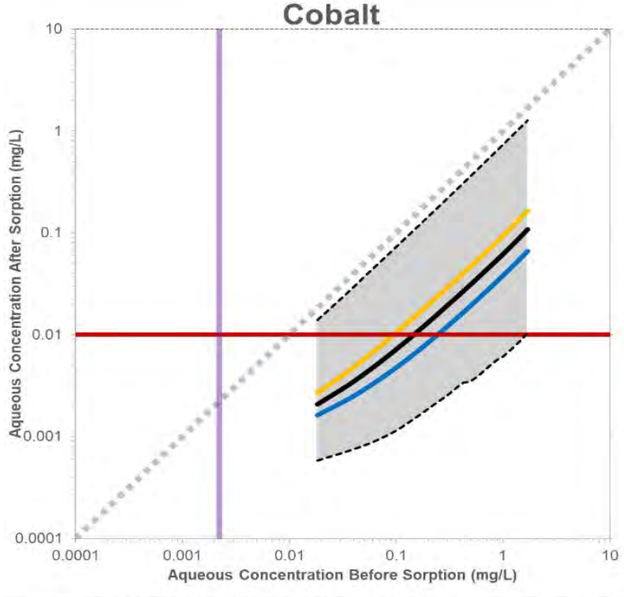
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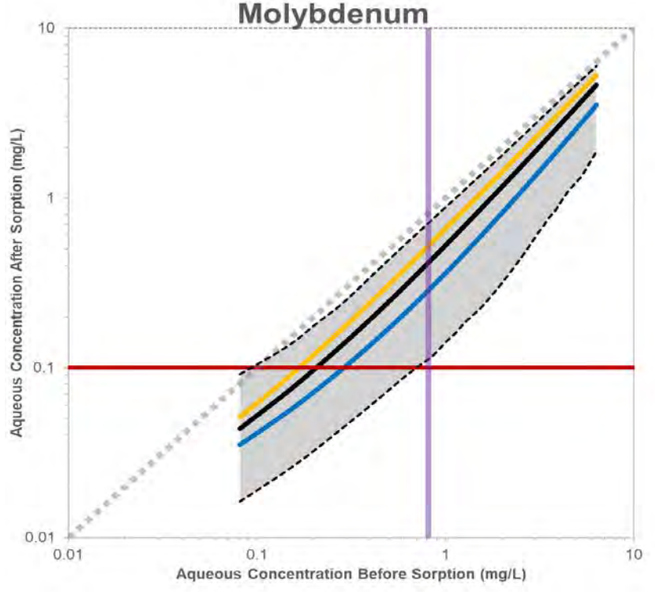
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(c)



(d)



- Minimum Hfo and Hao Contents (Geometric mean of all simulations)
- Mean Hfo and Hao Contents (Geometric mean of all simulations)
- Maximum Hfo and Hao Contents (Geometric mean of all simulations)
- 5th to 95th Precentile of Min, Mean, and Max Simulations
- Groundwater Protection Standard
- Porewater
- 1:1 Line

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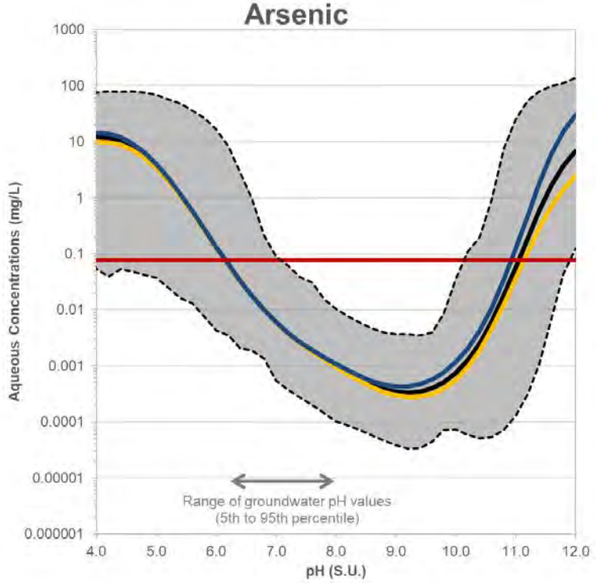
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Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Capacity of Soils to Adsorb Constituents: Aqueous Concentrations Prior to Equilibrating with Hfo and Hao versus Aqueous Concentrations After Equilibrating

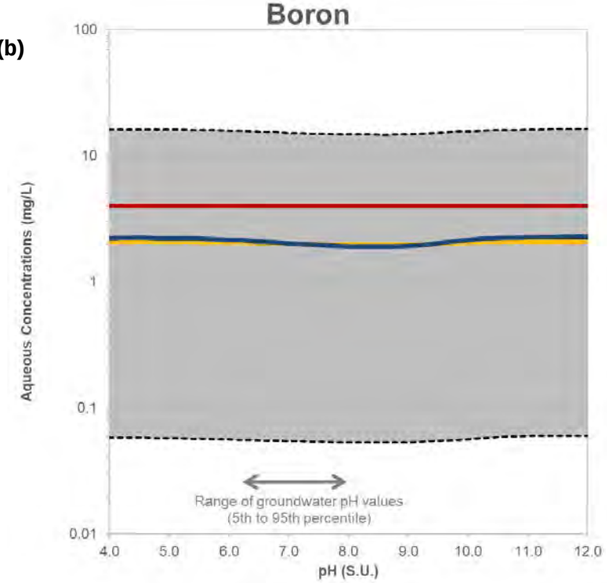
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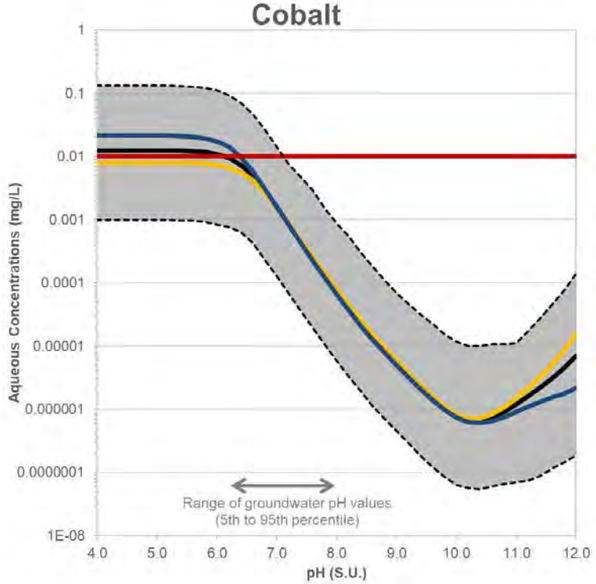
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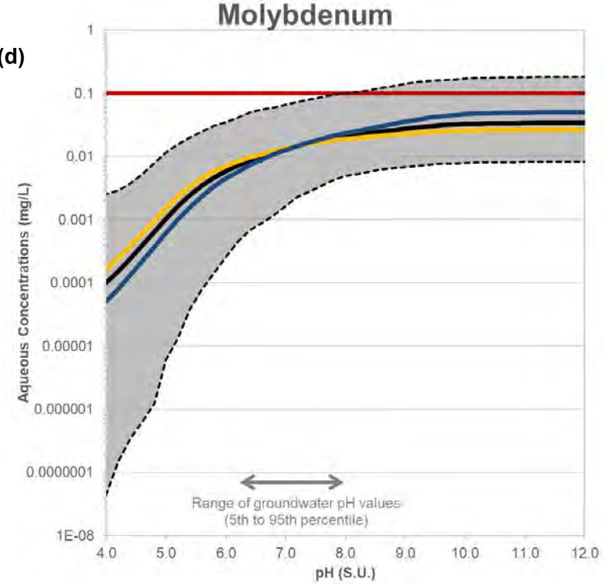
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Minimum Hfo and Hao Contents (Geometric mean of all simulations)
Mean Hfo and Hao Contents (Geometric mean of all simulations)
Maximum Hfo and Hao Contents (Geometric mean of all simulations)
5th to 95th Precentile of Min, Mean, and Max Simulations
Groundwater Protection Standard

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Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

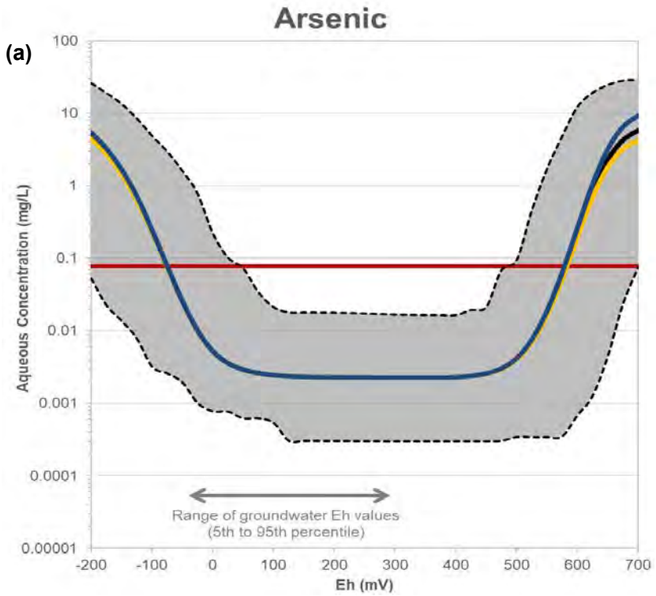
TITLE
Stability of Adsorbed Constituents Versus pH

PROJECT NO.	PHASE	REV.	FIGURE
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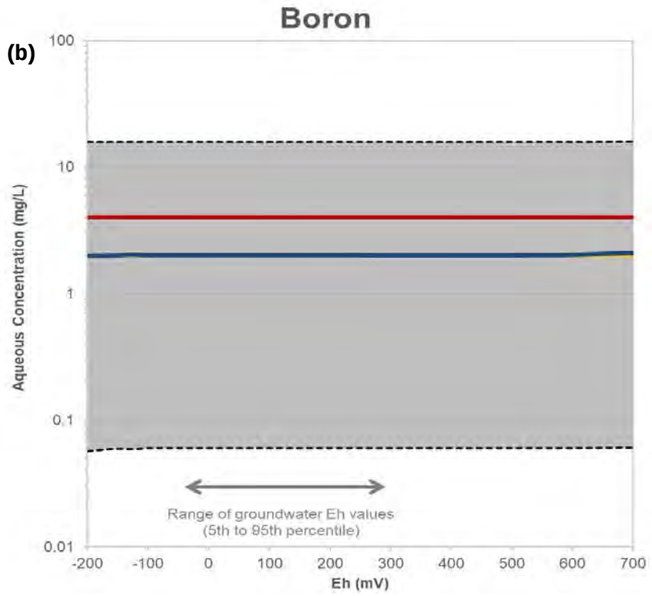
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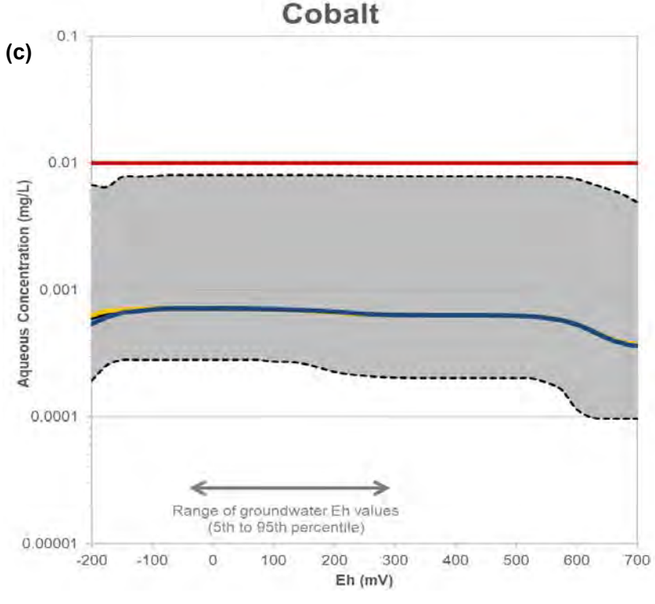
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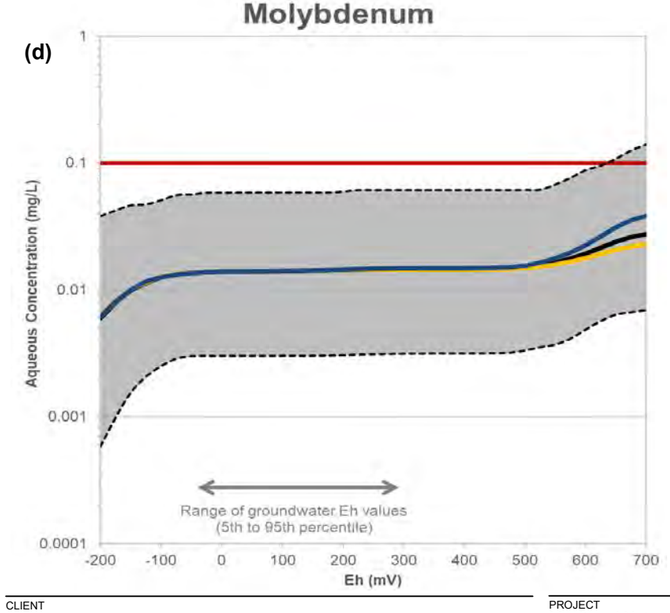
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Minimum Hfo and Hao Contents (Geometric mean of all simulations)
Mean Hfo and Hao Contents (Geometric mean of all simulations)
Maximum Hfo and Hao Contents (Geometric mean of all simulations)
5th to 95th Precentile of Min, Mean, and Max Simulations
Groundwater Protection Standard

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PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

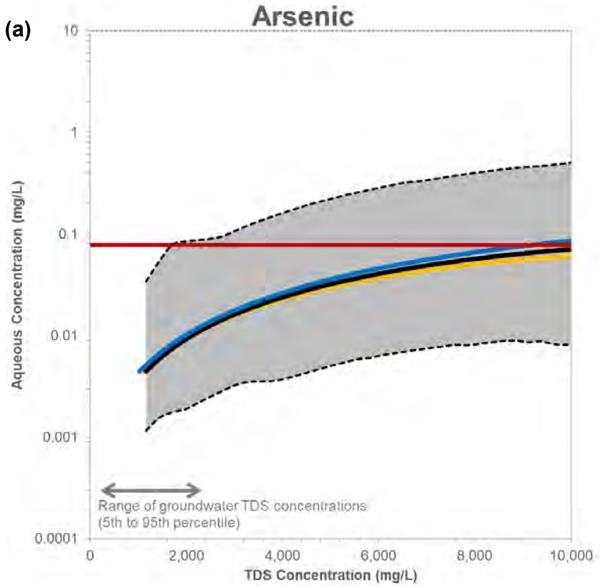
TITLE
Stability of Adsorbed Constituents Versus Eh

PROJECT NO.	PHASE	REV.	FIGURE
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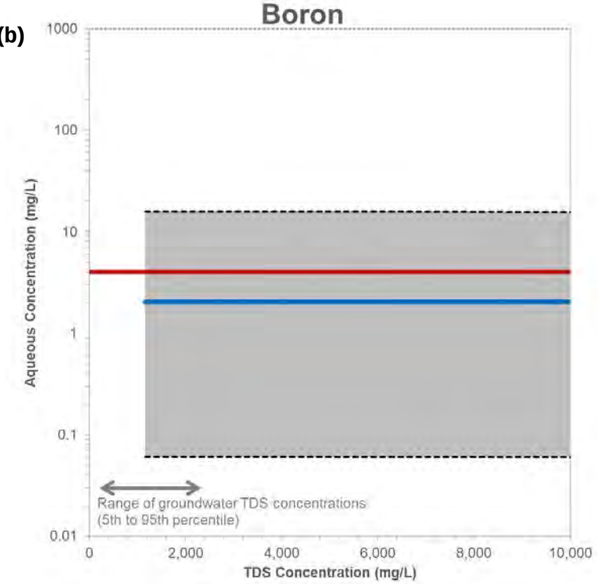
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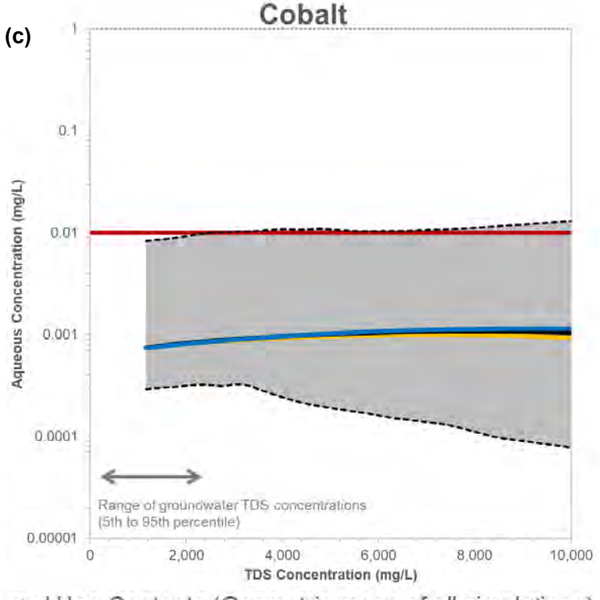
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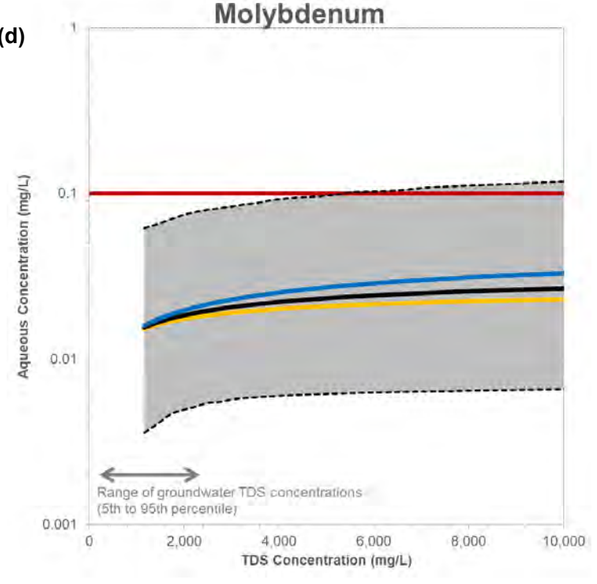
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(c)



(d)



Minimum Hfo and Hao Contents (Geometric mean of all simulations)
Mean Hfo and Hao Contents (Geometric mean of all simulations)
Maximum Hfo and Hao Contents (Geometric mean of all simulations)
5th to 95th Precentile of Min, Mean, and Max Simulations
Groundwater Protection Standard

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PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Stability of Adsorbed Constituents Versus TDS

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	18

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APPENDIX A

Groundwater and Porewater Monitoring Data

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW04																
	Sample Date	2016-07-12	2016-09-08	2016-11-09	2017-01-10		2017-03-01	2017-04-26	2017-06-28	2017-08-22	2017-10-04	2018-03-13		2018-04-20		2018-10-25	2019-04-23	2019-11-07
	Sample Type	N	N	N	FD	N	N	N	N	N	N	FD	N	FD	N	N	N	N
Chemical Name	Unit																	
CCR Appendix III																		
Boron	mg/L	0.48	1.4	2.4	1.1	1	1.2	0.74	0.92	1.2	0.54			0.74	0.72	0.78	0.74	1.3
Calcium	mg/L	110	230	300	270	240	230	220	200	200	140			140	140	210	130	190
Chloride	mg/L	2.2	27	69	13	14	13	5.4	12	13	4.5			3.7 J	4.4	10	3.7	9.5
Fluoride	mg/L	0.92 J+	0.2 J	10 U	0.19 J	0.17 J	5 U	5 U	0.19 J	0.21 J	0.24 J	0.15 J	5 U	5 U	0.17 J-	0.26	0.16 J+	0.23
pH	SU	7.22	6.83	6.75		6.93	7.01	6.76	6.88	7.21	7.28		6.95		7.2	6.39	7	7.14
Sulfate	mg/L	140 J-	460	480	460	470	390	470	370	440	250			220	210	530	260	490
Total Dissolved Solids	mg/L	420	990	1400	1000	1000	890	870	880	920	610			580 J	580	980	600	900
CCR Appendix IV																		
Antimony	mg/L	0.002 U	0.002 U	0.00027 J	0.002 U	0.00057 J	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U	0.002 U			0.002 U	0.00065 J	0.00092 J
Arsenic	mg/L	0.0059	0.013	0.0052	0.0058	0.0072	0.005 U	0.0099	0.012	0.012		0.004 J	0.0054			0.014	0.0023 J	0.0018 J
Barium	mg/L	0.041	0.077	0.11	0.095	0.079	0.089	0.069	0.084	0.09		0.11	0.077			0.074	0.068	0.066
Beryllium	mg/L	0.00027 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.00048 J	0.00053 J	0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.00036 J	0.00036 J	0.0052 J	0.002 U	0.002 U	0.002 U	0.002 U		0.0011 J	0.0012 J			0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.00031 J	0.00064 J	0.0061	0.0058	0.0038	0.0049	0.003	0.0023		0.0028	0.0031			0.0026	0.0011	0.00043 J
Fluoride	mg/L	0.92 J+	0.2 J	10 U	0.19 J	0.17 J	5 U	5 U	0.19 J	0.21 J	0.24 J	0.15 J	5 U	5 U	0.17 J-	0.26	0.16 J+	0.23
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.0018 J	0.008 U	0.008 U	0.0021 J	0.0023 J	0.0033 J	0.0033 J	0.0062 J	0.0062 J		0.008 U	0.008 U			0.0023 J	0.0045 J	0.0028 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U	0.0002 U			0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.0075 J	0.023	0.073	0.037	0.038	0.034	0.016	0.02	0.034		0.0048 J	0.024			0.039	0.024	0.055
Radium, Total	pci/L	5 U	0.583	0.697	0.804	0.515 U	0.362 U	0.379 U	0.364 U	0.352 U		1.35 J+	0.778 J+			0.473	0.591	
Radium-226	pci/L	1 U	0.138 U	0.346 U	0.301 U	0.242 U	0.121 U	0.117 U	0.119 J+	0.118		0.177	0.0881			0.306	0.311 U	
Radium-228	pci/L	1 U	0.498 U	0.495 U	0.677 J+	0.515 U	0.362 U	0.379 U	0.364 U	0.352 U		1.17 J+	0.69 J+			0.462 U	0.405	
Selenium	mg/L	0.005 U	0.005 U	0.00064 J	0.0017 J	0.0021 J	0.005 U	0.005 U	0.005 U	0.005 U		0.001 J	0.001 J			0.005 U	0.0013 J	0.0052
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U
Supplemental Parameters																		
Alkalinity, Bicarbonate (HCO3)	mg/L																	
Alkalinity, Carbonate (CO3)	mg/L																	
Alkalinity, Hydroxide (OH)	mg/L																	
Alkalinity, Total	mg/L															230	190	270
Ferric Iron	mg/L															6.9		
Ferrous Iron	mg/L															3.1 J		
Iron	mg/L																2.3	0.083 J
Magnesium	mg/L															31	18	31
Manganese	mg/L																0.012 J-	0.0078 J
Nitrate as N	mg/L																0.1 U	0.1 U
Nitrite as N	mg/L																	
Nitrogen, Nitrate-Nitrite	mg/L															0.39		
Phosphorus (as phosphate)	mg/L															0.9	0.31 U	0.31 UJ
Potassium	mg/L															3.3 J	3.1 J	3.2 J
Sodium	mg/L															13	12	36
Sample Parameters																		
Dissolved Oxygen	mg/L	0.09	0.58	0.37		1.82	1.47	0.12	0.3	0.52	0.09		0.66		2.3	0.15	7.08	2.55
Oxidation Reduction Potential	mV	59.6	-24	-6.9		-31.7	14	-57.8	-45	-27	-105.8		-181.8		-81.2	-58.1	19	-60.7
Eh	mV	259.6	176.0	193.1		168.3	214.0	142.2	155.0	173.0	94.2		18.2		118.8	141.9	219.0	139.3
pH	SU	7.22	6.83	6.75		6.93	7.01	6.76	6.88	7.21	7.28		6.95		7.2	6.39	7	7.14
Specific Conductance	uS/cm	595	1345	1681		1109	910	1137	911	1153	813		562		770	1311	549	866
Temperature	deg C	13	17.3	16.3		10.5	8.05	10.2	13.1	15.9	16.1		7.55		3.5	15.5	4.2	13.2
Turbidity	NTU	4.04	1.48	2.21		2.28	4.26	4.04	4.88	1.65	0.51		4.92		3.12	1.92	4.48	1.38

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW07															GAMW07B			
	Sample Date	2016-07-12	2016-09-08	2016-11-09	2017-01-10	2017-03-01	2017-04-26	2017-06-29	2017-08-23	2017-10-03		2018-03-15	2018-04-23	2018-10-26	2019-05-02	2019-11-08	2018-09-06	2018-10-26	2019-05-02	2019-11-12
	Sample Type	N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N	N	N	N
Chemical Name	Unit																			
CCR Appendix III																				
Boron	mg/L	1.2	1	0.91	0.91	1	0.68	0.67	0.68	0.71	0.72		1.2	1.3	0.85	0.85	20	23	18	15
Calcium	mg/L	170	190	200	170	170	190	220	190	220	220		210	230	220	180	370	430	380	400
Chloride	mg/L	7.8	6.6	5.3	6	7.6	2.8	3 J	3.2 J	3 J	3.6 J		4.7 J	6.3	6.5	4.8	10 U	250	170	150
Fluoride	mg/L	0.72 J+	0.91 J	0.8 J	0.85 J	0.66 J	0.76 J	0.79 J	0.66 J	1.1 J	0.93 J	0.58 J	0.57 J	0.73	0.97	0.88	10 U	1.5	1.3	1.2
pH	SU	7.03	7.27	7.04	7.15	7.2	7.17	6.57	7.2		7.1	7.28	7.35	5.71	7.2	7.44	8.29	6.78	7.58	7.13
Sulfate	mg/L	310 J-	330	320	320	290	310	360	380	460	450		450	530	500	480	10 U	1600	1500	1400
Total Dissolved Solids	mg/L	770	830	840	750	710	810	970	910	970	1000		900	970	1100	940	2700	2600	920	2300
CCR Appendix IV																				
Antimony	mg/L	0.00035 J	0.00039 J	0.00035 J	0.00028 J	0.002 U	0.002 U	0.002 U	0.002 U			0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.0013 J	0.0016 J	0.0018 J	0.0028 J	0.005 U	0.0028 J	0.0025 J	0.0016 J			0.005 U		0.0012 J	0.0019 J	0.0011 J	0.0028 J	0.0015 J	0.0019 J	0.0017 J
Barium	mg/L	0.052	0.055	0.056	0.042	0.05	0.05	0.059	0.059			0.056		0.064	0.053	0.043	0.072	0.063	0.053	0.043
Beryllium	mg/L	0.00011 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0003 J	0.00022 J			0.001 U		0.00047 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.00047 J	0.00046 J	0.002 U	0.002 U	0.002 U	0.002 U			0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.0056	0.0077	0.0055	0.0038	0.0044	0.0063	0.01	0.0095			0.006		0.01	0.0074	0.0049	0.00074 J	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	0.72 J+	0.91 J	0.8 J	0.85 J	0.66 J	0.76 J	0.79 J	0.66 J	1.1 J	0.93 J	0.58 J	0.57 J	0.73	0.97	0.88	10 U	1.5	1.3	1.2
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0007 J			0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.0034 J	0.008 U	0.008 U	0.0035 J	0.0031 J	0.0041 J	0.0037 J	0.0038 J			0.0024 J		0.0054 J	0.0041 J	0.0033 J	0.0043 J	0.0045 J	0.004 J	0.0035 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ			0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.0084 J	0.0098 J	0.0095 J	0.01 U	0.01 U	0.0083 J	0.0081 J	0.007 J			0.0066 J		0.0087 J	0.0097 J	0.0087 J	0.015	0.017	0.025	0.026
Radium, Total	pci/L	1.59	0.696	0.548	0.412 U	0.42 U	0.371 U	0.45	0.588			0.749 J+		0.823 J+	0.37 U		2.63	2.6 J+	2.31	
Radium-226	pci/L	0.667 J+	0.289	0.374	0.237 U	0.186	0.155	0.232 J+	0.3			0.163		0.483 J+	0.305 U		1.16	1.56 J+	1.17	
Radium-228	pci/L	0.923	0.406	0.462 U	0.412 U	0.42 U	0.371 U	0.262 U	0.413 U			0.585 J+		0.365 U	0.37 U		1.47	1.04	1.14	
Selenium	mg/L	0.005 U	0.005 U	0.003 J	0.003 J	0.005 U	0.008	0.0054	0.005			0.0028 J		0.0016 J	0.0045 J	0.0019 J	0.0012 J	0.005 U	0.005 U	0.005 U
Thallium	mg/L	0.00011 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.00024 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Supplemental Parameters																				
Alkalinity, Bicarbonate (HCO3)	mg/L																180			
Alkalinity, Carbonate (CO3)	mg/L																5 U			
Alkalinity, Hydroxide (OH)	mg/L																5 U			
Alkalinity, Total	mg/L													260	270	250	180	180	170	170
Ferric Iron	mg/L													0.035 J			6.7 J	6.8		
Ferrous Iron	mg/L													0.05 UJ			0.1 R	1.1 J		
Iron	mg/L														0.067 J	0.09 J			5.3	5.5
Magnesium	mg/L													39	41	38	72	87	73	72
Manganese	mg/L														0.46	0.61			0.46	0.49
Nitrate as N	mg/L														3.3	1.6	0.05 R		0.1 U	0.1 U
Nitrite as N	mg/L																0.05 R			
Nitrogen, Nitrate-Nitrite	mg/L													0.53				0.049 J		
Phosphorus (as phosphate)	mg/L													0.31 U	0.31 U	0.31 U	0.031 U	0.31 U	0.31 U	0.31 U
Potassium	mg/L													6.6	5.5	6.5	12	13	13	13
Sodium	mg/L													14	14	9.9	290	240	230	120
Sample Parameters																				
Dissolved Oxygen	mg/L	0.6	1.81	0.59	0.52	0.51	1.96	1.02	0.84		0.48	0.8	3.52	2.64	0.81	0.38	0.13	0.67	0.19	0.2
Oxidation Reduction Potential	mV	111.2	64.2	-6.4	71.3	65.3	76.9	291.1	8.5		95.4	-55	-98.7	-233.3	135.1	-131.8	-197.6	-230.2	34.9	-196.7
Eh	mV	311.2	264.2	193.6	271.3	265.3	276.9	491.1	208.5		295.4	145.0	101.3	-33.3	335.1	68.2	2.4	-30.2	234.9	3.3
pH	SU	7.03	7.27	7.04	7.15	7.2	7.17	6.57	7.2		7.1	7.28	7.35	5.71	7.2	7.44	8.29	6.78	7.58	7.13
Specific Conductance	uS/cm	966	1072	1106	928	832	1121	1151	1157		1273	760	1060	1240	975	828	5178	3237	2357	1686
Temperature	deg C	14.4	19.2	16.7	12.9	10.63	11.8	14.6	16.5		18	10	10	16.95	10.3	15.3	15.03	13.86	12.4	12.9
Turbidity	NTU	4.6	4.51	1.26	3.2	4.76	2.17	2.87	0.9		0.49	1.3	1.75	1.08	2.72	4.58	4.48	3.01	2.86	1.11

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW08														GAMW08B					
Sample Date		2016-07-13	2016-09-08	2016-11-09	2017-01-10	2017-03-02	2017-04-27	2017-06-29	2017-08-23	2017-10-04	2018-03-14	2018-04-23	2018-10-26	2019-05-08	2019-11-07	2018-09-07		2018-10-26		2019-05-03	2019-11-07
Sample Type		N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	FD	N	N	N
Chemical Name	Unit																				
CCR Appendix III																					
Boron	mg/L	3.5	3.9	3.2	3.4	3.3	3.2	2.9	2.2	3.7		2.4	1.8	1.4	2.5		18		15	14	13
Calcium	mg/L	310	310	300	260	270	310	340	270	290		360	230	250	280		380		370	350	340
Chloride	mg/L	88	71	89	99	110	86	83	39	87		64	56	49	66		240		180	160	180
Fluoride	mg/L	1 J+	1.2 J	0.73 J	0.87 J	0.94 J	0.92 J	1.3 J	2 J	0.68 J	1.2 J	1.3 J-	1.6	2.2	1.9		1.6 J		1.5	1.9	1.7
pH	SU	6.92	7.03	6.85	7.02	7.09	6.93	7	7.27	6.89	7.41	7.41	6.99	7.37	7.5		7.7		7.45	7.57	7.85
Sulfate	mg/L	770 J-	690	680	610	630	770	800	640	670		800	460	540	670		1500		1500	1400	1300
Total Dissolved Solids	mg/L	1600	1500	1600	1300	1400	1700	2000	1400	1500		1700	1100	1300	1300		1900 J+		2300	2300	2200
CCR Appendix IV																					
Antimony	mg/L	0.00073 J	0.00069 J	0.0014 J	0.00041 J	0.00043 J	0.002 U	0.00059 J	0.00075 J		0.002 U		0.00082 J	0.00076 J	0.00077 J		0.002 U		0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.0018 J	0.0019 J	0.0018 J	0.0027 J	0.0016 J	0.0031 J	0.0027 J	0.0023 J		0.005 U		0.0011 J	0.0015 J	0.0016 J		0.005 U		0.005 U	0.005 U	0.005 U
Barium	mg/L	0.068	0.065	0.065	0.05	0.055	0.064	0.074	0.077		0.066	0.069	0.053	0.058	0.066		0.042		0.03	0.025	0.023
Beryllium	mg/L	0.00017 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.0004 J	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U
Cadmium	mg/L	7.4E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.00037 J	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.00029 J	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.036	0.034	0.059	0.047	0.05	0.037	0.047	0.02		0.022	0.027	0.011	0.0079	0.011		0.00066 J		0.001 U	0.001 U	0.001 U
Fluoride	mg/L	1 J+	1.2 J	0.73 J	0.87 J	0.94 J	0.92 J	1.3 J	2 J	0.68 J	1.2 J	1.3 J-	1.6	2.2	1.9		1.6 J		1.5	1.9	1.7
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.0098	0.012	0.009	0.0098	0.0093	0.012	0.011	0.012		0.0089	0.009	0.011	0.015	0.0091		0.0098		0.0073 J	0.0063 J	0.0058 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U		0.0002 U		0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.034	0.036	0.024	0.02	0.019	0.038	0.049	0.083		0.058	0.058	0.059	0.08	0.068		0.037		0.039	0.057	0.044
Radium, Total	pci/L	1.07	1.08	1.09	0.581	0.777	0.632	1.11	0.762		1.13 J+	0.99	1 J+	0.473			1.67 J+		1.02 J+	0.704	
Radium-226	pci/L	0.501 J+	0.469	0.557	0.375	0.368	0.383	0.613 J+	0.591		0.267	0.437	0.582 J+	0.312 U			1.09 J+		0.596 J+	0.438	
Radium-228	pci/L	1 U	0.609	0.533	0.43 U	0.423 U	0.365 U	0.499	0.341 U		0.865 J+	0.552	0.423	0.456 U			0.579		0.454 U	0.518 U	
Selenium	mg/L	0.005 U	0.0065	0.0033 J	0.0014 J	0.0032 J	0.011	0.0088	0.0081		0.024	0.022	0.0021 J	0.016	0.0036 J		0.0014 J		0.005 U	0.005 U	0.005 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.00045 J	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U
Supplemental Parameters																					
Alkalinity, Bicarbonate (HCO3)	mg/L															160	160				
Alkalinity, Carbonate (CO3)	mg/L															5 U	5 U				
Alkalinity, Hydroxide (OH)	mg/L															5 U	5 U				
Alkalinity, Total	mg/L												350	380	380	160	160	160	160	130	160
Ferric Iron	mg/L												0.083 J			6.1 J	6.9 J	6.5	6.2		
Ferrous Iron	mg/L												0.05 UJ			0.1 R	0.1 R	0.79 J	0.98 J		
Iron	mg/L													0.2 U	0.2 U					5.6	5.1
Magnesium	mg/L												44	53	56	58	66	63	62	45	42
Manganese	mg/L													0.22	0.37					0.49	0.45
Nitrate as N	mg/L													7.7	0.25	0.05 R	0.05 R			0.075 J	0.43
Nitrite as N	mg/L															0.05 R	0.05 R				
Nitrogen, Nitrate-Nitrite	mg/L												0.06					0.05 U	0.05 U		
Phosphorus (as phosphate)	mg/L												0.31 U	0.15 J	0.11 J-	0.028 J	0.031 U	0.31 U	0.31 U	0.31 U	0.19 J-
Potassium	mg/L												12	13	12	5.6	6.4	5.5	5.5	5.6	5.3
Sodium	mg/L												45	45	51	260	300	200	200	240	200
Sample Parameters																					
Dissolved Oxygen	mg/L	1.9	0.38	1.62	1.27	0.96	0.63	1.96	0.93	0.21	0.97	5.09	0.21	0.44	4.2		0.42		0.12	0.13	2.61
Oxidation Reduction Potential	mV	159.7	64.6	-8	58.4	49.9	60.4	242.5	61.9	-15.9	110.1	-106.4	27.7	62.2	44.1		-185.5		-67	7.9	-67
Eh	mV	359.7	264.6	192.0	258.4	249.9	260.4	442.5	261.9	184.1	310.1	93.6	227.7	262.2	244.1		14.5	200.0	133.0	207.9	133.0
pH	SU	6.92	7.03	6.85	7.02	7.09	6.93	7	7.27	6.89	7.41	7.41	6.99	7.37	7.5		7.7		7.45	7.57	7.85
Specific Conductance	uS/cm	1925	1807	1664	1517	1494	2098	1834	1713	1840	1121	1732	1440	1102	1322		2538		2375	2190	1896
Temperature	deg C	15.5	18.78	17.75	12.2	10.06	11.1	15.8	18.5	18.3	9.6	10.2	17.2	11	10.84		14.6		14.5	12.8	8.05
Turbidity	NTU	2.3	3.22	0.58	1.26	1.56	1.1	2.41	0.68	4.38	1.11	1.54	1.4	1.81	0.31		3.4		1.63	1.72	2.89

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW09																
Sample Date		2016-07-13	2016-09-08	2016-11-09	2017-01-10	2017-03-01		2017-04-26		2017-06-28	2017-08-23	2017-10-03	2018-03-14	2018-04-23	2018-10-25	2019-05-02		2019-11-07
Sample Type		N	N	N	N	FD	N	FD	N	N	N	N	N	N	N	FD	N	N
Chemical Name	Unit																	
CCR Appendix III																		
Boron	mg/L	5.7	4.7	7.3	5.3	7.7	7.6	5.9	6.1	4.9	7.9	7.3		4.9	6.3	3	3	2.7
Calcium	mg/L	320	240	210	210	200	200	220	240	270	280	220		220	220	200	200	150
Chloride	mg/L	63	55	58	58	75	73	71	67	53	39	64		58	82	46	46	39
Fluoride	mg/L	0.15 J+	10 U	10 U	0.22 J	0.13 J	0.14 J	0.16 J	0.13 J	0.18 J	2 J	0.21 J	5 U	0.26 J-	0.28	0.27	0.27	0.33
pH	SU	7.27	7.25	7.12	6.68		7.44		7.15	7.25	7.31	7.3	7.28	6.87	6.88		7.1	7.06
Sulfate	mg/L	910 J-	570	360	500	440	420	460	460	600	740	540		510	510 J-	530	530	380
Total Dissolved Solids	mg/L	1500	1100	880	980	1000	990	1000	960	1300	1400	1100		930	1100	970	980	770
CCR Appendix IV																		
Antimony	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.0015 J	0.0013 J	0.00076 J	0.0031 J	0.005 U	0.005 U	0.0028 J	0.0029 J	0.002 J	0.0027 J		0.005 U		0.005 U	0.005 U	0.005 U	0.005 U
Barium	mg/L	0.059	0.043	0.036	0.039	0.035	0.037	0.039	0.042	0.047	0.054		0.041	0.039	0.039	0.041	0.041	0.036
Beryllium	mg/L	0.00012 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00036 J	0.001 U	0.001 U	0.001 U		0.001 U		0.00092 J	0.00058 J	0.00052 J	0.00049 J
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.00033 J	0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.0036	0.002 U	0.00062 J	0.0013 J	0.002 U	0.002 U	0.002 U	0.002 U	0.0011 J	0.0015 J		0.0016 J		0.002 U	0.0012 J	0.0012 J	0.002 U
Cobalt	mg/L	0.001 U	0.00018 J	0.0002 J	0.0002 J	0.001 U	0.001 U	0.00029 J	0.00025 J	0.001 U	0.001 U		0.001 U		0.00038 J	0.00049 J	0.00055 J	0.00035 J
Fluoride	mg/L	0.15 J+	10 U	10 U	0.22 J	0.13 J	0.14 J	0.16 J	0.13 J	0.18 J	2 J	0.21 J	5 U	0.26 J-	0.28	0.27	0.27	0.33
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.0019 J	0.008 U	0.008 U	0.0016 J	0.0011 J	0.0012 J	0.008 U	0.008 U	0.0017 J	0.0018 J		0.008 U		0.008 U	0.008 U	0.008 U	0.008 U
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.02	0.017	0.029	0.023	0.027	0.027	0.021	0.021	0.028	0.032		0.025	0.035	0.04	0.043	0.043	0.035
Radium, Total	pci/L	1.5	0.568	0.477 U	0.467 U	0.55	0.469	0.593	0.414	0.707	0.803		1.45 J+	0.096	0.679	0.505	0.427 U	
Radium-226	pci/L	0.506 J+	0.231	0.397 U	0.257	0.134	0.166	0.194	0.205	0.255 J+	0.357		0.188	0.204	0.446	0.33	0.355 U	
Radium-228	pci/L	0.994	0.349 U	0.477 U	0.467 U	0.427 U	0.432 U	0.398	0.36 U	0.452	0.446		1.26 J+	-0.108	0.361 U	0.428 U	0.427 U	
Selenium	mg/L	0.014	0.0091	0.0049 J	0.011	0.014	0.014	0.019	0.02	0.013	0.027		0.0082	0.011	0.0098	0.012	0.012	0.0077
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U
Supplemental Parameters																		
Alkalinity, Bicarbonate (HCO3)	mg/L																	
Alkalinity, Carbonate (CO3)	mg/L																	
Alkalinity, Hydroxide (OH)	mg/L																	
Alkalinity, Total	mg/L														150	110	100	110
Ferric Iron	mg/L														0.042 J			
Ferrous Iron	mg/L														0.05 UJ			
Iron	mg/L															0.027 J	0.038 J	0.037 J
Magnesium	mg/L														21	21	19	16
Manganese	mg/L															0.011 J	0.013 J	0.0083 J
Nitrate as N	mg/L															5.6	5.6	7.1
Nitrite as N	mg/L																	
Nitrogen, Nitrate-Nitrite	mg/L														1.4			
Phosphorus (as phosphate)	mg/L														0.31 U	0.31 U	0.31 U	0.31 UJ
Potassium	mg/L														9	7.2	7.1	5.6
Sodium	mg/L														38	35	33	28
Sample Parameters																		
Dissolved Oxygen	mg/L	3.59	6.69	1.98	6.1		3.41		3.92	5.27	3.24	5.98	6.71	5.43	0.22		5.82	5.54
Oxidation Reduction Potential	mV	-1.4	75.7	27.6	236		90.5		152.6	280.8	58.9	139.5	-116.3	-90.8	-48.8		53.6	-25.7
Eh	mV	198.6	275.7	227.6	436.0		290.5		352.6	480.8	258.9	339.5	83.7	109.2	151.2		253.6	174.3
pH	SU	7.27	7.25	7.12	6.68		7.44		7.15	7.25	7.31	7.3	7.28	6.87	6.88		7.1	7.06
Specific Conductance	uS/cm	1671	736	1110	822		1041		1209	702	1542	1331	600	1156	1274		888	685
Temperature	deg C	14.4	18.4	16.9	11.9		10.75		11.9	14.7	17.2	18.2	10.2	10.6	17.9		11.4	15.9
Turbidity	NTU	1.59	3.92	1.15	1.34		3.12		1.88	1.91	0.91	0.39	0.82	2.44	2.41		3.41	1.55

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

		Location	GAMW09B																	
		Sample Date	2016-07-13		2016-09-08	2016-11-09	2017-01-10	2017-03-01	2017-04-26	2017-06-28	2017-08-23		2017-10-03	2018-03-14	2018-04-23	2018-09-06	2018-10-26	2019-05-08		2019-11-07
		Sample Type	FD	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	FD	N	N
Chemical Name	Unit																			
CCR Appendix III																				
Boron	mg/L		24	25	25	16	11	11	11	12	16	16	16		14	12	12		14	8
Calcium	mg/L		260	280	270	190	200	170	170	180	180	180	160		160	150	180		150	150
Chloride	mg/L		210	180	190	130	110	120	130	150	170	160	140		150	180	150		140	110
Fluoride	mg/L		0.54 J+	0.55 J+	0.67 J	0.68 J	0.1 J	1.3 J	1.2 J	1.4 J	1.2 J	0.37 J	1.5 J	1.4 J	1.6 J	1.8 J	1.6		1.6	1.5
pH	SU			7.08	7.15	6.96	7.36	7.44	7.29	7.36		7.46	7.36	7.56	7.43	7.32	7.46		7.49	7.56
Sulfate	mg/L		970 J-	1000 J-	960	740	670 J+	550	570	640	630	650	550		430	570	580		520	440
Total Dissolved Solids	mg/L		2100	2000	2100	1700	1300	1200	1200	1500	1500	1500	1300		990	1300	1200		1200	990
CCR Appendix IV																				
Antimony	mg/L		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U		0.002 U	0.002 U
Arsenic	mg/L		0.0024 J	0.0026 J	0.002 J	0.0014 J	0.0027 J	0.005 U	0.004 J	0.004 J	0.0031 J	0.0031 J		0.0054	0.0064	0.0044 J	0.004 J		0.0057	0.0042 J
Barium	mg/L		0.069	0.071	0.076	0.062	0.048	0.04	0.046	0.055	0.062	0.058		0.045	0.04	0.049	0.047		0.041	0.029
Beryllium	mg/L		0.00012 J	9.1E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U		0.001 U	0.001 U
Cadmium	mg/L		0.00027 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U		0.001 U	0.001 U
Chromium	mg/L		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U		0.002 U	0.002 U
Cobalt	mg/L		0.001 U	0.001 U	0.00069 J	0.00028 J	0.00045 J	0.001 U	0.00028 J	0.00045 J	0.00041 J	0.00041 J		0.001 U		0.00058 J	0.00028 J		0.00025 J	0.001 U
Fluoride	mg/L		0.54 J+	0.55 J+	0.67 J	0.68 J	0.1 J	1.3 J	1.2 J	1.4 J	1.2 J	0.37 J	1.5 J	1.4 J	1.6 J	1.8 J	1.6		1.6	1.5
Lead	mg/L		0.001 U	0.001 U	0.001 U	0.00017 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U		0.001 U	0.001 U
Lithium	mg/L		0.0055 J	0.0065 J	0.008 U	0.008 U	0.0049 J	0.0045 J	0.0056 J	0.0054 J	0.0047 J	0.0042 J		0.0031 J		0.0037 J	0.0052 J		0.0055 J	0.0033 J
Mercury	mg/L		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U		0.0002 U	0.0002 U
Molybdenum	mg/L		0.01 U	0.0079 J	0.0075 J	0.0097 J	0.013	0.015	0.015	0.013	0.0094 J	0.01		0.014	0.012	0.01	0.011		0.012	0.0096 J
Radium, Total	pci/L		1.12	1.86	1.65	1.14	0.453	1.09	0.774	1.85	1.01	1.27		1.18 J+	0.868	1.04	1.24 J+		1.01	
Radium-226	pci/L		0.809 J+	0.947 J+	0.907	0.579	0.476	0.585	0.316	0.781 J+	0.585	0.709		0.482	0.301	0.653	0.69 J+		0.449	
Radium-228	pci/L		1 U	0.913	0.743	0.559	0.41 U	0.508	0.458	1.07	0.422	0.563		0.699 J+	0.567	0.386	0.546		0.564	
Selenium	mg/L		0.005 U	0.005 U	0.005 U	0.005 U	0.002 J	0.005 U	0.0014 J	0.001 J	0.0015 J	0.0016 J		0.005 U		0.002 J	0.0019 J		0.005 U	0.0011 J
Thallium	mg/L		0.0003 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U		0.0002 J	0.001 U
Supplemental Parameters																				
Alkalinity, Bicarbonate (HCO3)	mg/L															190				
Alkalinity, Carbonate (CO3)	mg/L															5 U				
Alkalinity, Hydroxide (OH)	mg/L															5 U				
Alkalinity, Total	mg/L															190	200	200	200	170
Ferric Iron	mg/L															2.5 J	2.1			
Ferrous Iron	mg/L															0.1 R	0.55 J			
Iron	mg/L																	3.2	3.2	3
Magnesium	mg/L															57	60	64	63	54
Manganese	mg/L																	1.2	1.2	1.2
Nitrate as N	mg/L															0.05 R		0.1 U	0.1 U	0.12
Nitrite as N	mg/L															0.05 R				
Nitrogen, Nitrate-Nitrite	mg/L																0.077			
Phosphorus (as phosphate)	mg/L															0.09	0.31 U	0.31 U	0.31 U	0.31 UJ
Potassium	mg/L															4 J	3.8 J	4 J	4 J	2.4 J
Sodium	mg/L															150	94	110	110	46
Sample Parameters																				
Dissolved Oxygen	mg/L			0.44	1.06	0.43	0.38	0.44	0.61	0.71		0.57	0.45	0.1	0.04	0.61	0.28		0.04	0.35
Oxidation Reduction Potential	mV			-57.7	67.3	-76.4	-100.1	-80.6	-102.6	68.2		19.7	-46.8	-121.6	-130.5	-100.5	-101.1		-16.8	-131.8
Eh	mV			142.3	267.3	123.6	99.9	119.4	97.4	268.2		219.7	153.2	78.4	69.5	99.5	98.9		183.2	68.2
pH	SU			7.08	7.15	6.96	7.36	7.44	7.29	7.36		7.46	7.36	7.56	7.43	7.32	7.46		7.49	7.56
Specific Conductance	uS/cm			2356	2435	2088	1559	1352	1592	1561		1922	1722	1053	1301	1556	1693		1165	9.24
Temperature	deg C			14.1	14.7	15.1	13.6	13.45	14.5	14.8		15.5	16	14	14.4	16.1	16		14.2	14.4
Turbidity	NTU			3.48	4.29	2.17	0.99	2.58	1.88	1.69		2.54	1.96	4.18	4.11	2.96	1.39		4.7	3.36

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW15														
Sample Date		2016-07-13	2016-09-08		2016-11-09	2017-01-11	2017-03-02	2017-04-27	2017-06-29	2017-08-23	2017-10-03	2018-03-15	2018-04-24	2018-10-26	2019-05-06	2019-11-08
Sample Type		N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N
Chemical Name	Unit															
CCR Appendix III																
Boron	mg/L	0.75	0.45 J	1 J	1.1	0.6	0.44	0.45	0.87	0.91	0.66		0.72	0.76	0.71	0.73
Calcium	mg/L	100	130	120	100	82	81	95	160	150	77		170	120	140	100
Chloride	mg/L	28	31	31	27	28	27	27	27	25	19		24	21	22	28
Fluoride	mg/L	1.2 J+	0.85 J	0.85 J	0.74 J	0.8 J	0.77 J	0.74 J	0.82 J	0.82 J	0.93 J	0.67 J	0.76 J	0.69	0.52	0.73
pH	SU	6.88		6.98	6.83	6.96	6.99	6.76	6.61	6.96	6.88	6.95	6.89	5.2	7.1	7.34
Sulfate	mg/L	160 J-	260	260	150	140	140	160	300	330	260		410	240	380	260
Total Dissolved Solids	mg/L	570	660	630	520	400	400	420	780	750	660		790	5900	740	640
CCR Appendix IV																
Antimony	mg/L	0.002 U	0.00041 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.056	0.072	0.069	0.078	0.076	0.054	0.062	0.059	0.066		0.058		0.091	0.081	0.075
Barium	mg/L	0.044	0.053	0.053	0.039	0.032	0.031	0.034	0.054	0.058		0.047		0.046	0.047	0.037
Beryllium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.00027 J	0.00028 J	0.00029 J	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.0019	0.0022	0.0022	0.0021	0.0019	0.0018	0.0022	0.0029	0.0027		0.0025		0.0023	0.0035	0.0017
Fluoride	mg/L	1.2 J+	0.85 J	0.85 J	0.74 J	0.8 J	0.77 J	0.74 J	0.82 J	0.82 J	0.93 J	0.67 J	0.76 J	0.69	0.52	0.73
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.0053 J	0.008 U	0.008 U	0.008 U	0.004 J	0.0024 J	0.0041 J	0.0058 J	0.005 J		0.0023 J		0.0054 J	0.0053 J	0.0027 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.02	0.027	0.026	0.023	0.022	0.022	0.026	0.017	0.019		0.029		0.016	0.017	0.029
Radium, Total	pci/L	5 U	0.479	0.513	0.646 U	0.555 J+	0.339 U	0.463 U	0.335	0.342 U		0.657 J+		0.858 J+	0.476 U	
Radium-226	pci/L	1 U	0.202	0.145	0.337 U	0.38	0.127 U	0.1	0.0965 J+	0.104		0.0817		0.527 J+	0.28 U	
Radium-228	pci/L	1 U	0.397 U	0.382 U	0.646 U	0.401 U	0.339 U	0.463 U	0.278 U	0.342 U		0.576 J+		0.407 U	0.476 U	
Selenium	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U		0.005 U		0.005 U	0.005 U	0.005 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U
Supplemental Parameters																
Alkalinity, Bicarbonate (HCO3)	mg/L															
Alkalinity, Carbonate (CO3)	mg/L															
Alkalinity, Hydroxide (OH)	mg/L															
Alkalinity, Total	mg/L													180	180	170
Ferric Iron	mg/L													4.3		
Ferrous Iron	mg/L													5.2 J		
Iron	mg/L														11	5.4
Magnesium	mg/L													24	30	24
Manganese	mg/L														0.089	0.055
Nitrate as N	mg/L														0.1 U	0.1 U
Nitrite as N	mg/L															
Nitrogen, Nitrate-Nitrite	mg/L													0.05 U		
Phosphorus (as phosphate)	mg/L													4	1.4	1.3
Potassium	mg/L													2.6 J	3.2 J	3.3 J
Sodium	mg/L													24	32	30
Sample Parameters																
Dissolved Oxygen	mg/L	0.48		0.48	0.14	0.25	0.16	0.19	1	0.32	0.29	0.06	0.02	1.97	0.15	0.12
Oxidation Reduction Potential	mV	-79.2		-60.1	-111	-114.3	-104.1	-104.4	-46.9	-43.7	-13.8	-56.8	-99.1	-254.7	-27.5	-100
Eh	mV	120.8		139.9	89.0	85.7	95.9	95.6	153.1	156.3	186.2	143.2	100.9	-54.7	172.5	100.0
pH	SU	6.88		6.98	6.83	6.96	6.99	6.76	6.61	6.96	6.88	6.95	6.89	5.2	7.1	7.34
Specific Conductance	uS/cm	779		909	733	594	584	674	9.32	1004	901	581	933	855	730	598
Temperature	deg C	15.3		20.3	19.9	14.6	12.1	11.6	14.6	16.6	18.1	10.8	10.6	17.1	8.3	15.8
Turbidity	NTU	4.48		2.96	3.41	3.98	4.4	4.92	4.2	3.1	4.11	3.98	4.29	3.1	4.9	6.9

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW15B																
Sample Date		2016-07-13	2016-09-08	2016-11-09	2017-01-11	2017-03-02	2017-04-27	2017-06-29	2017-08-24	2017-10-03	2018-03-15	2018-04-24	2018-09-06		2018-10-26	2019-05-08	2019-11-08	
Sample Type		N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	FD	N
Chemical Name	Unit																	
CCR Appendix III																		
Boron	mg/L	1.1	1.7	2	3.7	3.3	3.6	3.1	2.1	2.1		4.4		4.1	4.9	10		6.2
Calcium	mg/L	160	160	160	180	160	170	190	170	73		230		200	210	280		280
Chloride	mg/L	52	58	62	81	64	65	71	64	64		87		89	93	110		80
Fluoride	mg/L	0.65 J+	0.62 J	0.46 J	0.74 J	0.77 J	0.75 J	0.72 J	0.61 J	0.5 J	0.69 J	0.79 J		0.6 J	0.6	0.84 J+		0.89
pH	SU	7.81	7.49	7.04	7.52	7.48	7.11	7.26	7.37	7.42	7.45	7.36		7.8	6.74	7.43		7.57
Sulfate	mg/L	380 J-	390	340	500	390	460	530	540	500		790		720	770	1300		940
Total Dissolved Solids	mg/L	830	800	840	1000	890	980	1200	1100	1100		1400		1400	1400	2100		1600
CCR Appendix IV																		
Antimony	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U			0.002 U	0.002 U	0.002 U		0.002 U
Arsenic	mg/L	0.003 J	0.0011 J	0.0014 J	0.0022 J	0.0011 J	0.00098 J	0.00084 J	0.00081 J		0.005 U			0.005 U	0.005 U	0.00088 J		0.005 U
Barium	mg/L	0.054	0.053	0.056	0.056	0.051	0.052	0.064	0.069		0.068			0.07	0.064	0.081		0.054
Beryllium	mg/L	7.8E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U			0.001 U	0.001 U	0.001 U		0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U			0.001 U	0.001 U	0.001 U		0.001 U
Chromium	mg/L	0.00062 J	0.002 U	0.002 U	0.00033 J	0.00034 J	0.002 U	0.002 U	0.002 U		0.002 U			0.002 U	0.002 U	0.002 U		0.002 U
Cobalt	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.00016 J	0.001 U	0.001 U	0.001 U		0.00029 J			0.00037 J	0.001 U	0.001 U		0.001 U
Fluoride	mg/L	0.65 J+	0.62 J	0.46 J	0.74 J	0.77 J	0.75 J	0.72 J	0.61 J	0.5 J	0.69 J	0.79 J		0.6 J	0.6	0.84 J+		0.89
Lead	mg/L	0.001 U	0.001 U	0.00023 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U			0.001 U	0.001 U	0.001 U		0.001 U
Lithium	mg/L	0.0069 J	0.008 U	0.008 U	0.0077 J	0.0053 J	0.0082	0.0082	0.0077 J		0.007 J			0.008	0.0096	0.012		0.0085
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U			0.0002 U	0.0002 U	0.0002 U		0.0002 U
Molybdenum	mg/L	0.011	0.013	0.01	0.012	0.015	0.014	0.014	0.012		0.011			0.01	0.011	0.012		0.01
Radium, Total	pci/L	1.26	0.594	0.61	1.14 J+	0.876	0.687	0.789	0.872		1.69 J+			1.31	1.51 J+	1.61		
Radium-226	pci/L	0.607 J+	0.442	0.361 U	0.785	0.441	0.442	0.537 J+	0.547		0.752			0.711	0.837 J+	1.07		
Radium-228	pci/L	1 U	0.389 U	0.498 U	0.502 U	0.435	0.378 U	0.329 U	0.363 U		0.94 J+			0.603	0.676	0.544		
Selenium	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U		0.005 U			0.0017 J	0.005 U	0.005 U		0.005 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U			0.001 U	0.001 U	0.0003 J		0.001 U
Supplemental Parameters																		
Alkalinity, Bicarbonate (HCO3)	mg/L												180	180				
Alkalinity, Carbonate (CO3)	mg/L												5 U	5 U				
Alkalinity, Hydroxide (OH)	mg/L												5 U	5 U				
Alkalinity, Total	mg/L												180	180	200	200	180	180
Ferric Iron	mg/L												2 J	2.1 J	1.8			
Ferrous Iron	mg/L												0.1 R	0.1 R	0.38 J			
Iron	mg/L															4.6	3	3.1
Magnesium	mg/L												36	39	39	62	43	45
Manganese	mg/L															0.59	0.54	0.57
Nitrate as N	mg/L												0.05 R	0.05 R		0.1 U	0.1 U	0.1 U
Nitrite as N	mg/L												0.05 R	0.05 R				
Nitrogen, Nitrate-Nitrite	mg/L														0.05 U			
Phosphorus (as phosphate)	mg/L												0.031 U	0.031 U	0.31 U	0.14 J	0.31 U	0.31 U
Potassium	mg/L												4.5 J	5	4.7 J	7.2	5.1	5.3
Sodium	mg/L												140	150	170	280	130	130
Sample Parameters																		
Dissolved Oxygen	mg/L	0.22	0.91	0.56	0.22	0.46	0.3	0.43	0.64	0.23	0.08	0.04		0.29	2.06	0.23		0.16
Oxidation Reduction Potential	mV	-129.7	-21.6	-94.6	-132.6	-81.7	-79.6	-21.3	-36.5	-42.6	-64	-102.4		-91.2	-256.1	46.3		-189.2
Eh	mV	70.3	178.4	105.4	67.4	118.3	120.4	178.7	163.5	157.4	136.0	97.6		108.8	-56.1	246.3		10.8
pH	SU	7.81	7.49	7.04	7.52	7.48	7.11	7.26	7.37	7.42	7.45	7.36		7.8	6.74	7.43		7.57
Specific Conductance	uS/cm	834	1049	1060	1237	940	1096	1099	1110	1294	1255	1612		2757	1889	1798		1384
Temperature	deg C	12.71	15.9	16.1	13.9	13.6	13	13.8	14.2	14.5	13.3	13		14.13	13.6	8.1		13.8
Turbidity	NTU	4.72	1.56	1.48	3.8	2.23	3.65	3.16	1.78	0.4	4.59	4.88		3.59	1.35	3.56		1.49

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
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"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW16															
Sample Date		2016-07-13	2016-09-08	2016-11-09	2017-01-11	2017-03-02	2017-04-27	2017-06-29	2017-08-24	2017-10-04	2018-03-15	2018-04-24	2018-10-29		2019-05-03	2019-11-08	
Sample Type		N	N	N	N	N	N	N	N	N	N	N	FD	N	N	FD	N
Chemical Name	Unit																
CCR Appendix III																	
Boron	mg/L	1.1	1.8	1.6	1.2	0.89	1.3	1	1.4	1.1		1.4	1.4	1.4	1.6		1.9
Calcium	mg/L	230	180	170	120	160	210	220	240	57		220	160	160	210		210
Chloride	mg/L	53	37	30	28	24	25	28	31	42		58	36	36	28		59
Fluoride	mg/L	1.4 J+	1.6 J	1.3 J	1.5	1.3 J	1.3 J	1.2 J	1.3 J	1.5 J	1 J	1.2 J	1.1	1.1	0.99		1.1
pH	SU	7.92	7.18	7.48	7.5	7.58	7.17	7.36	7.06	7.62	7.41	7.67		7.28	7.46		7.8
Sulfate	mg/L	530 J-	400	320	47	300	500	480	630	520		530	340	350	570		530
Total Dissolved Solids	mg/L	1100	810	790	570	670	930	1000	1100	980		1100	740	730	1100		1100
CCR Appendix IV																	
Antimony	mg/L	0.002 U	0.002 U	0.00028 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U		0.002 U
Arsenic	mg/L	0.011	0.0077	0.012	0.0084	0.0079	0.006	0.008	0.0096		0.002 J	0.0065	0.01	0.0098	0.005		0.0082
Barium	mg/L	0.049	0.042	0.035	0.024	0.029	0.043	0.044	0.054		0.057	0.045	0.035	0.035	0.034		0.034
Beryllium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U		0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U		0.001 U
Chromium	mg/L	0.00062 J	0.002 U	0.002 U	0.0031	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U		0.002 U
Cobalt	mg/L	0.001 U	0.00068 J	0.00051 J	0.00046 J	0.00055 J	0.00092 J	0.00094 J	0.0011		0.0013		0.00059 J	0.00061 J	0.00066 J		0.00061 J
Fluoride	mg/L	1.4 J+	1.6 J	1.3 J	1.5	1.3 J	1.3 J	1.2 J	1.3 J	1.5 J	1 J	1.2 J	1.1	1.1	0.99		1.1
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U		0.001 U
Lithium	mg/L	0.00043 J	0.008 U	0.008 U	0.00023 J	0.008 U	0.008 U	0.008 U	0.008 U		0.008 U		0.008 U	0.008 U	0.008 U		0.008 U
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U		0.0002 U
Molybdenum	mg/L	0.024	0.036	0.045	0.044	0.03	0.027	0.023	0.024		0.027	0.031	0.033	0.033	0.027		0.028
Radium, Total	pci/L	1.68	0.543	0.527 U	0.629 U	0.648	0.392 U	0.339 U	0.429		0.862 J+	0.29	0.862 J+	1.32 J+	0.685 U		
Radium-226	pci/L	0.537 J+	0.249	0.363 U	0.256 U	0.129 U	0.094	0.106 J+	0.246		0.1	0.0822	0.214 J+	0.278 J+	0.277 U		
Radium-228	pci/L	1.14	0.395 U	0.527 U	0.629 U	0.528	0.392 U	0.339 U	0.322 U		0.762 J+	0.208	0.648 J+	1.04 J+	0.685 U		
Selenium	mg/L	0.005 U	0.005 U	0.0005 J	0.0005 J	0.005 U	0.0012 J	0.005 U	0.005 U		0.0015 J		0.005 U	0.005 U	0.005 U		0.0015 J
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U		0.001 U
Supplemental Parameters																	
Alkalinity, Bicarbonate (HCO3)	mg/L																
Alkalinity, Carbonate (CO3)	mg/L																
Alkalinity, Hydroxide (OH)	mg/L																
Alkalinity, Total	mg/L													180	200	5 U	210
Ferric Iron	mg/L													1.8			
Ferrous Iron	mg/L													0.19 J			
Iron	mg/L														1.4	1.6	1.7
Magnesium	mg/L													23	29	29	31
Manganese	mg/L														0.35	0.29	0.31
Nitrate as N	mg/L														0.042 J	0.1 U	0.1 U
Nitrite as N	mg/L																
Nitrogen, Nitrate-Nitrite	mg/L													0.056			
Phosphorus (as phosphate)	mg/L													1.2	0.55	0.47	0.42
Potassium	mg/L													4.3 J	4.2 J	4.9 J	5.2
Sodium	mg/L													41	41	36	38
Sample Parameters																	
Dissolved Oxygen	mg/L	0.16	0.27	0.48	0.31	0.36	0.14	0.5	0.14	0.06	0.22	0.22		1.27	0.29		4.02
Oxidation Reduction Potential	mV	-18.06	711.6	-124.8	-78.8	-136.9	-73.6	-114.2	9.6	-158.4	-55.9	-106.5		-216.8	8		-2
Eh	mV	181.9	911.6	75.2	121.2	63.1	126.4	85.8	209.6	41.6	144.1	93.5		-16.8	208.0		198.0
pH	SU	7.92	7.18	7.48	7.5	7.58	7.17	7.36	7.06	7.62	7.41	7.67		7.28	7.46		7.8
Specific Conductance	uS/cm	1331	1112	927	751	821	1257	1123	1406	1254	1029	1239		1046	1001		1014
Temperature	deg C	15.02	18.8	18.15	12.1	9.72	10.6	15.41	18	17.8	8.71	9.2		17.81	10.5		17.52
Turbidity	NTU	3.89	2.16	1.93	3.16	4.14	3.25	4.33	2.45	4.95	4.62	12.81		3.64	4.65		3.98

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW16B																
	Sample Date	2016-07-13	2016-09-08	2016-11-09		2017-01-11	2017-03-02	2017-04-27	2017-06-29	2017-08-24	2017-10-04	2018-03-15	2018-04-24	2018-09-07	2018-10-29	2019-05-06	2019-11-08	
	Sample Type	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	FD	N
Chemical Name	Unit																	
CCR Appendix III																		
Boron	mg/L	1.8	1.6	1.4	1.4	1.4	1.4	1.1	3.4	6.5	2.9		4.1	7.6	9.7	12	11	10
Calcium	mg/L	230	190	180	180	210	210	270	220	260	100		250	310	350	350	300	280
Chloride	mg/L	63	56	57	55	57	47	71	71	120	78		140	160	150	190	220	210
Fluoride	mg/L	1.1 J+	1.1 J	0.84 J	0.73 J	0.99 J	0.87 J	0.83 J	0.76 J	0.78 J	1 J	0.8 J	0.76 J	0.73 J	0.64	0.76	1	1
pH	SU	7.76	7.47		7.41	7.57	7.55	7.3	7.51	7.28	7.54	7.6	7.65	7.97	7.02	7.49		7.85
Sulfate	mg/L	580 J-	480	500	440	50	470	730	720	640	580		690	760	890	940	1500	1500
Total Dissolved Solids	mg/L	1100	1000	1000	1000	1000	1000	1300	1200	1400	1200		1400	20 U	1600	1800	2400	2400
CCR Appendix IV																		
Antimony	mg/L	0.002 U	0.002 U	0.00057 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.00095 J		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.0068	0.0064	0.011	0.011	0.012	0.0095	0.012	0.0096	0.0081		0.0099	0.0097	0.011	0.0088	0.0071	0.0079	0.0076
Barium	mg/L	0.072	0.04	0.036	0.035	0.038	0.039	0.055	0.043	0.046		0.053	0.058	0.068	0.071	0.079	0.055	0.054
Beryllium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.00022 J		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.00029 J	0.002 U	0.00026 J	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.00016 J	0.00019 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.0003 J		0.00054 J	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	1.1 J+	1.1 J	0.84 J	0.73 J	0.99 J	0.87 J	0.83 J	0.76 J	0.78 J	1 J	0.8 J	0.76 J	0.73 J	0.64	0.76	1	1
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.0055 J	0.008 U	0.0032 J	0.0022 J	0.0058 J	0.0035 J	0.0072 J	0.006 J	0.0061 J		0.007 J		0.0059 J	0.0059 J	0.007 J	0.0054 J	0.0055 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.013	0.012	0.012	0.012	0.012	0.013	0.023	0.016	0.013		0.016	0.015	0.012	0.011	0.014	0.02	0.019
Radium, Total	pci/L	1.31	1.05	0.866	0.794	0.998 J+	0.577	1.23	0.795	1.21		1.11 J+	0.99	1.17 J+	1.64 J+	0.984		
Radium-226	pci/L	0.651 J+	0.458	0.427	0.412 U	0.507	0.348	0.635	0.54 J+	0.559		0.443	0.535	0.724 J+	0.719 J+	0.753		
Radium-228	pci/L	0.66	0.59	0.467 U	0.435 U	0.491 J+	0.399 U	0.597	0.287 U	0.647		0.671 J+	0.455	0.522 U	0.919 J+	0.459 U		
Selenium	mg/L	0.005 U	0.005 U	0.00061 J	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U		0.005 U		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Supplemental Parameters																		
Alkalinity, Bicarbonate (HCO3)	mg/L													200				
Alkalinity, Carbonate (CO3)	mg/L													5 U				
Alkalinity, Hydroxide (OH)	mg/L													5 U				
Alkalinity, Total	mg/L													200	210	190		200
Ferric Iron	mg/L													6 J	5.1			
Ferrous Iron	mg/L													0.1 R	1.8 J			
Iron	mg/L															9.2		7.5
Magnesium	mg/L													46	53	58		49
Manganese	mg/L															0.49		0.39
Nitrate as N	mg/L													0.05 R		0.018 J		0.1 U
Nitrite as N	mg/L													0.05 R				
Nitrogen, Nitrate-Nitrite	mg/L														0.063			
Phosphorus (as phosphate)	mg/L													0.19	0.28 J	0.22 J		0.17 J
Potassium	mg/L													4.9 J	5.2	5.5		6.3
Sodium	mg/L													84	84	97		380
Sample Parameters																		
Dissolved Oxygen	mg/L	1.23	1.63		0.39	0.3	0.21	0.12	0.32	0.16	0.15	0.28	0.25	1.02	4.23	0.33		3.41
Oxidation Reduction Potential	mV	-122.6	-89		-126.3	-148.5	-132.2	-130.2	-123.1	-32.7	-135.8	-75.5	-117.8	-101.5	-166.8	21.2		-99.5
Eh	mV	77.4	111.0	200.0	73.7	51.5	67.8	69.8	76.9	167.3	64.2	124.5	82.2	98.5	33.2	221.2		100.5
pH	SU	7.76	7.47		7.41	7.57	7.55	7.3	7.51	7.28	7.54	7.6	7.65	7.97	7.02	7.49		7.85
Specific Conductance	uS/cm	1147	1297		1158	1230	1192	1645	1333	1665	1461	1142	1653	3104	2098	1692		2340
Temperature	deg C	13.04	14.44		15.27	14.3	13.37	12.3	13.48	14.3	15	12.6	12.3	15	17.7	11.2		14.65
Turbidity	NTU	4.1	3.99		1.8	2.76	4.21	4.58	3.27	2.48	3.9	4.08	4.2	4.99	3.49	3.72		2.81

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW17																
	Sample Date	2016-07-14	2016-09-08	2016-11-09	2017-01-10	2017-03-02	2017-04-27	2017-06-29	2017-08-24	2017-10-04	2018-03-14		2018-04-23		2018-10-29	2019-05-09	2019-11-08
	Sample Type	N	N	N	N	N	N	N	N	N	FD	N	FD	N	N	N	N
Chemical Name	Unit																
CCR Appendix III																	
Boron	mg/L	12	12	11	11	11	8.9	7.6	12	12			5.8	5.8	16	7.7	4.9
Calcium	mg/L	150	160	170	180	200	180	120	150	64			110	110	200	130	120
Chloride	mg/L	110	100	130	150	140	81	170	130	160			40	38	150	90	92
Fluoride	mg/L	1.8 J+	2.2 J	2 J	1.9 J	1.6 J	1.6 J	0.79 J	1.9 J	2.4 J	5 U	1.7 J	1.9 J	1.9 J-	1.7	1.6	1.7
pH	SU	7.56	7.27	7.21	7.33	7.54	7.23	7.4	7.16	7.22		7.62		7.82	6.85	7.53	7.75
Sulfate	mg/L	330 J-	330	360	390	390	390	520	250	350			240	220	430	300	290
Total Dissolved Solids	mg/L	940	920	940	1000	1100	950	1400	890	1000			630	620	1100	800	860
CCR Appendix IV																	
Antimony	mg/L	0.00034 J	0.00032 J	0.00032 J	0.002 U	0.00028 J	0.002 U	0.002 U	0.002 U		0.002 U	0.002 U			0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.0054	0.0056	0.0042 J	0.0069	0.0055	0.0054	0.0035 J	0.0028 J		0.005 U	0.0027 J			0.004 J	0.0021 J	0.0028 J
Barium	mg/L	0.047	0.056	0.054	0.05	0.054	0.048	0.044	0.06		0.041	0.058		0.029	0.073	0.041	0.052
Beryllium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.00076 J	0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.0015 J	0.002 U	0.0011 J	0.0011 J	0.0012 J	0.0012 J	0.002 U	0.002 U		0.0017 J	0.0014 J			0.002 U	0.002 U	0.002 U
Cobalt	mg/L	6.3E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U
Fluoride	mg/L	1.8 J+	2.2 J	2 J	1.9 J	1.6 J	1.6 J	0.79 J	1.9 J	2.4 J	5 U	1.7 J	1.9 J	1.9 J-	1.7	1.6	1.7
Lead	mg/L	0.00018 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.0047 J	0.008 U	0.0036 J	0.0047 J	0.0024 J	0.0045 J	0.0058 J	0.0076 J		0.008 U	0.0035 J			0.0066 J	0.0035 J	0.0052 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U	0.0002 U			0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.015	0.012	0.011	0.01 U	0.01	0.011	0.018	0.024		0.024	0.024		0.02	0.017	0.017	0.012
Radium, Total	pci/L	0.569	0.451 U	0.447 U	0.553 U	0.428	0.477	0.403 U	0.71		0.816 J+	0.384 U		0.205	1.1 J+	0.518 U	
Radium-226	pci/L	1 U	0.331	0.415 U	0.246 U	0.222	0.23	0.191 J+	0.215		0.202	0.112		0.0399	0.315 J+	0.26 U	
Radium-228	pci/L	1 U	0.451 U	0.447 U	0.553 U	0.402 U	0.406 U	0.403 U	0.495		0.614 J+	0.384 U		0.166	0.783 J+	0.518 U	
Selenium	mg/L	0.019	0.03	0.018	0.023	0.028	0.026	0.0081	0.0032 J		0.0074	0.021		0.015	0.022	0.004 J	0.011
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.00063 J	0.001 U
Supplemental Parameters																	
Alkalinity, Bicarbonate (HCO3)	mg/L																
Alkalinity, Carbonate (CO3)	mg/L																
Alkalinity, Hydroxide (OH)	mg/L																
Alkalinity, Total	mg/L														190	160	160
Ferric Iron	mg/L														0.1 U		
Ferrous Iron	mg/L														0.05 UJ		
Iron	mg/L															0.2 U	0.2 U
Magnesium	mg/L														67	49	40
Manganese	mg/L															0.015 U	0.015 U
Nitrate as N	mg/L															0.97	2
Nitrite as N	mg/L																
Nitrogen, Nitrate-Nitrite	mg/L														2.8		
Phosphorus (as phosphate)	mg/L														0.47	0.28 J	0.3 J
Potassium	mg/L														5.3	3.5 J	5
Sodium	mg/L														34	31	28
Sample Parameters																	
Dissolved Oxygen	mg/L	5.78	1.7	1.8	1.01	2.35	7.33	3.18	4.33	3.3		4.99		9	1.78	5.75	6.47
Oxidation Reduction Potential	mV	45.8	825.9	6.1	82.3	6.6	67.9	23.3	8	57.9		-90.2		-90.2	-237	53.1	35
Eh	mV	245.8	1025.9	206.1	282.3	206.6	267.9	223.3	208.0	257.9	200.0	109.8		109.8	-37.0	253.1	235.0
pH	SU	7.56	7.27	7.21	7.33	7.54	7.23	7.4	7.16	7.22		7.62		7.82	6.85	7.53	7.75
Specific Conductance	uS/cm	1059	1287	1141	1272	1541	1290	902	1151	1357		832		675	1513	894	798
Temperature	deg C	17.23	20.6	18.63	13.6	10.95	11.8	17.71	24.4	22.3		10.9		11.4	20	12.1	17.23
Turbidity	NTU	1.56	1.09	0.58	2.58	0.44	2.21	1.02	1.5	2.51		0.54		1.19	0.45	0.44	0.86

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW17B														
	Sample Date	2016-07-13	2016-09-08	2016-11-09	2017-01-10	2017-03-02	2017-04-27	2017-06-29	2017-08-23	2017-10-04	2018-03-14	2018-04-23	2018-09-06	2018-10-29	2019-05-09	2019-11-08
	Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Chemical Name	Unit															
CCR Appendix III																
Boron	mg/L	18	19	19	21	22	20	16	13	11		13	10	12	12	9.4
Calcium	mg/L	230	250	240	250	270	250	240	160	57		180	150	150	180	150
Chloride	mg/L	180	170	180	190	200	200	71	99	130		140	120	110	130	110
Fluoride	mg/L	0.9 J+	0.98 J	0.68 J	0.58 J	0.6 J	0.6 J	2.1 J	1.3 J	1.1 J	0.55 J	0.58 J	0.84 J	0.71	0.62	0.67
pH	SU	7.43	7.37	7.1	7.24	7.44	7.02	7.25	7.19	7.38	7.48	7.39	7.63	7.4	7.15	7.66
Sulfate	mg/L	710 J-	680	710	740	710	680	300	380	420		520	350	350	270	350
Total Dissolved Solids	mg/L	1500	1400	1400	1500	1700	1500	660	1000	960		1100	940	950	980	990
CCR Appendix IV																
Antimony	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.0024 J	0.0021 J	0.0024 J	0.0035 J	0.0023 J	0.0022 J	0.0023 J	0.0026 J		0.0011 J		0.0017 J	0.0023 J	0.0022 J	0.0019 J
Barium	mg/L	0.078	0.079	0.086	0.092	0.1	0.089	0.065	0.06		0.085	0.069	0.066	0.073	0.11	0.074
Beryllium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.00033 J	0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.0003 J	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	0.9 J+	0.98 J	0.68 J	0.58 J	0.6 J	0.6 J	2.1 J	1.3 J	1.1 J	0.55 J	0.58 J	0.84 J	0.71	0.62	0.67
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.0017 J	0.008 U	0.008 U	0.0019 J	0.00046 J	0.0021 J	0.0019 J	0.008 U		0.008 U		0.008 U	0.008 U	0.008 U	0.008 U
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ		0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.024	0.021	0.013	0.011	0.012	0.011	0.017	0.021		0.017	0.016	0.01	0.011	0.0073 J	0.01
Radium, Total	pci/L	1.79	1.84	2.53	2.58	1.25	1.94	1.03	2.4			1.21	1.47	2.48 J+	1.71	
Radium-226	pci/L	0.882 J+	0.864	1.28	1.4	1.01	1.09	0.639 J+	0.867			0.518	0.945	1.15 J+	0.964	
Radium-228	pci/L	0.913	0.98	1.25	1.17	0.423 U	0.846	0.395	1.53			0.696	0.524	1.33 J+	0.748	
Selenium	mg/L	0.005 U	0.005 U	0.005 U	0.00053 J	0.00051 J	0.005 U	0.005 U	0.005 U		0.005 U		0.0011 J	0.005 U	0.005 U	0.005 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.00022 J	0.001 U
Supplemental Parameters																
Alkalinity, Bicarbonate (HCO3)	mg/L												210			
Alkalinity, Carbonate (CO3)	mg/L												5 U			
Alkalinity, Hydroxide (OH)	mg/L												5 U			
Alkalinity, Total	mg/L												210	230	300	190
Ferric Iron	mg/L												4.1 J	3		
Ferrous Iron	mg/L												0.1 R	1.5 J		
Iron	mg/L														6.8	5.1
Magnesium	mg/L												32	33	53	44
Manganese	mg/L														1	0.76
Nitrate as N	mg/L												0.05 R		0.1 U	0.1 U
Nitrite as N	mg/L												0.05 R			
Nitrogen, Nitrate-Nitrite	mg/L													0.23		
Phosphorus (as phosphate)	mg/L												0.46	0.17 J	0.31 U	0.31 U
Potassium	mg/L												5.7	6.2	9.5	6.1
Sodium	mg/L												83	110	39	42
Sample Parameters																
Dissolved Oxygen	mg/L	0.33	0.24	0.67	0.36	0.13	0.13	0.18	0.14	0.09	0.16	0.11	0.2	0.88	0.23	4.2
Oxidation Reduction Potential	mV	-115	654	-100.8	-119.6	-91.8	102.3	-98.6	-51.1	-129.4	-95.2	-131.9	-91.9	-244.5	11.8	-3.6
Eh	mV	85.0	854.0	99.2	80.4	108.2	302.3	101.4	148.9	70.6	104.8	68.1	108.1	-44.5	211.8	196.4
pH	SU	7.43	7.37	7.1	7.24	7.44	7.02	7.25	7.19	7.38	7.48	7.39	7.63	7.4	7.15	7.66
Specific Conductance	uS/cm	1525	1734	1568	171.9	2251	1950	1488	1244	1337	1235	1463	2077	1380	1060	890
Temperature	deg C	15.29	16.16	15.77	15	14.8	14.4	15.62	16.5	16.6	15.2	15.2	16.55	16.1	13.6	15.05
Turbidity	NTU	4.09	2.48	0.62	0.92	0.58	2.11	2.35	1.86	3.45	3.76	3.88	3.55	4.86	3.61	2.68

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW18																	GAMW18B				
Sample Date		2016-07-13	2016-09-08	2016-11-09		2017-01-10	2017-03-01	2017-04-26	2017-07-12		2017-08-23	2017-10-03		2018-03-14	2018-04-23	2018-10-25	2019-04-29	2019-11-07	2018-09-10	2018-10-25		2019-04-29	2019-11-07
Sample Type		N	N	FD	N	N	N	N	FD	N	N	FD	N	N	N	N	N	N	N	FD	N	N	N
Chemical Name	Unit																						
CCR Appendix III																							
Boron	mg/L	1.8	3.5	1.9	1.8	1.3	1	0.77	1.2	1.2	1.5	1.9	1.9		1.2	1.7	0.95	1.7	13	12	13	14	11
Calcium	mg/L	320	610	370	360	330	280	210	280	290	300	380 J	64 J		320	230	320	360	260	200	220	240	180
Chloride	mg/L	17	39	17	17	9.3	5	4.3	10	10	11	23	23		7.3	22	12	27	150	140	140	170	140
Fluoride	mg/L	0.047 J+	0.036 J	10 U	10 U	5 U	5 U	2 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	0.057	0.074	0.15	0.77 J	0.74	0.73	0.88	0.99
pH	SU	6.95	6.83		6.7	6.88	7.11	6.6		6.96	7.02		6.91	7.2	7.21	6.54	6.71	7.18	7.73		6.86	7.15	7.68
Sulfate	mg/L	760 J-	1400	850	830	640	540	370	600	610	690	960	950		670	550	780	920	1100	1000	1100	1100	840
Total Dissolved Solids	mg/L	1300	2200	1500	1500	1200	1000	730	1100	1100	1300	1600	1500		2400	1100	1400	1500	2100	2000	2000	2100	1500
CCR Appendix IV																							
Antimony	mg/L	0.002 U	0.002 U	0.00096 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U			0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.0014 J	0.0023 J	0.0014 J	0.00091 J	0.0014 J	0.005 U	0.0015 J	0.0021 J	0.0021 J	0.0011 J			0.005 U		0.005 U	0.00079 J	0.005 U	0.0018 J	0.0026 J	0.0028 J	0.0037 J	0.0041 J
Barium	mg/L	0.038	0.047	0.041	0.039	0.037	0.024	0.021	0.051	0.052	0.055			0.048	0.035	0.037	0.039	0.05	0.048	0.035	0.039	0.039	0.024
Beryllium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.00094 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00053 U	0.001 U
Cadmium	mg/L	8.1E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.00067 J	0.00046 J	0.0005 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U			0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.00023 J	0.00047 J	0.0002 J	0.00024 J	0.001 U	0.00023 J	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.00028 J	0.001 U	0.00027 J	0.00026 J	0.00028 J	0.00024 J	0.00024 J
Fluoride	mg/L	0.047 J+	0.036 J	10 U	10 U	5 U	5 U	2 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	0.057	0.074	0.15	0.77 J	0.74	0.73	0.88	0.99
Lead	mg/L	0.001 U	0.001 U	0.00051 J	0.00025 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.00067 J		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.00096 J	0.008 U	0.008 U	0.008 U	0.00042 J	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U			0.008 U		0.008 U	0.008 U	0.008 U	0.025	0.015	0.016	0.023	0.015
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ			0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.11	0.18	0.14	0.13	0.094	0.1	0.1	0.1	0.11	0.1			0.097	0.085	0.057	0.062	0.076	0.024	0.014	0.015	0.026	0.011
Radium, Total	pci/L	5 U	0.803	0.474	0.449	0.581 U	0.398 U	0.384 U	0.493	0.337 U	0.629			0.373 U	0.259	0.477	0.365 U		1.7	1.28	1.46		
Radium-226	pci/L	1 U	0.348	0.334 U	0.33 U	0.325	0.13	0.131 U	0.166 J+	0.179 J+	0.332			0.111	0.0715	0.291	0.325 U		0.773 J+	0.717	0.748	0.41	
Radium-228	pci/L	1 U	0.49 U	0.455 U	0.413 U	0.581 U	0.398 U	0.384 U	0.381 U	0.337 U	0.369 U			0.373 U	0.187	0.357 U	0.365 U		0.928	0.562	0.708	0.941	
Selenium	mg/L	0.01	0.018	0.0065	0.0052	0.0099	0.011	0.0053	0.012	0.012	0.006			0.009	0.0084	0.015	0.015	0.012	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Supplemental Parameters																							
Alkalinity, Bicarbonate (HCO3)	mg/L																		230				
Alkalinity, Carbonate (CO3)	mg/L																		5 U				
Alkalinity, Hydroxide (OH)	mg/L																		5 U				
Alkalinity, Total	mg/L															240	190	250	230		230	210	200
Ferric Iron	mg/L															0.032 J			6.8 J		2.9		
Ferrous Iron	mg/L															0.05 UJ			0.1 R		1.3 J		
Iron	mg/L																0.16 J	0.083 J				3.6	3
Magnesium	mg/L															16	17	23	66		58	67	51
Manganese	mg/L																0.0047 J	0.014 J				0.69	0.66
Nitrate as N	mg/L																0.19	0.51	0.05 UJ			0.1 U	0.1 U
Nitrite as N	mg/L																		0.05 UJ				
Nitrogen, Nitrate-Nitrite	mg/L															0.55					0.05 U		
Phosphorus (as phosphate)	mg/L															0.31 U	0.14 J	0.31 UJ	0.031 U		0.31 U	0.31 U	0.31 UJ
Potassium	mg/L															3.4 J	2 J	3.7 J	7.3		5.7	7.8	4.4 J
Sodium	mg/L															28	24	39	260		240	260	180
Sample Parameters																							
Dissolved Oxygen	mg/L	4.83	4.77		5.93	7.52	8.86	7.79		6.04	4.52		5.32	6.5	8.49	3.78	7.01	2.95	0.24		0.29	0.92	0.36
Oxidation Reduction Potential	mV	98.9	76.8		28.7	106.8	97.9	209.2		203.2	24.7		121.9	-129.6	-51.6	-36.6	129.2	-41.1	-140.7		-103.4	109.2	-144.8
Eh	mV	298.9	276.8		228.7	306.8	297.9	409.2	200.0	403.2	224.7		321.9	70.4	148.4	163.4	329.2	158.9	59.3		96.6	309.2	55.2
pH	SU	6.95	6.83		6.7	6.88	7.11	6.6		6.96	7.02		6.91	7.2	7.21	6.54	6.71	7.18	7.73		6.86	7.15	7.68
Specific Conductance	uS/cm	1474	2362		1740	1255	986	970		1299	1414		1760	905	1170	1230	1060	1338	3311		2147	1902	1475
Temperature	deg C	16.3	20.1		16.6	9.65	8.47	11.2		17.9	19.8		19.3	8.1	8.9	17.4	8.8	14.2	15.39		14.9	11.8	13.7
Turbidity	NTU	3.32	1.63		2.38	3.05	4.44	2.48		1.71	1.03		4.16	4.59	0.71	1.29	4.55	2.04	2.78		3.58	3.21	3.14

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW46								GAMW46B								GAMW52					
Sample Date		2018-06-13	2019-03-01	2019-04-17	2019-06-06	2019-07-18	2019-08-26	2019-10-04	2019-11-19	2018-06-13	2019-03-04	2019-04-17	2019-06-07	2019-07-18	2019-08-26	2019-10-04	2019-11-19	2018-09-10	2018-10-31		2019-05-09	2019-11-14	
Sample Type		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	FD	N
Chemical Name	Unit																						
CCR Appendix III																							
Boron	mg/L	0.055 J	0.1 U	0.033 J	0.1 U	0.032 J	0.053 J	0.043 J	0.049 J	0.05 J	0.05 J	0.037 J	0.047 J	0.03 J	0.05 J	0.047 J	0.046 J	0.34		0.17	0.077 J		0.13
Calcium	mg/L	56	14	28	25 J-	25	25	23	27	25	58	58	56	52	58	49	56	75		59	52		72
Chloride	mg/L	8.4	2.4	1.9		1.8	1.6	1.6	1.6	3	7.9	7.9		7.2	8	7.1	6.9	34		9.1	5.5		37
Fluoride	mg/L	0.052 J	0.068	0.063		0.065	0.06	0.079 J+	0.062	0.048 J	0.066	0.076		0.072	0.069	0.073 J+	0.072	0.36 J		0.3	0.25 J+		0.3
pH	SU	7.93	8.17	8.23	7.52	8.15	7.9	7.81	7.77	8.2	7.11	7.99	7.58	8.18	7.62	7.44	7.47	7.5		7.06	7.17		7.59
Sulfate	mg/L	55	34	30		28	29	30	27	29	64	64		64	68	65	64	86		39	24		67
Total Dissolved Solids	mg/L	260	160	150		130	150	140 J+	140	150	260	290		240	220 J	250	240	400		250	240		350
CCR Appendix IV																							
Antimony	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U	0.002 U		0.002 U
Arsenic	mg/L	0.0014 J	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.00086 J	0.005 U	0.0015 J	0.0012 J	0.00076 J	0.005 U	0.00091 J	0.00095 J	0.0013 J	0.001 J	0.005 U		0.005 U	0.005 U		0.005 U
Barium	mg/L	0.027	0.0028 J	0.0059	0.0065	0.0054	0.0054	0.0049 J	0.0059	0.0086	0.027	0.026	0.025	0.023	0.024	0.021	0.025	0.039		0.019	0.015		0.02
Beryllium	mg/L	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00054 J	0.001 U	0.001 U	0.0011	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0011	0.001 U		0.001 U	0.001 U		0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.00024 J	0.001 U		0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.0014 J	0.002 U	0.002 U	0.0021	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U	0.002 U		0.002 U
Cobalt	mg/L	0.0002 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00034 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00058 J		0.00031 J	0.001 U		0.001 U
Fluoride	mg/L	0.052 J	0.068	0.063		0.065	0.06	0.079 J+	0.062	0.048 J	0.066	0.076		0.072	0.069	0.073 J+	0.072	0.36 J		0.3	0.25 J+		0.3
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U		0.001 U
Lithium	mg/L	0.008 U	0.04 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.0017 J	0.008 U	0.008 U	0.002 J	0.008 U	0.008 U	0.003 J	0.0017 J		0.008 U	0.008 U		0.0025 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U		0.0002 U	0.0002 U		0.0002 U
Molybdenum	mg/L	0.0031 J	0.01	0.01 U	0.01 U	0.01 U	0.01 U	0.0015 J	0.01 U	0.0018 J	0.0024 J	0.0022 J	0.0025 J	0.0028 J	0.0028 J	0.0025 J	0.003 J	0.005 J		0.0035 J	0.0016 J		0.0017 J
Radium, Total	pci/L	0.384 U	0.486 U	0.33 U		0.427 U	0.505 U	0.566		0.392 U	0.402 U	0.308 U		0.427 U	0.609 U	0.408 U		0.796		1 J+	0.53 U		
Radium-226	pci/L	0.244 U	0.103 U	0.0708 U		0.214 U	0.0925 UJ	0.179 J+		0.223 U	0.286	0.108		0.232 U	0.105 UJ	0.192 J+		0.46 J+		0.299 J+	0.436		
Radium-228	pci/L	0.384 U	0.486 U	0.33 U		0.427 U	0.505 UJ	0.481 U		0.392 U	0.402 U	0.308 U		0.427 U	0.609 UJ	0.408 U		0.392 U		0.706 J+	0.53 U		
Selenium	mg/L	0.001 J	0.025 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.0017 J	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.0014 J		0.0017 J	0.0014 J		0.0011 J
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00059 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00068 J	0.001 U		0.001 U	0.001 U		0.001 U
Supplemental Parameters																							
Alkalinity, Bicarbonate (HCO3)	mg/L																	210					
Alkalinity, Carbonate (CO3)	mg/L																	5 U					
Alkalinity, Hydroxide (OH)	mg/L																	5 U					
Alkalinity, Total	mg/L			82					73			140					130	210	180	190	170	190	190
Ferric Iron	mg/L																	0.2 J	0.1 U	0.1 U			
Ferrous Iron	mg/L																	0.1 R	0.05 J	0.05 UJ			
Iron	mg/L			0.054 J					0.2 U			1.5					1.6				0.2 U	0.2 U	0.2 U
Magnesium	mg/L			9.7					7.8			15					14	20	16	15	16	20	21
Manganese	mg/L			0.0066 J					0.015 U			0.26					0.23				0.0022 J	0.017	0.02
Nitrate as N	mg/L			0.58					0.48			0.1 U					0.1 U	1 J			1.9	1.1	1.1
Nitrite as N	mg/L																	0.089 J					
Nitrogen, Nitrate-Nitrite	mg/L																		1.3	1.3			
Phosphorus (as phosphate)	mg/L			0.16 J					0.31 U			0.15 J					0.31 U	0.031 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U
Potassium	mg/L			0.97 J					1 J			0.83 J					0.82 J	4.7	3 J	2.9 J	2.1 J	3.1 J	3.3 J
Sodium	mg/L			4.6 J					2.4 J			5.4					4.6 J	25	13	13	9.8	18	21
Sample Parameters																							
Dissolved Oxygen	mg/L	0.12	1.85	4.18	6.44	6.58	4.03	2.44	3.36	3.59	0.08	1.9	0.3	1.4	1.25	0.31	0.3	0.48		0.21	6.42		2.2
Oxidation Reduction Potential	mV	-171.4	1.9	7.7	157.6	25.5	40.6	9.16	-141.1	-29.4	111.9	-111.1	-133.1	-93.9	-119.9	33.7	-229.6	-30.3		85.1	108.2		-43.2
Eh	mV	28.6	201.9	207.7	357.6	225.5	240.6	209.2	58.9	170.6	311.9	88.9	66.9	106.1	80.1	233.7	-29.6	169.7		285.1	308.2	200.0	156.8
pH	SU	7.93	8.17	8.23	7.52	8.15	7.9	7.81	7.77	8.2	7.11	7.99	7.58	8.18	7.62	7.44	7.47	7.5		7.06	7.17		7.59
Specific Conductance	uS/cm	367	155	161	179	153	153	152	132	211	268	294	282	274	284	260	242	0.896		448	308		320
Temperature	deg C	11.4	8	9.1	11.1	13.2	14.2	14.8	11.7	11.3	9.6	10.8	11	11.9	12.3	12.3	11.3	19.97		17.6	14.2		15.3
Turbidity	NTU	3.96	1.91	1.33	0.51	0.82	0.69	0.89	0.66	3.45	3.26	4.3	3.25	3.11	1.15	4.16	2.84	0.45		0.83	0.42		0.74

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW52B				GAMW53				GAMW53B					GAMW54				GAMW54B				
Sample Date		2018-09-11	2018-10-31	2019-05-09	2019-11-14	2018-09-11	2018-10-30	2019-04-30	2019-11-14	2018-09-11	2018-10-30		2019-04-30	2019-11-14	2018-09-10	2018-10-31	2019-04-30	2019-11-14	2018-09-10	2018-10-31		2019-05-01	2019-11-15
Sample Type		N	N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N	N	FD	N	N	N
Chemical Name	Unit																						
CCR Appendix III																							
Boron	mg/L	0.75	0.8	1	1.3	0.19	0.25	0.056 J	0.13	2.5		3.1	2.2	0.73	0.84	0.77	0.39	0.37	5.6		6.5	5.9	6
Calcium	mg/L	160	160	110	130	45	53	17	25	180		190	150	140	93	88	93	81	210		220	200	240
Chloride	mg/L	530	470	380	370	4.9	4.6	1.9	3.6	90		85	81	74	15	10	10	4	100		95	110	120
Fluoride	mg/L	10 U	0.18	0.21 J+	0.23	0.17 J	0.17	0.05 U	0.05 U	0.52 J		0.46	0.51	0.7	0.18 J	0.17	0.14	0.28	0.41 J		0.52	0.59	0.58
pH	SU	8.3	7.1	7.42	7.34	6	6.47	5.93	6.21	7.3		7.35	7.41	7.52	6.24	7.92	6.82	7.08	6.95		8.71	7.27	7.2
Sulfate	mg/L	210	190	220	290	51	56	37	36	430		510	340	320	190	150	190	76	750		730	710	720
Total Dissolved Solids	mg/L	1500	1300	1100	1100	240	250	130	160	1100		1100	900	770	500	400	470	350	1600		1400	1500	1400
CCR Appendix IV																							
Antimony	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.00061 J	0.002 U		0.002 U	0.002 U	0.002 U	0.0011 J	0.00074 J	0.00078 J	0.001 J	0.002 U		0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.0013 J	0.0016 J	0.00083 J	0.0012 J	0.013	0.015	0.00097 J	0.0018 J	0.00079 J		0.00083 J	0.001 J	0.0016 J	0.0024 J	0.0028 J	0.0022 J	0.0045 J	0.0025 J		0.0032 J	0.0045 J	0.005
Barium	mg/L	0.32	0.31	0.25	0.28	0.027	0.028	0.019	0.026	0.052		0.054	0.044	0.072	0.043	0.039	0.031	0.031	0.098		0.093	0.08	0.084
Beryllium	mg/L	0.001 U	0.00042 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.00059 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U
Cadmium	mg/L	0.001 U	0.00029 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.0019 J	0.0018 J	0.0012 J	0.002 U	0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.001 U	0.00032 J	0.001 U	0.001 U	0.00084 J	0.00099 J	0.0005 J	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U	0.00053 J	0.00052 J	0.00062 J	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U
Fluoride	mg/L	10 U	0.18	0.21 J+	0.23	0.17 J	0.17	0.05 U	0.05 U	0.52 J		0.46	0.51	0.7	0.18 J	0.17	0.14	0.28	0.41 J		0.52	0.59	0.58
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.0014	0.00089 J	0.00057 J	0.00063 J	0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.0041 J	0.0031 J	0.0033 J	0.0071 J	0.008 U	0.008 U	0.008 U	0.0021 J	0.0042 J		0.0052 J	0.005 J	0.0066 J	0.008 U	0.008 U	0.008 U	0.0023 J	0.0048 J		0.0036 J	0.0048 J	0.0074 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U		0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.014	0.015	0.0095 J	0.0086 J	0.012	0.015	0.0051 J	0.011	0.0083 J		0.0075 J	0.0098 J	0.02	0.043	0.044	0.023	0.03	0.018		0.019	0.0085 J	0.012
Radium, Total	pci/L	3.52	5.55 J+	2.63		0.547 U	1.45 J+	0.344 U		1.69		0.48 J+	1.26		0.5	1.08 J+	0.393 U		2.03		2.7 J+	1.82	
Radium-226	pci/L	2.11	2.76 J+	1.2		0.257	0.795 J+	0.316 U		0.789		0.238 J+	0.544		0.385 J+	0.237 J+	0.337 U		1.18 J+		1.35 J+	0.956	
Radium-228	pci/L	1.41	2.79 J+	1.44		0.547 U	0.658 J+	0.344 U		0.897		0.347 U	0.719		0.385 U	0.843 J+	0.393 U		0.849		1.35 J+	0.865	
Selenium	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U		0.005 U	0.005 U	0.005 U	0.0017 J	0.0012 J	0.0043 J	0.0035 J	0.005 U		0.005 U	0.005 U	0.005 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.00049 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U
Supplemental Parameters																							
Alkalinity, Bicarbonate (HCO3)	mg/L	220				120				250					150				240				
Alkalinity, Carbonate (CO3)	mg/L	5 U				5 U				5 U					5 U				5 U				
Alkalinity, Hydroxide (OH)	mg/L	5 U				5 U				5 U					5 U				5 U				
Alkalinity, Total	mg/L	220	230	220	200	120	140	53	73	250	240	250	260	190	150	160	160	230	240	230	230	250	260
Ferric Iron	mg/L	5 J	3.4			2 J	1			3.2 J	2.3	2.7			0.13 J	0.14			5.9 J	4.5	3.4		
Ferrous Iron	mg/L	0.1 R	0.32 J			0.1 R	0.5 J			0.1 R	0.56 J	1 J			0.1 R	0.029 J			0.1 R	0.94 J	1.6 J		
Iron	mg/L			2.7	2.5			0.25	0.28				3.1	2.4			0.14 J	0.31				5.4	5.4
Magnesium	mg/L	37	38	30	28	15	15	8.9	11	23	24	25	23	19	19	18	21	17	38	38	36	42	46
Manganese	mg/L			0.21	0.25			0.0079 J	0.015 U				0.4	0.32			0.0097 J	0.015 U				0.48	0.51
Nitrate as N	mg/L	0.05 UJ		0.1 U	0.1 U	1.3 J		1.4	0.4	0.05 UJ			0.1 U	0.1 U	0.028 J		0.49	0.15	0.05 UJ			0.1 U	0.1 U
Nitrite as N	mg/L	0.05 UJ				0.03 J				0.05 UJ					0.05 UJ				0.05 UJ				
Nitrogen, Nitrate-Nitrite	mg/L		0.052				0.05 U				0.099	0.74 J-				0.21				0.15	0.091		
Phosphorus (as phosphate)	mg/L	0.056	0.21 J	0.31 U	0.11 J	0.32	0.31 U	0.31 U	0.31 U	0.031 U	0.14 J	0.52	0.31 U	0.31 U	0.031 U	0.31 U	0.11 J	0.31 U	0.079	0.31 U	0.39	0.38	0.3 J
Potassium	mg/L	6	6.4	7	6.5	2.2	5 U	1.3 J	1.6 J	4.6	5.2	5.4	4.9 J	4.5 J	1.9	1.8 J	1.2 J	1.6 J	6.8	6.8	6.2	6.3	5.6
Sodium	mg/L	220	250	250	210	6.5	7.8	4.9 J	3.9 J	120	130	130	99	75	21	21	15	11	200	200	180	160	140
Sample Parameters																							
Dissolved Oxygen	mg/L	0.44	0.1	0.15	0.19	0.53	0.86	3.11	0.84	0.26		0.8	0.36	0.09	0.61	1.41	0.72	0.26	0.42		2.12	0.42	0.31
Oxidation Reduction Potential	mV	-214.9	-103.5	6.31	-102.9	-24.6	-199.5	43.7	-54.8	-183.2		-168	27.7	-75.3	107.8	-294.7	48.4	-69.5	-123.4		-315.7	-23.1	-43.3
Eh	mV	-14.9	96.5	206.3	97.1	175.4	0.5	243.7	145.2	16.8		32.0	227.7	124.7	307.8	-94.7	248.4	130.5	76.6	200.0	-115.7	176.9	156.7
pH	SU	8.3	7.1	7.42	7.34	6	6.47	5.93	6.21	7.3		7.35	7.41	7.52	6.24	7.92	6.82	7.08	6.95		8.71	7.27	7.2
Specific Conductance	uS/cm	1934	2005	1652	1353	307	400	125	155	1354		1620	1160	870	675	630	493	374	1816		1983	1636	1310
Temperature	deg C	17.26	16.6	15.3	16.1	21.3	20.1	11.4	17.5	20.89		20.4	18.7	19.7	21.2	18.53	10.5	15.3	17.6		17.29	15.5	15.8
Turbidity	NTU	1.6	0.88	2.35	1.01	9.93	5.17	4.76	4.8	2.43		3	3.45	2.5	2.03	1	3.24	2.31	4.2		1.64	4.49	1.67

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Appendix A-1: Groundwater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

Location		GAMW55				GAMW55R	GAMW55B					GAMW56				GAMW56B			
Sample Date		2018-09-10		2018-10-29		2019-11-15	2018-09-11		2018-10-29	2019-05-01	2019-11-15	2018-09-11	2018-10-26	2019-04-29	2019-11-15	2018-09-11	2018-10-29	2019-04-29	2019-11-15
Sample Type		FD	N	FD	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N
Chemical Name	Unit																		
CCR Appendix III																			
Boron	mg/L	1.9	1.9	1.8	1.8	1.1	7.1	7.4	8.2	9.1	11	0.26	0.28	0.21	0.2	1.2	1.2	2.3	3.2
Calcium	mg/L	260	250	270	260	180	250	250	260	210	210	130	110	91	120	140	140	150	150
Chloride	mg/L	58	59	69	70	61	220	220	190	170	150	3.1	2.4	3.2	2.1	50	36	55	64
Fluoride	mg/L	0.51 J	0.52 J	0.47	0.47	0.62	0.29 J	10 U	0.25	0.31	0.31	1.2 J	0.99	0.53	0.71	0.41 J	0.33	0.4	0.44
pH	SU		6.77		7.04	7.46	7.31		7.07	7.19	7.31	6.82	7.17	6.83	7.06	6.95	6.91	7.08	7.21
Sulfate	mg/L	590	600	630	620	480	820	820	910	790	750	57	63	54	56	170	130	260	360
Total Dissolved Solids	mg/L	1200	1300	1300	1300	950	1800	1900	1800	1700	1400	470	480	420	440	740	690	830	860
CCR Appendix IV																			
Antimony	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002	0.002 U
Arsenic	mg/L	0.00083 J	0.005 U	0.005 U	0.005 U	0.005 U	0.0014 J	0.0011 J	0.005 U	0.005 U	0.005 U	0.019	0.022	0.011	0.0097	0.005 U	0.005 U	0.005	0.005 U
Barium	mg/L	0.099	0.097	0.068	0.069	0.035	0.14	0.14	0.12	0.074	0.067	0.068	0.049	0.044	0.04	0.076	0.072	0.082	0.076
Beryllium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001	0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001	0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002	0.002 U
Cobalt	mg/L	0.0065	0.0058	0.0044	0.0044	0.001 U	0.00034 J	0.00028 J	0.001 U	0.001 U	0.001 U	0.0017	0.0053	0.0084	0.0081	0.001 U	0.001 U	0.001	0.001 U
Fluoride	mg/L	0.51 J	0.52 J	0.47	0.47	0.62	0.29 J	10 U	0.25	0.31	0.31	1.2 J	0.99	0.53	0.71	0.41 J	0.33	0.4	0.44
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001	0.001 U
Lithium	mg/L	0.0021 J	0.0017 J	0.008 U	0.008 U	0.0035 J	0.0064 J	0.0064 J	0.0054 J	0.0055 J	0.0078 J	0.0034 J	0.0039 J	0.0023 J	0.0053 J	0.0051 J	0.0035 J	0.0044	0.0062 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002	0.0002 U
Molybdenum	mg/L	0.03	0.028	0.026	0.026	0.024	0.0057 J	0.0055 J	0.0055 J	0.0046 J	0.005 J	0.013	0.0094 J	0.0072 J	0.0079 J	0.004 J	0.003 J	0.0031	0.0064 J
Radium, Total	pci/L	1.4	0.802	0.922 J+	1.24 J+		3.35	3.18	3.66 J+	2.08		0.728	0.698 J+			1.26	1.28 J+		
Radium-226	pci/L	0.574 J+	0.474 J+	0.363 J+	0.447 J+		1.72	1.75	1.86 J+	1.15		0.504	0.357 J+	0.334 U		0.763	0.578 J+	0.506	
Radium-228	pci/L	0.824	0.403 U	0.559 J+	0.796 J+		1.63	1.43	1.79 J+	0.926		0.371 U	0.429 U	0.373 U		0.493	0.698 J+	0.571	
Selenium	mg/L	0.0037 J	0.0031 J	0.0027 J	0.0027 J	0.0046 J	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005	0.005 U
Thallium	mg/L	0.00021 J	0.001 U	0.00023 J	0.00022 J	0.00022 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001	0.001 U
Supplemental Parameters																			
Alkalinity, Bicarbonate (HCO3)	mg/L		240					230				370				370			
Alkalinity, Carbonate (CO3)	mg/L		5 U					5 U				5 U				5 U			
Alkalinity, Hydroxide (OH)	mg/L		5 U					5 U				5 U				5 U			
Alkalinity, Total	mg/L		240		240	230		230	220	230	230	370	370	300	330	370	410	330	270
Ferric Iron	mg/L		0.65 J		0.19			5.2 J	2.5			13 J	5.5			6.4 J	3.5		
Ferrous Iron	mg/L		0.1 R		0.058 J			0.1 R	2.8 J			0.1 R	6.5 J			0.1 R	1.7 J		
Iron	mg/L					0.044 J				4.2	4.1			10	3.9			5.7	4.3
Magnesium	mg/L		32		39	28		46	51	50	42	24	25	27	24	37	38	40	38
Manganese	mg/L					0.22				0.58	0.46			0.25	0.45			0.33	0.29
Nitrate as N	mg/L		0.68 J			1.4		0.05 UJ		0.1 U	0.1 U	0.05 UJ		1.5	0.13	0.05 UJ		0.1 U	0.1 U
Nitrite as N	mg/L		0.058 J					0.05 UJ				0.05 UJ				0.05 UJ			
Nitrogen, Nitrate-Nitrite	mg/L				0.44				0.05 U				0.062				0.05 U		
Phosphorus (as phosphate)	mg/L		0.031 U		0.31 U	0.31 U		2.1	0.7	0.31 U	0.16 J	0.031 U	0.31 U	0.12 J	0.31 U	0.045	0.15 J	0.14 J	0.31 U
Potassium	mg/L		8.3		9.5	7.2		6	6.6	6.2	4.8 J	2.6	2.4 J	1.6 J	1.9 J	3.3	3.6 J	3.7 J	3.6 J
Sodium	mg/L		58		72	79		200	230	200	180	11	12	6.3	5.5	50	49	58	62
Sample Parameters																			
Dissolved Oxygen	mg/L		1.73		0.33	0.17	0.72		0.37	0.17	0.11	0.99	0.28	1.3	0.34	0.29	0.26	0.79	0.18
Oxidation Reduction Potential	mV		21.6		-69.4	-137.9	-28.9		-129.5	-115.9	-57.5	-97.4	-95.4	64	-86.6	-102.8	-44.4	31.8	-105.7
Eh	mV		221.6	200.0	130.6	62.1	171.1		70.5	84.1	142.5	102.6	104.6	264.0	113.4	97.2	155.6	231.8	94.3
pH	SU		6.77		7.04	7.46	7.31		7.07	7.19	7.31	6.82	7.17	6.83	7.06	6.95	6.91	7.08	7.21
Specific Conductance	uS/cm		1493		1574	1491	1017		2109	2201	1967	749	835	460	466	928	1036	856	741
Temperature	deg C		21.1		19.4	17.9	16.7		19.2	18.5	18.1	17	15.7	8.7	14	13.9	13.8	11.6	12.9
Turbidity	NTU		1.74		0.66	3.92	2.26		4.38	1.74	4.77	2.91	2.99	2.31	2.01	2.96	1.45	4.77	1.4

Notes:
CCR = coal combustion residual
mg/L = milligrams per liter
mV= millivolts
pci/L= picoCuries per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.
"R"= Result was rejected during data validation.

Prepared by: DFSC
Checked by: KMC
Reviewed by MAH

Appendix A-2: Porewater Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

SYS_LOC_CODE		DAPZ-02A	DAPZ-02B	GAPIEZ06	GAPIEZ06	GAPIEZ06
SAMPLE_DATE_yyyy-MM-dd		2020-03-03	2020-03-03	2018-08-09	2018-09-13	2018-10-31
FRACTION		T	T	D	T	T
Chemical Name	Unit					
CCR Appendix III						
Boron	mg/L	7.4	13.8	9.6	8.6	8.3
Calcium	mg/L	489	175	210	210	210
Chloride	mg/L	21.9	119	56	58	55
Fluoride	mg/L	0.16	0.72	0.91	1.1 J	0.92
pH	SU	7.33	7.62	7.51	7.43	9.37
Sulfate	mg/L	1760	2420	750	720	740
Total Dissolved Solids	mg/L	2810	3830		1300	1300
CCR Appendix IV						
Antimony	mg/L	0.001 U	0.001 U	0.0014 J	0.002 U	0.002 U
Arsenic	mg/L	0.001 U	0.0018	0.011	0.011	0.012
Barium	mg/L	0.028	0.033	0.03	0.029	0.03
Beryllium	mg/L	0.0002 U	0.0002 U	0.001 U	0.00052 J	0.001 U
Cadmium	mg/L	0.00052	0.0002 U	0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.002 U	0.0038	0.0023 J+	0.002 U	0.002 U
Cobalt	mg/L	0.0022	0.001 U	0.0004 J	0.00029 J	0.001 U
Fluoride	mg/L	0.16	0.72	0.91	1.1 J	0.92
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.008 U	0.016	0.0041 J	0.0038 J	0.0033 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.81	0.063	0.079	0.094	0.11
Selenium	mg/L	0.011	0.001 U	0.001 J	0.005 U	0.005 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Supplemental Parameters						
Alkalinity, Bicarbonate (HCO3)	mg/L				170	
Alkalinity, Carbonate (CO3)	mg/L				5 U	
Alkalinity, Hydroxide (OH)	mg/L				5 U	
Alkalinity, Total	mg/L	99.6	224	170	170	160
Ferric Iron	mg/L			2.8 J	2.7 J	0.19
Ferrous Iron	mg/L			0.1 U	0.1 R	0.088 J
Iron	mg/L	0.61	14.2			
Magnesium	mg/L	48.9	18.4	53	51	45
Manganese	mg/L	0.12	0.7			
Nitrate	mg/L			0.031 J		
Nitrate as N	mg/L	0.75 J+	0.1 U		0.05 U	
Nitrite as N	mg/L				0.05 U	
Nitrogen, Nitrate-Nitrite	mg/L					0.038 J
Phosphorus (as phosphate)	mg/L			0.031 U	0.028 J	0.12 J
Potassium	mg/L	59.1	17.5	3.9 J	4.1	5 U
Sodium	mg/L	286	1050	100	110	99
Field Parameters						
Dissolved Oxygen	mg/L	0.61	0.00	1.33	0.7	0.80
Oxidation-Reduction Potential	mV	66.9	-197.4	-130.8	-118.2	-261
Eh	mV	266.9	2.6	69.2	81.8	-61
pH	SU	7.33	7.62	7.51	7.43	9.37
Specific Conductance	uS/cm	3025	4772	1518	1371	1672
Temperature	deg C	9.4	11.7	15.91	16.1	15.1
Turbidity	NTU	28.9	2.74	3.73	4.29	3.4

Notes:
CCR= coal combustion residual
mg/L = milligrams per liter
mV= millivolts
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"R"= Indicates the result was rejected during data validation.

Prepared by: DFSC
Checked by: KMC
Reviewed by: MAH

APPENDIX B

Groundwater Flow Model Technical Memorandum

TECHNICAL MEMORANDUM

DATE November 12, 2020

TO Danielle Sylvia Cofelice, PE and PJ Nolan, Ph.D.

CC Mark Haney, Joe Gormley, and Rens Verburg

FROM: Ross Bennett, PE(NH) and Brandon Poiencot, PE

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM

R.M. SCHAHFER GENERATING STATION

1.0 GROUNDWATER MODELING

This Memorandum presents Golder's summary of groundwater modeling activities associated with the evaluation of hydrogeologic conditions and potential remedial designs at the R.M. Schahfer Generating Station in Wheatfield, Indiana (the Site).

A steady state groundwater flow model was developed and calibrated. This memorandum includes the following to document development of the groundwater flow model and includes:

1) Objectives;
2) Groundwater Flow Model Development
3) Model selection (numerical);
4) Model Geometry
5) Boundary Conditions
6) Input Parameters
7) Model Calibration and Verification
8) Parameter Sensitivity analysis
9) Design Simulations
10) Summary

The conceptual model (including geology, hydrology, lithology and analytical data) used to support numerical model development is described Section 2.0 of the CCR Assessment of Corrective Measures Report (Golder, 2019).

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1.1 Objectives

The primary objective of the modeling was to simulate the groundwater flow conditions in the area surrounding R.M. Schahfer Generating Station to support evaluation of the remedy design including the feasibility of Monitored Natural Attenuation (MNA) as part of the assessment of corrective measures process for the Coal Combustion Residuals (CCR) surface impoundments for the Site.

The general scope of the groundwater modeling is to:

- Simulate the groundwater flow regimes on Site;
- Predict the travel times and flow paths of unattenuated particles originating at areas impacted by metals contamination;
- Inform remedy design (e.g., groundwater pump and treat design);
- Inform the groundwater monitored natural attenuation study.

2.0 GROUNDWATER FLOW MODEL DEVELOPMENT

2.1 Numerical Implementation

Golder developed the groundwater flow model for the site using the USGS MODFLOW-2005 Modular Three-Dimensional Finite-Difference Groundwater Flow Model (Harbaugh, 2005). The pre- and post-processing software used for the modeling was Groundwater Vistas (Vistas) Version 7.24 (Environmental Simulations Inc.).

Development of a numerical groundwater flow model involved the following steps:

- Definition of the model geometry including lateral and vertical extent, number and thickness of model layers, and grid spacing
- Definition and placement of model boundary conditions
- Selection of input parameters such as hydraulic conductivity (horizontal and vertical) and precipitation recharge

The following sections describe the steps used to develop the model.

2.2 Model Geometry

The finite-difference model grid location is shown on Attachment A**.** The model area (excluding no-flow cells) is approximately 10,800 feet (along x-axis) by 12,300 feet (along y-axis) at the widest points. The southwest corner of the model grid (model coordinates 0, 0) corresponds with Site coordinates 2165530.5N and 2962863.0 W (Indiana State Plane West). The model grid is oriented parallel with cardinal directions. The model grid contains 504 rows and 432 columns. The grid cell size in the XY direction is uniform, at 25 feet by 25 feet across the entire model domain. Based on geologic and hydrogeologic conditions discussed in Section 2.0 of the CCR Assessment of Corrective Measures Report (Golder, 2019), the model utilizes three layers, with the lowermost layer representing the medium to coarse sand and the upper two layers representing the fine sands. Layers 1 and 2 have the same hydraulic properties, but they were divided to focus boundary condition cells in the upper portion of the aquifer using Layer 1. The base of Layer 3 is the top of the shale bedrock surface and ranges from 597 to 624

feet mean sea level (MSL). The surface topography is based on publicly available lidar data and ranges from 646 to 723 feet MSL. A cross section of model geometry along model column 200 is shown on Attachment B.

2.3 Model Boundary Conditions

Boundary conditions in groundwater models consist of physical and hydraulic boundaries within the model area. Physical boundary conditions are well-defined geologic and hydrologic features that influence groundwater flow patterns. The following sections describe the boundary conditions used in the model.

2.3.1 Constant Head Boundaries

Constant head boundaries (CHB) were assigned along an unnamed stream in Layer 1 in the southwestern corner of the model to recreate the approximate constant hydraulic heads where long-term average stream water levels are expected to remain relatively constant. Constant heads were also used within the basins that are surrounded slurry walls to simulate the average surface water elevations in the basins. The modeled CHBs are shown on Attachment C and summarized on Table B-1.

2.3.2 River Boundary Conditions

River boundary conditions are a head-dependent boundary condition, where the model computes the difference in head between the boundary and the model cell where the boundary is defined. River Boundary condition cells were used for the Kankakee River, as shown in Attachment A. River heads were defined by two USGS gauging stations that fell within the model grid, downstream at USGS station 05517530 in Kouts and upstream at USGS 05517500 at Dunns Bridge. The river width was estimated from satellite imagery, the river bottom elevation was assumed to be three feet lower than the stage, and the bed thickness was assumed to be 10 feet. The hydraulic conductivity of the river was set through calibration at 64.5 feet/day which is slightly lower than aquifer hydraulic conductivities discussed in Section 1.1.2.4.1.

2.3.3 Stream Boundary Conditions

Stream boundary conditions are a simplified version of river boundary conditions where surface water flow is monitored by MODFLOW and water is added or removed from the model based on the stream stage. Stream boundary conditions were used in the Model for Davis Ditch and Stalbaum Ditch, as shown in Attachment C. The stream width was estimated from satellite imagery, the stream bottom elevation was assumed to be 0.5 to 2 feet lower than the stage depending on size of the stream, and the bed thickness was assumed to be 5 feet. The hydraulic conductivity of the river was set at 100 feet/day for Davis Ditch where loosing stream conditions were expected, and at 0.5 feet per day in Stalbaum ditch where perched conditions where assumed to exist. Stream stage was set off two gauging stations in Stalbaum, SW-04 and SW-10. Elsewhere stream stage was estimated from surface elevations and then refined through model calibration.

2.3.4 Drain Boundary Conditions

Drain boundary conditions are a version of river/stream boundary conditions that can only remove water from the model. Drain boundary conditions were used in the Model for intermittent streams and drainage ditches, as shown in Attachment C. The drain width was estimated from satellite imagery, the drain bottom elevation was assumed to be 1 to 2 feet lower than the stage depending on size of the drain, and the bed thickness was assumed to be 1 foot. The hydraulic conductivity of the drains was set at 100 feet/day. Drain stage was estimated from surface elevations and then refined through model calibration.

2.3.5 No Flow Boundaries

No flow boundaries were assigned to the northeast side of the Kankakee River, as shown in Attachment C.

2.3.6 Horizontal Flow Barriers

A hydraulic flow barrier (HFB) or wall is a condition that limits flow between adjacent cells based on an assigned thickness and hydrologic conductivity. To model the slurry walls that are present around ponds, Golder used the HFB boundary condition with an assigned thickness of 1 foot and a horizontal hydraulic conductivity (K) value of 0.0000001 to model slurry walls that surround the basins. The location of HFB boundaries are presented in Attachment C

2.4 Model Input Parameters

The following paragraphs describe the input parameter data used for the model. Golder simulated steady state conditions in the model. Transient dependent parameters such as porosity and storage/storativity were not included in the model calibration process.

2.4.1 Hydraulic Conductivity

Golder based hydraulic conductivity values for the Site model on pumping test analysis results as discussed in Section 6.0 of the AT-01 Aquifer Test Report (Golder, 2020) and summarized in Table B-2. Golder used these results to assign initial hydraulic conductivity values to the groundwater flow model, and to check that the hydraulic conductivity values resulting from model calibration were within the range of values observed. Golder assigned a uniform Kx/Ky hydraulic conductivity value of 215 feet/day and a Kz of 21.5 feet/day across the entire model area for Layers 1 and 2. Layer 3 had a slightly lower hydraulic conductivity of 200 feet/day and a Kz of 20.0 feet/day across the entire model area. These hydraulic conductivities are based on a best fit from model calibration, and are within range of measured conductivities.

2.4.2 Precipitation Recharge

Precipitation recharge is the amount of precipitation that recharges the aquifer, which is generally the precipitation rate minus losses due to runoff and evapotranspiration. Recharge rates calculated for the area were presented in Letsinger (2015) and used in the model. After model calibration a best fit recharge value of 7.1 inches per year (0.00162 feet/day) was established, which was similar to the published rates. A recharge rate of 0.04 inches/year (0.00001 ft/day) was used for the capped landfill areas. Precipitation recharge rates are shown in Attachment D.

2.4.3 Groundwater Extraction and Recharge Wells

Groundwater extraction or recharge wells are present on and adjacent to the Site and were modeled in all versions of the model, as shown in Attachment D. The well field located on the northeast corner of the model contains eight wells that remove a total of 55,343 cubic feet/day. In the central portion of the Site the 5 cooling tower wells and two Miox wells remove a total of 7,701 cubic feet/day, and just west of the Site on well on the adjacent property removes 9,625 cubic feet/day.

3.0 MODEL CALIBRATION AND VERIFICATION

Model calibration consists of successive refinement of the model property assignments and input data from initial assumptions/estimates to improve the fit between observed and model-predicted results. A solution of a groundwater flow model problem requires information including aquifer parameters such as hydraulic conductivity, spatial boundary conditions, and the location and magnitude of applied stresses, such as recharge and drainage.

A solution is attained only when the proper combination of the above parameters and inputs are selected such that the physical problem is accurately represented by the model. The calibrated model described below should be considered a limited hydrologic effort founded on the available information within the context of necessary simplifying assumptions.

The purpose of the calibration effort was to simulate "steady-state" groundwater flow conditions that approximate the general flow patterns inferred from September 2019 groundwater level measurements. The model was calibrated through trial-and-error adjustment of model parameter values and through use of Model-Independent PEST, developed by Watermark Computing, to refine aquifer parameters. PEST allows model input parameters to be adjusted automatically over a given range until the model predicted head matches the observed head with the lowest possible numerical difference, referred to as the calibration residual (Doherty, 2016). Golder set the allowable range of parameter adjustment in PEST to represent realistic values as determined by previously published literature for the region and aquifer tests at the Site.

At each well location, the head residuals were calculated in Groundwater Vistas as the difference between the measured and simulated head values. Positive residual values indicate simulated head values were lower than measured elevations, while negative residual values indicate simulated head values were higher than measured elevations.

As a measure of the accuracy of the model, Groundwater Vistas calculates summary statistics using calculated residuals, which are used as measures of error in the calibrated model. The residual mean (RM) is the arithmetic mean of all calculated residual values. The absolute residual mean (ARM) is the arithmetic mean of the absolute value of the residuals (i.e., all negative residuals are considered positive). The root mean square error (RMSE) is the square root of the mean of the squared value of target residuals. Other statistics such as the residual standard deviation (RSD) (i.e., the square root of the variance [the average of the squared deviations from the mean]), and the sum of squared residuals (SSR) (computed by squaring each residual and adding them together) can also be useful in evaluation of the calibration process. While calibrating the model, Golder selected parameters estimated by PEST that were within a valid range from published literature or Site-specific data that resulted in improved calibration summary statistics.

3.1 Simulated Heads Calibrated to September 2019 Conditions

Measured groundwater elevations for 112 monitoring points from September 2019 were used for calibration, as presented in Table B-3. The model files for September 2019 calibration simulation use the root file name *V12_2019.* The simulated heads and residuals for targets screened in Layer 1 are presented in Attachment F. Based on the simulated contours of groundwater elevation, groundwater flows from the south/southwest toward the Site before it travels to the Kankakee River in the north/northeast.

A comparison of model-predicted versus observed September 2019 potentiometric heads for the 112 selected calibration points resulted in a RM of -0.36 feet and a RMSE of 0.72 feet. The calibration statistics for the model are presented in Table B-4. The RM of -0.36 feet, represents 4.9 percent of the total measured head difference for the model area (approximately 7.41 feet). The absolute residual mean for the model run is 0.57 feet, which is 7.7 percent of the total hydraulic head difference for the entire modeling area. The residual mean and the absolute residual mean are within the generally accepted standard of 10 percent of the total hydraulic head difference for the modeling area.

3.1.1 Water Balance

An effective measure of model calibration is the analysis of the water budget calculated by MODFLOW. The model provides flows across boundaries, flows to and from all sources and sinks, and flows generated by storage. Inflows into the model include:

- Constant head boundaries: 16,716 ft^3/d,
- Rivers: 165,339 ft^3/d,
- Streams: 182,984 ft^3/d and
- Recharge: 545,949 ft^3/d.

Outflows in the model include

- Constant head boundaries: 5,640 ft^3/d,
- Wells: 70,469 ft^3/d,
- Rivers: 474,633 ft^3/d,
- Streams: 400,512 ft^3/d, and
- Drains: 45,574 ft^3/d.

The outflow deficit is 85,842 cubic feet per day (ft^3/d), which is equivalent to error between outflow and inflow estimates of approximately 8.9 percent.

3.1.2 Numerical Model Verification

Model verification was performed using a second water level calibration data set from October 2018. The model input parameter values defined in the September 2019 simulation were maintained. The verification data is presented in Table B-5. The model files for the October 2018 conditions use the root file name *V12.1_2019*. The verification results indicate a RM of 0.33 feet, which represents 4.1 percent of the total hydraulic head difference for the model area. The absolute residual mean for this simulation was 0.52 feet, which is 6.5 percent of the total hydraulic head difference for the entire model area. The verification statistics suggests that the model is calibrated and verified.

4.0 DESIGN SIMULATIONS

Using the calibrated model, Golder used MODPATH (Pollack, 1989) to simulate travel times for particles released from the metals cleaning basin. Particles were started in Layer 3 of the model to simulate the release of contaminants in the deeper part of the aquifer where Boron concentrations exceeded 10 micrograms/liter. Effective porosity of the aquifer was varied between 0.16, 0.3, and 0.46 to represent values within the expected range for medium to fine sand. The length of the particle traces produced by MODPATH along with travel time estimates were used to calculate average groundwater velocities. These travel time calculations are presented in Table B-6.

5.0 GROUNDWATER MODELING SUMMARY

Through standard numerical groundwater modeling procedures, Golder developed a steady state groundwater flow model for the Site that is considered calibrated and verified. This model was utilized to inform the groundwater monitored natural attenuation study by simulating travel times for particles released from the metals cleaning basin.

6.0 REFERENCES

Doherty, 2016. PEST, Model-Independent Parameter Estimation. User Manual 6th Edition.

Golder, 2019, CCR Assessment of Corrective Measures Northern Indiana Public Service Company Rollin M Schahfer Generating Station Wheatfield, Indiana. April 2019.

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Letsinger, S. L., 2015, Map of Indiana showing near-surface aquifer recharge: Indiana Geological Survey Miscellaneous Map 92, scale 1:500,000.

Pollock, D.W., 1989 Documentation of computer programs to compute and display pathlines using results from the U.S. Geological Survey modular three-dimensional finite-difference groundwater flow model. U.S. Geological Survey, Open File Report 89-381.

List of Attachments:

Attachment A Model Grid

Attachment B Cross Section of Model Grid

Attachment C Boundary Conditions

Attachment D Precipitation Recharge Zones

Attachment E Active Pumping Wells

Attachment F Model Calibration – September 2019

List of Tables

Table B-1 Boundary Conditions

Table B-2 Site Pumping Test Results

Table B-3 Measured Groundwater Elevations - September 2019

Table B-4 Calibration Residuals and Summary Statistics - September 2019

Table B-5 Verification Residuals and Summary Statistics – October 2018

Table B-6 Travel Time Simulations

Table B-1: Boundary Conditions
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Constant Head Boundaries

Name	Layer	Reach	Starting Head (ft)	Ending Head (ft)
Intake Settling Basin	1	104	675.0	675.0
Final Settling Basin	1	101	675.0	675.0
Drying Area	1	100	672.0	672.0
Unnamed SW. Stream	1	1	663.17	661.20

Rivers

Name	Layer	Starting Stage (ft)	Starting Bed Elevation (ft)	Ending Stage (ft)	Ending Bed Elevation (ft)	Starting Width (ft)	Ending Width (ft)	Length (ft)	Thickness of Bed (ft)	Hydraulic Conductivity (ft/d)
Kakakanee River	1	651.82	649.10	646.72	644.01	135.28	159.88	24.0	10.0	64.41

Streams

Name	Layer	Starting Stage (ft)	Starting Bed Elevation (ft)	Ending Stage (ft)	Ending Bed Elevation (ft)	Starting Width (ft)	Ending Width (ft)	Length (ft)	Thickness of Bed (ft)	Hydraulic Conductivity (ft/d)	Slope of Channel (ft/ft)
Davis Ditch	1	661.99	659.99	650.29	646.31	20.05	74.80	50	10.0	63.41	0.001
Stalbaum Ditch	1	660.74	659.74	654.5	652.0	10.07	50	28	1.0	50	0.001
Fisher Ditch	1	661.49	659.49	660.88	658.88	30.04	32.08	51	5.0	100	0.001
Stalbaum South Ancillary Ditch	1	661.50	660.0	659.21	657.76	2.06	29.93	31	1.0	10	0.001
Stalbaum East Ancillary Ditch	1	661.0	655.36	657.17	655.21	18.80	30.36	13	5.0	0.1	0.001
Coal Yard Ditch	1	660.7	659.00	660.7	659	5.0	5.0	50	1.0	50	0.001

Drains

Name	Layer	Starting Stage (ft)	Ending Stage (ft)	Starting Width (ft)	Ending Width (ft)	Length (ft)	Thickness of Bed (ft)	Hydraulic Conductivity (ft/d)
Sands Ditch	1	662.0	654.1	1.0	5	38	1	50
W. Sands Drain	1	660.0	655.6	2	2	27	1	50
Hilliard St Ditch	1	659	659	2	2	24	1	10
N. LF Drain	1	661	661	8.8	8.8	50.0	1.0	62.0
S. LF Drain	1	661	661	8.8	8.8	50.0	1.0	62.0
W. LF Drain	1	661	661	5	5	50	2	100

Hydraulic Flow Barriers (Slurry Walls)

Name	First Layer	Last Layer	Thickness (ft)	Hydraulic Conductivity (ft/d)
Intake Settling Basin Slurry Wall	1	3	1	1.00E-07
Final Settling Basin Slurry Wall	1	3	1	1.00E-07
Drying Area Slurry Wall	1	3	1	1.00E-06

Table B-2: Site Pumping Test Results
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Pumping Test Results		Estimated Hydraulic Conductivity (ft/d)
SHALLOW WELLS	*Minimum:*	192
	Maximum:	363
	Arithmetic Mean:	266
DEEP WELLS	*Minimum:*	234
	Maximum:	320
	Arithmetic Mean:	268

Table B-3: Measured Groundwater Elevations - September 2019
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Well ID	Layer	Groundwater Elevation (ft msl)
GAMW01	1	658.89
GAMW01B	3	658.72
GAMW03	1	659.84
GAMW03B	3	659.26
GAMW07	1	660.74
GAMW07B	3	660.79
GAMW08	1	658.87
GAMW08B	3	658.98
GAMW09	1	659.27
GAMW09B	3	658.87
GAMW12	1	658.64
GAMW12B	3	658.66
GAMW13	1	658.35
GAMW13B	3	658.37
GAMW14	1	658.14
GAMW14B	3	658.12
GAMW15	1	660.35
GAMW15B	3	660.33
GAMW16	1	659.31
GAMW16B	3	659.46
GAMW17B	3	658.92
GAMW18	1	658.92
GAMW18B	3	659.17
GAMW20	1	658.21
GAMW24	1	658.66
GAMW24B	2	658.73
GAMW25	1	658.41
GAMW25B	2	658.41
GAMW26	1	658.33
GAMW26B	3	658.26
GAMW27	1	658.29
GAMW27B	3	658.32
GAMW29	1	657.48
GAMW29B	3	657.48
GAMW30	1	657.42
GAMW30B	3	657.51
GAMW31	1	657.24
GAMW31B	2	657.25
GAMW32	1	657.19
GAMW32B	3	657.15
GAMW33	1	657.04
GAMW33B	3	657.13
GAMW34	1	657.58

Table B-3: Measured Groundwater Elevations - September 2019
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Well ID	Layer	Groundwater Elevation (ft msl)
GAMW34B	3	657.59
GAMW35B	2	658.16
GAMW36	1	656.67
GAMW36B	3	656.69
GAMW37B	2	657.26
GAMW38	1	657.91
GAMW38B	3	657.91
GAMW39	2	657.88
GAMW39B	3	657.84
GAMW40	1	657.66
GAMW40B	3	657.65
GAMW42	1	658.12
GAMW42B	3	658.13
GAMW43	1	657.83
GAMW43B	3	657.83
GAMW44	1	657.71
GAMW44B	3	657.69
GAMW45B	3	654.52
GAMW46	1	655.22
GAMW46B	3	655.21
GAMW48	1	654.5
GAMW48B	3	654.51
GAMW49	1	656.26
GAMW49B	3	656.34
GAMW50	1	656.37
GAMW50B	3	656.35
GAMW51	1	658.07
GAMW51B	3	658.19
GAMW52	1	657.81
GAMW52B	3	657.82
GAMW53	1	658.04
GAMW53B	3	658.21
GAMW54	1	657.87
GAMW54B	3	657.82
GAMW55B	3	657.78
GAMW56	1	657.81
GAMW56B	3	657.77
GAMW02	1	660.14
GAMW05	1	658.17
GAMW06	1	659.65
GAMW10	1	657.63
GAMW11	1	657.37
GAMW20B	3	658.25

Table B-3: Measured Groundwater Elevations - September 2019
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Well ID	Layer	Groundwater Elevation (ft msl)
MW-1D	3	659.11
MW-1S	2	659.09
MW-2S	2	657.7
MW-3D	3	656.68
MW-4S	2	657.08
MW-5D	3	658.17
MW-5S	2	658.14
MW-6D	3	654.1
MW-6S	2	654.07
MW-7D	3	656.12
MW-7S	2	656.1
MW-8S	3	654.65
MW-9D	3	655.18
MW-9S	3	655.14
MW-10D	3	658.66
MW-10S	1	658.61
MW-11D	3	656.75
MW-11S	2	656.73
MW-12D	3	656.97
MW-12S	2	656.95
MW-13D	3	657.2
MW-13S	2	657.17
MW-14D	2	656.51
MW-14S	2	656.54
SW-4	1	661.48
SW-10	1	660

Table B-4: Calibration Residuals and Summary Statistics - September 2019
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Name	Observed Groundwater Elevation (ft msl)	Computed Groundwater Elevation (ft msl)	Residual (ft)
Layer 1			
GAMW01	658.89	658.87	0.02
GAMW03	659.84	660.22	-0.38
GAMW07	660.74	662.14	-1.40
GAMW08	658.87	658.87	0.00
GAMW09	659.27	659.05	0.22
GAMW12	658.64	658.58	0.06
GAMW13	658.35	658.50	-0.15
GAMW14	658.14	658.57	-0.43
GAMW15	660.35	662.08	-1.73
GAMW16	659.31	659.11	0.20
GAMW18	658.92	659.30	-0.38
GAMW20	658.21	658.72	-0.51
GAMW24	658.66	659.16	-0.50
GAMW25	658.41	658.67	-0.26
GAMW26	658.33	658.34	-0.01
GAMW27	658.29	658.09	0.20
GAMW29	657.48	658.19	-0.71
GAMW30	657.42	658.20	-0.78
GAMW31	657.24	658.12	-0.88
GAMW32	657.19	657.99	-0.80
GAMW33	657.04	657.92	-0.88
GAMW34	657.58	658.44	-0.86
GAMW36	656.67	657.59	-0.92
GAMW38	657.91	658.24	-0.33
GAMW40	657.66	658.27	-0.61
GAMW42	658.12	658.62	-0.50
GAMW43	657.83	658.54	-0.71
GAMW44	657.71	658.56	-0.85
GAMW46	655.22	654.39	0.83
GAMW48	654.5	654.25	0.25
GAMW49	656.26	656.37	-0.11
GAMW50	656.37	656.86	-0.49
GAMW51	658.07	658.84	-0.77
GAMW52	657.81	657.89	-0.08
GAMW53	658.04	658.21	-0.17
GAMW54	657.87	658.36	-0.49
GAMW56	657.81	658.51	-0.70
GAMW02	660.14	659.81	0.33
GAMW05	658.17	658.77	-0.60
GAMW06	659.65	660.42	-0.77

Table B-4: Calibration Residuals and Summary Statistics - September 2019
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Name	Observed Groundwater Elevation (ft msl)	Computed Groundwater Elevation (ft msl)	Residual (ft)
GAMW10	657.63	658.34	-0.71
GAMW11	657.37	658.19	-0.82
MW-10S	658.61	659.16	-0.55
SW-4	661.48	657.77	3.71
SW-10	660	659.21	0.79
Layer 2			
GAMW24B	658.73	659.16	-0.43
GAMW25B	658.41	658.67	-0.26
GAMW31B	657.25	658.12	-0.87
GAMW35B	658.16	659.00	-0.84
GAMW37B	657.26	658.24	-0.98
GAMW39	657.88	658.29	-0.41
MW-1S	659.09	659.72	-0.63
MW-2S	657.7	658.54	-0.84
MW-4S	657.08	657.79	-0.71
MW-5S	658.14	658.13	0.01
MW-6S	654.07	654.60	-0.53
MW-7S	656.1	656.26	-0.16
MW-11S	656.73	657.28	-0.55
MW-12S	656.95	657.48	-0.53
MW-13S	657.17	657.95	-0.78
MW-14S	656.54	657.27	-0.73
Layer 3			
GAMW01B	658.72	658.87	-0.15
GAMW03B	659.26	660.22	-0.96
GAMW07B	660.79	660.99	-0.20
GAMW08B	658.98	658.87	0.11
GAMW09B	658.87	659.05	-0.18
GAMW12B	658.66	658.58	0.08
GAMW13B	658.37	658.50	-0.13
GAMW14B	658.12	658.57	-0.45
GAMW15B	660.33	662.22	-1.89
GAMW16B	659.46	659.11	0.35
GAMW17B	658.92	659.55	-0.63
GAMW18B	659.17	659.30	-0.13
GAMW26B	658.26	658.34	-0.08
GAMW27B	658.32	658.13	0.19
GAMW29B	657.48	658.19	-0.71
GAMW30B	657.51	658.20	-0.69
GAMW32B	657.15	657.98	-0.83
GAMW33B	657.13	657.92	-0.79

Table B-4: Calibration Residuals and Summary Statistics - September 2019
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Name	Observed Groundwater Elevation (ft msl)	Computed Groundwater Elevation (ft msl)	Residual (ft)
GAMW34B	657.59	658.44	-0.85
GAMW36B	656.69	657.59	-0.90
GAMW38B	657.91	658.24	-0.33
GAMW39B	657.84	658.29	-0.45
GAMW40B	657.65	658.27	-0.62
GAMW42B	658.13	658.62	-0.49
GAMW43B	657.83	658.54	-0.71
GAMW44B	657.69	658.56	-0.87
GAMW45B	654.52	653.66	0.86
GAMW46B	655.21	654.39	0.82
GAMW48B	654.51	654.24	0.27
GAMW49B	656.34	656.36	-0.02
GAMW50B	656.35	656.86	-0.51
GAMW51B	658.19	658.84	-0.65
GAMW52B	657.82	657.88	-0.06
GAMW53B	658.21	658.21	0.00
GAMW54B	657.82	658.36	-0.54
GAMW55B	657.78	658.47	-0.69
GAMW56B	657.77	658.51	-0.74
GAMW20B	658.25	658.72	-0.47
MW-1D	659.11	659.72	-0.61
MW-3D	656.68	657.50	-0.82
MW-5D	658.17	658.13	0.04
MW-6D	654.1	654.61	-0.51
MW-7D	656.12	656.26	-0.14
MW-8S	654.65	654.32	0.33
MW-9D	655.18	654.27	0.91
MW-9S	655.14	654.28	0.86
MW-10D	658.66	659.16	-0.50
MW-11D	656.75	657.27	-0.52
MW-12D	656.97	657.48	-0.51
MW-13D	657.2	657.95	-0.75
MW-14D	656.51	657.27	-0.76

Calibration Parameter	Value
Residual Mean (ft)	-0.36
Redsidual Standard Deviation (ft)	0.63
Absolute Residual Mean (ft)	0.57
Residual Sum of Squares	59
RMS Error	0.72
Minimum Residual (ft)	-1.89
Maximum Residual (ft)	3.71

Table B-4: Calibration Residuals and Summary Statistics - September 2019
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Name	Observed Groundwater Elevation (ft msl)	Computed Groundwater Elevation (ft msl)	Residual (ft)
Range of Observations (ft)			7.41
Scaled Residual Standard Deviation			0.085
Scaled Absolute Mean			0.076
Scaled RMS (%)			9.8
Number of Observations			112

Table B-5: Verification Residuals and Summary Statistics – October 2018
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Name	Observed Groundwater Elevation (ft msl)	Computed Groundwater Elevation (ft msl)	Residual (ft)
Layer 1			
GAMW01	659.19	658.87	0.32
GAMW03	660.82	660.22	0.60
GAMW07	659.27	660.62	-1.35
GAMW08	659.06	658.87	0.19
GAMW09	660.34	659.05	1.29
GAMW12	658.84	658.58	0.26
GAMW13	658.72	658.50	0.22
GAMW14	659.55	658.57	0.98
GAMW15	659.10	660.00	-0.90
GAMW16	659.07	659.11	-0.04
GAMW18	659.57	659.30	0.27
GAMW20	659.81	658.72	1.09
GAMW24	659.90	659.16	0.74
GAMW25	659.67	658.67	1.00
GAMW26	659.73	658.34	1.39
GAMW27	659.67	658.09	1.58
GAMW29	658.28	658.19	0.09
GAMW30	658.62	658.20	0.42
GAMW31	658.13	658.12	0.01
GAMW32	657.99	657.99	0.00
GAMW33	657.84	657.92	-0.08
GAMW34	658.47	658.44	0.03
GAMW36	657.71	657.59	0.12
GAMW38	659.19	658.24	0.95
GAMW40	658.76	658.27	0.49
GAMW42	658.40	658.62	-0.22
GAMW43	658.16	658.54	-0.38
GAMW44	657.95	658.56	-0.61
GAMW46	655.25	654.39	0.86
GAMW48	654.68	654.25	0.43
GAMW49	656.86	656.37	0.49
GAMW50	657.22	656.86	0.36
GAMW51	658.42	658.84	-0.42
GAMW52	657.99	657.89	0.10
GAMW53	658.14	658.21	-0.07
GAMW54	658.47	658.36	0.11
GAMW56	658.86	658.51	0.35
GAMW02	660.52	659.81	0.71
GAMW05	658.53	658.77	-0.24
GAMW06	658.63	660.42	-1.79

Table B-5: Verification Residuals and Summary Statistics – October 2018
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Name	Observed Groundwater Elevation (ft msl)	Computed Groundwater Elevation (ft msl)	Residual (ft)
GAMW10	658.61	658.34	0.27
GAMW11	657.97	658.19	-0.22
MW-10S	659.83	659.16	0.67
SW-4	662.48	657.77	4.71
SW-10	660.45	659.21	1.24
Layer 2			
GAMW24B	659.95	659.16	0.79
GAMW25B	659.69	658.67	1.02
GAMW31B	658.14	658.12	0.02
GAMW35B	659.16	659.00	0.16
GAMW37B	658.42	658.24	0.18
GAMW39	659.08	658.29	0.79
MW-1S	659.76	659.72	0.04
MW-2S	658.58	658.54	0.04
MW-4S	657.62	657.79	-0.17
MW-5S	659.47	658.13	1.34
MW-6S	654.83	654.60	0.23
MW-7S	656.72	656.26	0.46
MW-11S	657.55	657.28	0.27
MW-12S	657.68	657.48	0.20
MW-13S	657.97	657.95	0.02
MW-14S	657.49	657.27	0.22
Layer 3			
GAMW01B	659.23	658.87	0.36
GAMW03B	660.31	660.22	0.09
GAMW07B	659.29	660.56	-1.27
GAMW08B	659.12	658.87	0.25
GAMW09B	659.94	659.05	0.89
GAMW12B	657.90	658.58	-0.68
GAMW13B	658.70	658.50	0.20
GAMW14B	658.50	658.57	-0.07
GAMW15B	659.13	660.03	-0.90
GAMW16B	659.14	659.11	0.03
GAMW17B	659.18	658.84	0.34
GAMW18B	660.15	659.30	0.85
GAMW26B	659.66	658.34	1.32
GAMW27B	659.70	658.13	1.57
GAMW29B	658.43	658.19	0.24
GAMW30B	658.71	658.20	0.51
GAMW32B	657.95	657.98	-0.03
GAMW33B	657.89	657.92	-0.03

Table B-5: Verification Residuals and Summary Statistics – October 2018
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Name	Observed Groundwater Elevation (ft msl)	Computed Groundwater Elevation (ft msl)	Residual (ft)
GAMW34B	658.46	658.44	0.02
GAMW36B	657.72	657.59	0.13
GAMW38B	659.21	658.24	0.97
GAMW39B	659.04	658.29	0.75
GAMW40B	658.68	658.27	0.41
GAMW42B	658.41	658.62	-0.21
GAMW43B	658.10	658.54	-0.44
GAMW44B	657.91	658.56	-0.65
GAMW45B	654.52	653.66	0.86
GAMW46B	655.24	654.39	0.85
GAMW48B	654.67	654.24	0.43
GAMW49B	656.94	656.36	0.58
GAMW50B	657.25	656.86	0.39
GAMW51B	658.58	658.84	-0.26
GAMW52B	658.00	657.88	0.12
GAMW53B	658.24	658.21	0.03
GAMW54B	658.42	658.36	0.06
GAMW55B	658.68	658.47	0.21
GAMW56B	658.87	658.51	0.36
GAMW20B	659.85	658.72	1.13
MW-1D	659.76	659.72	0.04
MW-3D	657.50	657.50	0.00
MW-5D	659.47	658.13	1.34
MW-6D	654.86	654.61	0.25
MW-7D	656.70	656.26	0.44
MW-8S	654.80	654.32	0.48
MW-9D	655.15	654.27	0.88
MW-9S	655.14	654.28	0.86
MW-10D	659.83	659.16	0.67
MW-11D	657.52	657.27	0.25
MW-12D	657.64	657.48	0.16
MW-13D	657.96	657.95	0.01
MW-14D	657.46	657.27	0.19

Calibration Parameter	Value
Residual Mean (ft)	0.33
Redsidual Standard Deviation (ft)	0.71
Absolute Residual Mean (ft)	0.52
Residual Sum of Squares	69
RMS Error	0.78
Minimum Residual (ft)	-1.79
Maximum Residual (ft)	4.71

Table B-5: Verification Residuals and Summary Statistics – October 2018
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

Name	Observed Groundwater Elevation (ft msl)	Computed Groundwater Elevation (ft msl)	Residual (ft)
Range of Observations (ft)			7.96
Scaled Residual Standard Deviation			0.09
Scaled Absolute Mean			0.066
Scaled RMS (%)			9.9
Number of Observations			112

Table B-6: Travel Time Simulations
Groundwater Flow Model Technical Memorandum
NIPSCO LLC R. M. Schahfer Generating Station

	Shallow Flow Paths				Deep Flow Paths			
Starting Well	**GAMW-16**	**GAMW-18**	**GAMW-17B**	**GAMW-09B**	**GAMW-16B**	**GAMW-18B**	**GAMW-17B**	**GAMW-09B**
Ending Well	**GAMW-53**	**GAMW-55**	**GAMW-54B**	**GAMW-54B**	**GAMW-53B**	**GAMW-55B**	**GAMW-54B**	**GAMW-54B**
Distance (ft)	**1521**	**1964**	**1200**	**1714**	**1521**	**1964**	**1200**	**1714**
Effective Porosity = 16%								
Travel Time (years)	4.8	11.0	4.5	8.9	5.0	11.0	5.5	9.0
Velocity (ft/year)	317	179	267	193	304	179	218	190
Time to Davis Ditch (years)	5.5	-	-	-	6	-	-	-
Time to property boundry near GAMW46B (years)	-	27	49	41	-	28.5	45	41
Effective Porosity = 30%								
Travel Time (years)	8.5	19.8	8.0	16.0	8.9	20.0	10.0	16.5
Velocity (ft/year)	179	99	150	107	171	98	120	104
Time to Davis Ditch (years)	10	-	-	-	9.9	-	-	-
Time to property boundry near GAMW46B (years)	-	49.8	79	75	-	51.5	80	76
Effective Porosity = 46%								
Travel Time (years)	13.0	31.0	12.0	25.0	13.5	29.0	15.0	25.0
Velocity (ft/year)	117	63	100	69	113	68	80	69
Time to Davis Ditch (years)	15	-	-	-	15	-	-	-
Time to property boundry near GAMW46B (years)	-	76.8	122	117	-	77	130	120

Notes:
ft = feet



LEGEND

NOTE(S)
1. BASED ON MODEL V12_2019.

REFERENCE(S)
1. COORDINATE SYSTEM: WGS 1984 WEB MERCATOR AUXILIARY SPHERE

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRB, MCWB, AND DRYING AREA
NIPSCO LLC R. M. SCHAHFER GENERATING STATION

TITLE

MODEL GRID

CONSULTANT

GOLDER

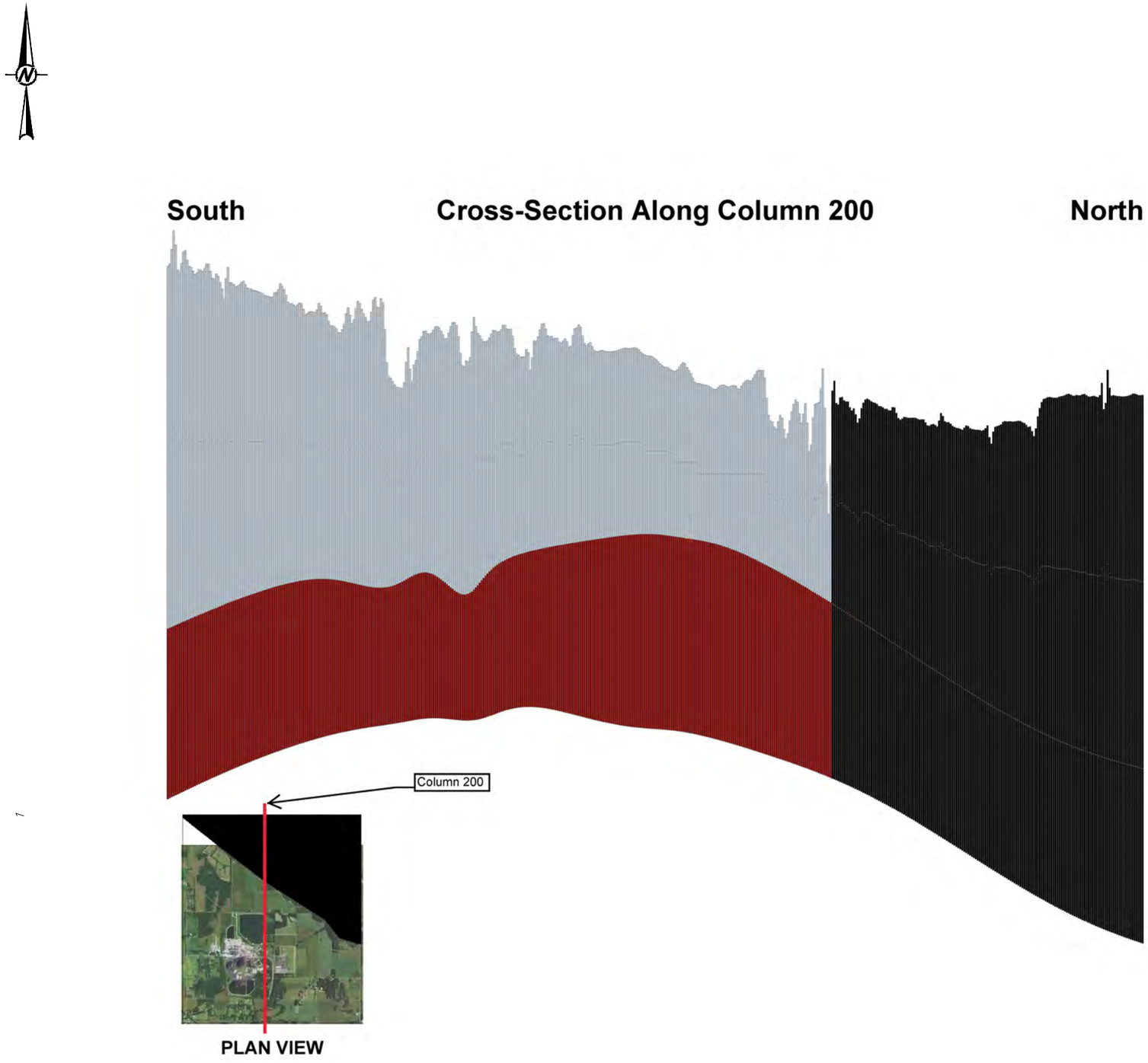
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PREPARED	SHL
REVIEWED	BP
APPROVED	RWB

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19121567	-	-	A

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LEGEND

NOTE(S)
1. BASED ON MODEL V12_2019.

REFERENCE(S)
1. COORDINATE SYSTEM: WGS 1984 WEB MERCATOR AUXILIARY SPHERE

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRB, MCWB, AND DRYING AREA
NIPSCO LLC R. M. SCHAHFER GENERATING STATION

TITLE

CROSS SECTION OF MODEL GRID

CONSULTANT

GOLDER

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APPROVED	RWB

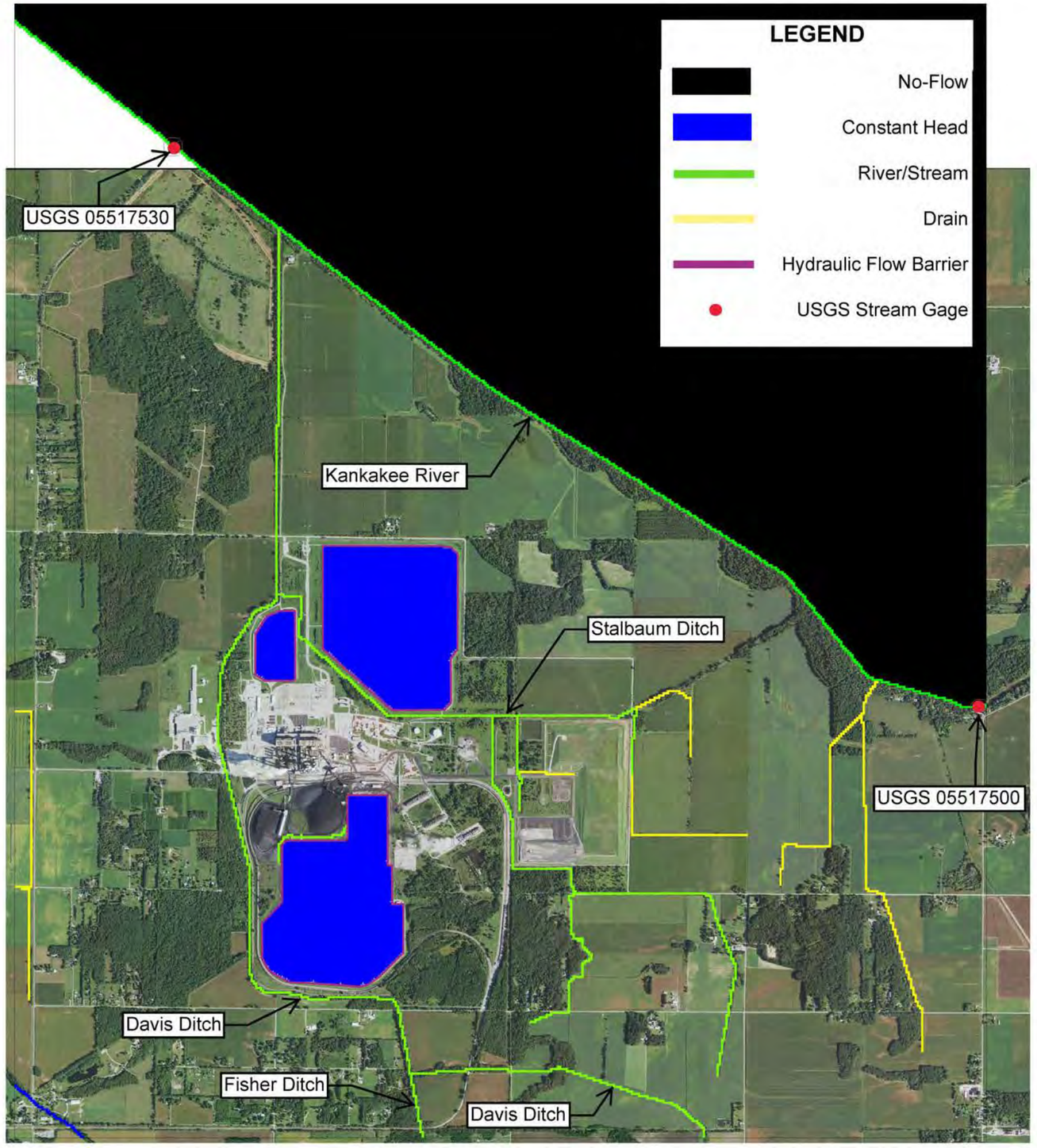
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LEGEND

NOTE(S)
1. BASED ON MODEL V12_2019.

REFERENCE(S)
1. COORDINATE SYSTEM: WGS 1984 WEB MERCATOR AUXILIARY SPHERE

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRB, MCWB, AND DRYING AREA
NIPSCO LLC R. M. SCHAHFER GENERATING STATION

TITLE

BOUNDARY CONDITIONS

CONSULTANT

GOLDER

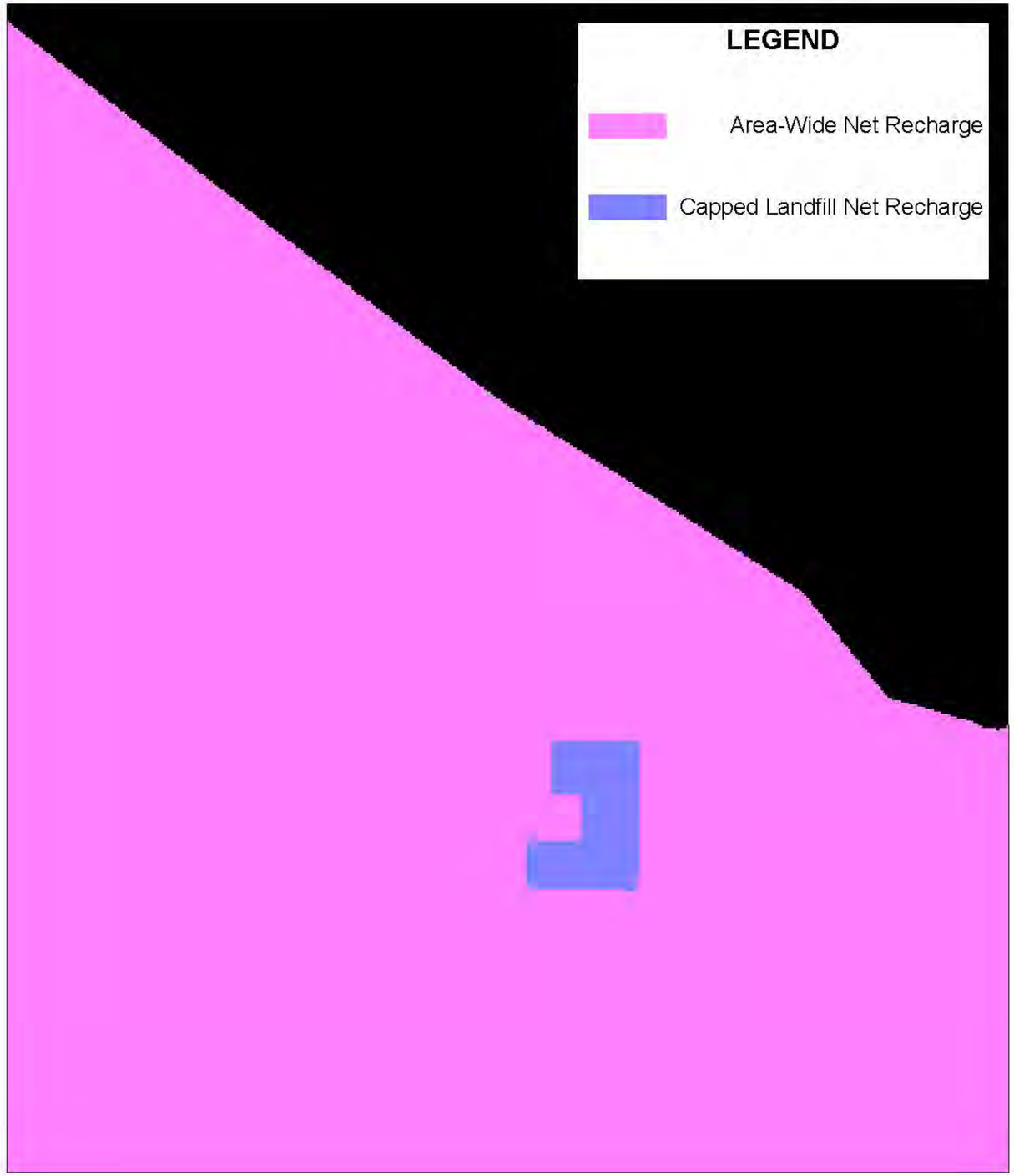
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REVIEWED	BP
APPROVED	RWB

PROJECT NO.	CONTROL	REV.	ATTACHMENT
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NOTE(S)
1. BASED ON MODEL V12_2019.

REFERENCE(S)
1. COORDINATE SYSTEM: WGS 1984 WEB MERCATOR AUXILIARY SPHERE

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT
GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRB, MCWB, AND DRYING AREA
NIPSCO LLC R. M. SCHAHFER GENERATING STATION

TITLE

PRECIPITATION RECHARGE ZONES

CONSULTANT

GOLDER

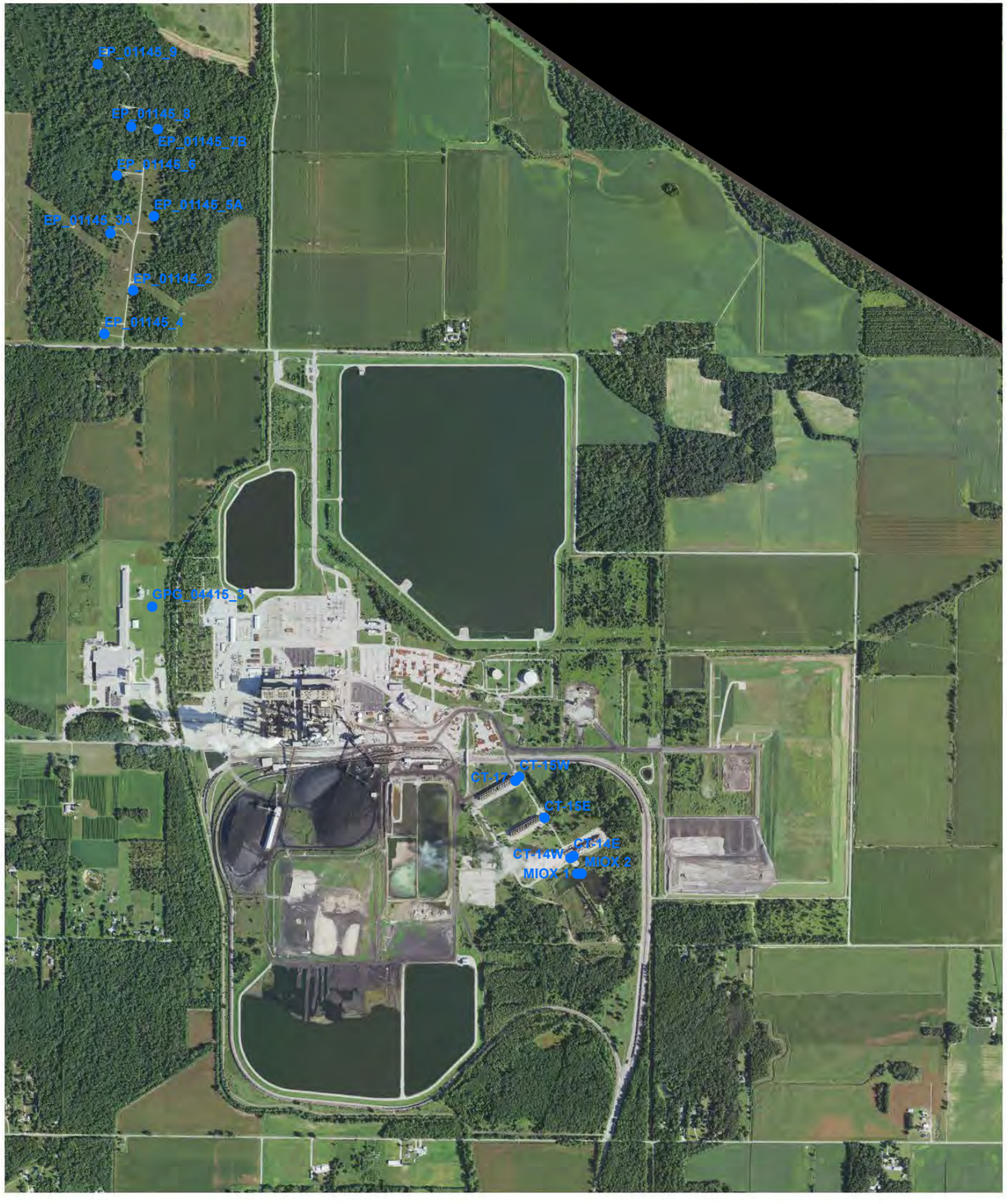
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APPROVED	RWB

PROJECT NO.	CONTROL	REV.	ATTACHMENT
19121567	-	-	D

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LEGEND

- Well Location

0 840 1,680

Feet

1 " = 1,667 feet

NOTE(S)

1. BASED ON MODEL V12_2019.

REFERENCE(S)

1. COORDINATE SYSTEM: NAD 1983 STATEPLANE INDIANA WEST FIPS 1302 FEET
2. 2016 NAIP IMAGERY SOURCED FROM AGOL ONLINE FEATURE SERVICE LAYER.

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRB, MCWB, AND DRYING AREA
NIPSCO LLC R. M. SCHAHFER GENERATING STATION

TITLE

ACTIVE PUMPING WELLS

CONSULTANT

GOLDER

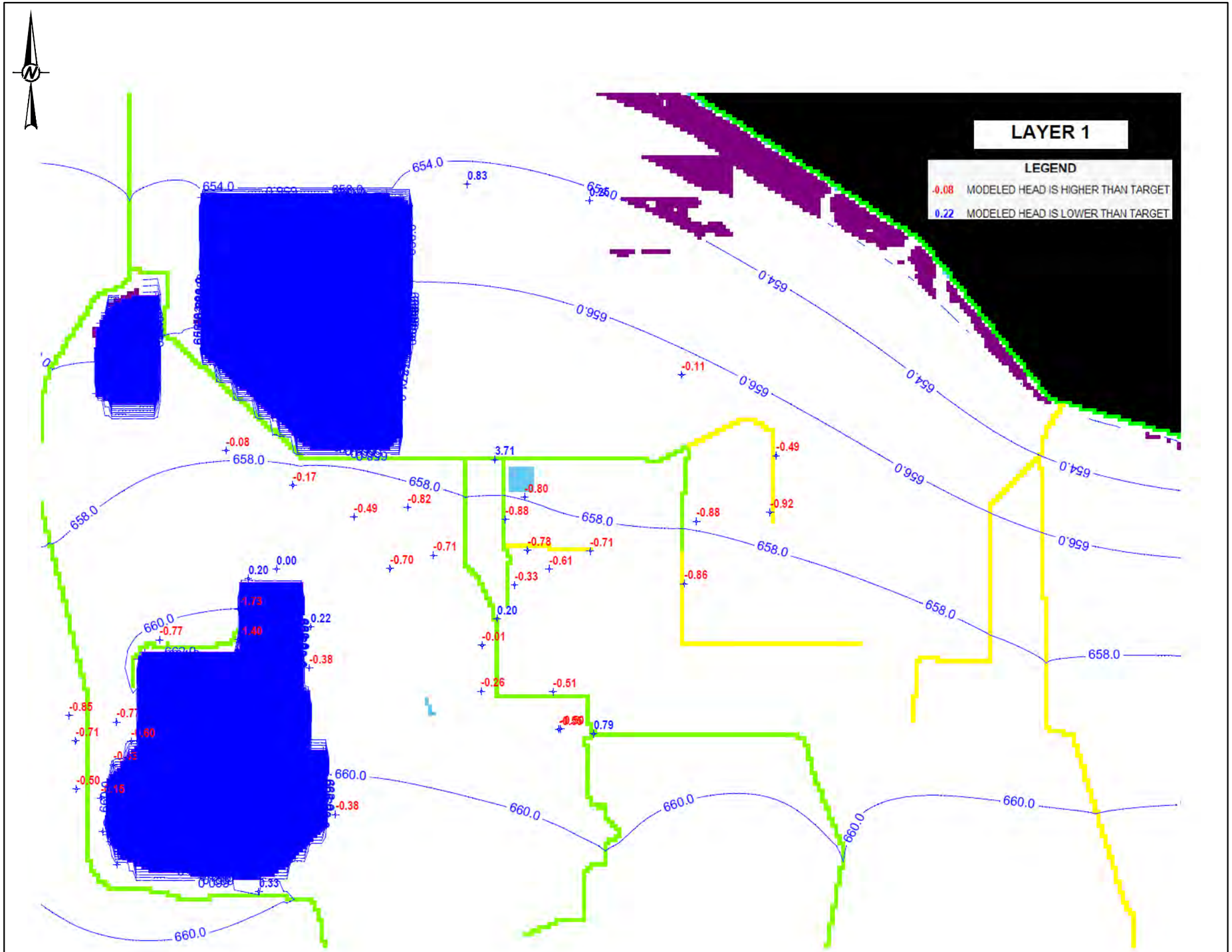
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PREPARED	SHL
REVIEWED	BP
APPROVED	RWB

PROJECT NO.	CONTROL	REV.	ATTACHMENT
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LEGEND

NOTE(S)
1. BASED ON MODEL V12_2019.

REFERENCE(S)
1. COORDINATE SYSTEM: WGS 1984 WEB MERCATOR AUXILIARY SPHERE

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRB, MCWB, AND DRYING AREA
NIPSCO LLC R. M. SCHAHFER GENERATING STATION

TITLE

MODEL CALIBRATION - SEPTEMBER 2019

CONSULTANT

GOLDER

YYYY-MM-DD	2020-10-23
DESIGNED	RWB
PREPARED	SHL
REVIEWED	BP
APPROVED	RWB

PROJECT NO.	CONTROL	REV.	ATTACHMENT
19121567	-	-	F

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

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APPENDIX P

Corrective Measures Selection of Remedy, Semi-Annual Progress Reports #21-01, #21-02, and #22-01

TECHNICAL MEMORANDUM

DATE April 9, 2021 **Project No.** 19121567

TO Joe Kutch, Team Leader Environmental Compliance
Northern Indiana Public Service Company LLC (NIPSCO LLC)

CC Jeff Loewe (NIPSCO LLC), Joe Gormley, Danielle Sylvia Cofelice, Jim Peace, Krysta Cione

FROM Mark Haney **EMAIL mhaney@golder.com**

**RE: NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC
R.M. SCHAHFER GENERATING STATION, CCR UNIT CONSISTING OF MSRB, MCWB AND DA
CORRECTIVE MEASURES SELECTION OF REMEDY, SEMI-ANNUAL PROGRESS REPORT #21-01**

On behalf of Northern Indiana Public Service Company LLC (NIPSCO LLC) and in conformance with 40 Code of Federal Regulations (CFR) §257.97(a), Golder Associates Inc. (Golder) has prepared this semi-annual progress report for the NIPSCO LLC R.M. Schahfer Generating Station (RMSGS or Site), 2723 E 1500 N Road, Wheatfield, Jasper County, Indiana. This report summarizes progress toward selection of a Corrective Measures remedy for three Coal Combustion Residuals (CCR) impoundments (the Material Storage Runoff Basin [MSRB], Metal Cleaning Waste Basin [MCWB], and Drying Area [DA]), collectively referred to as the Multi-Cell Unit (MCU). Specifically, this semi-annual progress report summarizes actions completed since the submittal of the third semi-annual progress report on October 9, 2020.

In April 2019, Golder prepared an Assessment of Corrective Measures (ACM) to address detections of Appendix IV parameters in groundwater downgradient of the MCU above the groundwater protection standards (GWPS). Specifically, the ACM addressed cobalt due to a detection at a Statistically Significant Level (SSL) in groundwater. In addition, the ACM addressed boron because of detections above the Indiana Department of Environmental Management (IDEM) 4 milligrams per liter (mg/l) groundwater screening level and based on information suggesting the United States Environmental Protection Agency (USEPA) is considering adding it to the Appendix IV list. The ACM was prepared in conformance with applicable requirements of 40 CFR §257.96 and was certified by a qualified Indiana-licensed professional engineer on April 19, 2019. Following certification, the ACM was placed in the facility operating record and NIPSCO LLC posted it to their publicly-accessible CCR website.

As discussed in the ACM, NIPSCO LLC plans to close the MCU by removal in accordance with 40 CFR §257.102(c). NIPSCO LLC initially submitted a Closure Application to IDEM in April 2019 and has since provided supplemental information in response to IDEM review comments. NIPSCO LLC continues to refine the Closure Application, which is currently under additional review by IDEM. Modifications to the closure approach and Closure Application will impact the ACM and selection of a groundwater corrective measure(s).

The ACM initially identified eight potential Corrective Measure alternatives to be considered for implementation following excavation and closure of the CCR Unit. However, Golder determined that additional data and further evaluation were required to select a remedy from among these options. Concurrent with IDEM review of the Closure Application and further development by NIPSCO LLC of the closure detailed design, Golder performed

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additional field investigations to collect Site-specific data and conducted analyses of recent and historical information. The following remedy selection-related activities have been performed in the past six months:

- In October 2020, Golder collected groundwater data from three piezometers installed in April 2020, northwest of the CCR Unit. Golder used these data along with data from May, July, August, and September 2020 to refine groundwater flow maps in the near vicinity of the CCR Unit. Golder will continue to collect groundwater surface elevation and groundwater quality data during succeeding monitoring events.
- In November 2020, Golder completed a monitored natural attenuation (MNA) Tier I-III evaluation report[1] that summarized its evaluations of the feasibility, mechanisms, rates, and stability of MNA as a potential remedy for groundwater impacts at the Site.
- In November 2020, Golder prepared a summary of the results of groundwater modeling activities associated with the evaluation of hydrogeologic conditions and potential remedial designs.[2]
- In November 2020, Golder prepared an ACM Addendum[3] (ACM Addendum #1) to supplement the findings of the 2019 ACM and provide further details of Golder's evaluation of the potential corrective measures for RMSGS. ACM Addendum #1 specifically focused on the following requirements under 40 CFR §257.96(c):

  "The assessment under paragraph (a) of this section must include an analysis of the effectiveness of potential corrective measures in meeting all of the requirements and objectives of the remedy as described under §257.97 addressing at least the following:
  1) *The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies including safety impacts, cross-media impacts, and control of exposure to any residual contamination;*
  2) *The time required to begin and complete the remedy;*
  3) *The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s)."*

  In addition, ACM Addendum #1 included copies of the MNA Tier I-III evaluation report and the summary of groundwater modeling activities.
- From October 2020 through April 2021, NIPSCO LLC continued to refine the Closure Application/Design of the MCU in response to IDEM comments.

Following final closure design for the MCU and IDEM acceptance of the Closure Application as complete, which is expected in summer 2021, Golder will prepare another Addendum to the ACM (ACM Addendum #2) to reevaluate the list of potential corrective measures identified in the ACM based on their compatibility with the final closure design.

Throughout the spring-fall 2021 timeframe, Golder will continue to collect and evaluate additional information and perform an engineering review of the potential Corrective Measures, consistent with timing and implications of the Closure Application IDEM review, NIPSCO LLC public meeting, and IDEM approval processes. For these reviews, Golder will place emphases on identifying critical data gaps, understanding and reacting to impacts of

[1] Golder, November 2020. Monitored Natural Attenuation Evaluation for the R.M. Schahfer Generating Station

[2] Golder, November 12, 2020. Groundwater Flow Model Technical Memorandum for the R.M. Schahfer Generating Station

[3] Golder, November 30, 2020. CCR Assessment of Corrective Measures Report – Addendum for the R.M. Schahfer Generating Station

newly gathered information on previous assumptions and/or conclusions, identifying and researching applicability of emerging technologies, and monitoring changing conditions and future plans for the Site and their impacts on the remedy process. Golder will summarize these additional evaluations along with a summary NIPSCO LLC's progress toward selection of remedy for groundwater Corrective Measures at the MCU in the next semi-annual progress report.

TECHNICAL MEMORANDUM

DATE October 11, 2021 **Project No.** 19121567

TO Joe Kutch, Team Leader - Environmental Compliance
Northern Indiana Public Service Company LLC

CC Jeff Loewe (NIPSCO LLC), Joe Gormley, Danielle Sylvia Cofelice, Jim Peace, Krysta Cione

FROM Mark Haney **EMAIL mhaney@golder.com**

**RE: NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC
R.M. SCHAHFER GENERATING STATION, CCR UNIT CONSISTING OF MSRB, MCWB AND DA
CORRECTIVE MEASURES SELECTION OF REMEDY, SEMI-ANNUAL PROGRESS REPORT #21-02**

On behalf of Northern Indiana Public Service Company LLC (NIPSCO) and in conformance with 40 Code of Federal Regulations (CFR) §257.97(a), Golder Associates Inc. (Golder), *a member of WSP,* has prepared this semi-annual progress report for the NIPSCO R.M. Schahfer Generating Station (RMSGS or Site), 2723 E 1500 N Road, Wheatfield, Jasper County, Indiana. This report summarizes progress toward selection of a Corrective Measures remedy for three Coal Combustion Residuals (CCR) impoundments (the Material Storage Runoff Basin [MSRB], Metal Cleaning Waste Basin [MCWB], and Drying Area [DA]), collectively referred to as the Multi-Cell Unit (MCU). Specifically, this semi-annual progress report summarizes actions completed since the submittal of the fourth semi-annual progress report on April 9, 2021.

In April 2019, Golder prepared an Assessment of Corrective Measures (ACM) to address detections of Appendix IV parameters in groundwater downgradient of the MCU above the groundwater protection standards (GWPS). Specifically, the ACM addressed cobalt due to a detection at a Statistically Significant Level (SSL) in groundwater. In addition, the ACM addressed boron because of detections above the Indiana Department of Environmental Management (IDEM) 4 milligrams per liter (mg/l) groundwater screening level and based on information suggesting the United States Environmental Protection Agency (USEPA) is considering adding it to the Appendix IV list. The ACM was prepared in conformance with applicable requirements of 40 CFR §257.96 and was certified by a qualified Indiana-licensed professional engineer on April 19, 2019. Following certification, the ACM was placed in the facility operating record and NIPSCO posted it to their publicly accessible CCR website.

In November 2020, based upon informal feedback from USEPA officials regarding their interpretation of ACM content, Golder prepared an Addendum (hereinafter Addendum #1) to the 2019 ACM in accordance with the requirements of 40 CFR §257.96. Addendum #1 was certified by a qualified Indiana-licensed professional engineer on November 30, 2020. Following certification, the ACM was placed in the facility operating record and NIPSCO posted it to their publicly accessible CCR website. In July 2021, consistent with changes to the MCU closure design and resultant impacts on remedy alternatives, Golder prepared a second Addendum (hereinafter Addendum #2) to the 2020 ACM in accordance with the requirements of 40 CFR §257.96. Addendum #2 was certified by a qualified Indiana-licensed professional engineer on July 29, 2021. Following certification, the ACM was placed in the facility operating record and NIPSCO posted it to their publicly accessible CCR website. For the purposes of this progress report the initial ACM and all Addenda are collectively referred to simply as the ACM.

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As discussed in the ACM, NIPSCO plans to close the MCU by removal in accordance with 40 CFR §257.102(c). NIPSCO initially submitted a Closure Application to IDEM in April 2019. On May 13, 2021, NIPSCO submitted a final Closure Application to IDEM that modified the closure design and provided supplemental information in response to IDEM review comments. The final Closure Application, which included a low permeability cap design, is currently under review by IDEM. The final Closure Application includes modifications to the closure approach and low permeability cap design that impacts the ACM findings and final selection of a groundwater corrective measure(s).

The ACM initially identified eight potential Corrective Measure alternatives to be considered for implementation following excavation and closure of the MCU. However, Golder determined that additional data and further evaluation were required to select a remedy from among these options. Concurrent with IDEM review of the Closure Application and further development by NIPSCO of the closure detailed design, Golder performed additional field investigations to collect Site-specific data and conducted analyses of recent and historical information. The following remedy selection-related activities have been performed in the past six months:

- From April 2021 through May 2021, NIPSCO LLC continued to refine the Closure Application/Design of the MCU in response to IDEM comments and submitted the final Closure Application on May 13, 2021.
- Following submittal of the final Closure Application and confirmation that IDEM was in general agreement with the modified cap design, Golder prepared the MCU Assessment of Corrective Measures - Addendum #2 to reevaluate the list of potential corrective measures identified in the ACM based on their compatibility with the modified cap design. ACM Addendum #2 revised and updated information provided in the predecessor documents and incorporated the low permeability cap design in all corrective measures alternatives identified in the ACM and Addendum #1, effectively eliminating four of the ACM alternatives from further consideration.
- From August through October 2021, Golder performed additional engineering evaluations of the four remaining alternatives taking into consideration the low permeability cap design and its impact on the selection of remedy for groundwater Corrective Measures.
- During the spring 2021, Golder collected groundwater samples from the monitoring well network and evaluated the resulting analytical data to confirm plume extent and stability. Golder sampled groundwater monitoring wells for CCR and monitored natural attenuation (MNA) parameters from April 14 to April 27, 2021.

Throughout the fall 2021 - spring 2022 timeframe, Golder will continue to collect and evaluate additional information and perform an engineering review of the potential Corrective Measures, consistent with timing and implications of the Closure Application IDEM review, NIPSCO LLC public meeting, and IDEM approval processes. For these reviews, Golder will place emphases on identifying critical data gaps, understanding and reacting to impacts of newly gathered information on previous assumptions and/or conclusions, identifying and researching applicability of emerging technologies, and monitoring changing conditions and future plans for the Site and their impacts on the remedy process. Golder will summarize these additional evaluations along with a summary NIPSCO LLC's progress toward selection of remedy for groundwater Corrective Measures at the MCU in the next semi-annual progress report.

TECHNICAL MEMORANDUM

DATE April 10, 2022 **Project No.** 21508844

TO Joe Kutch, Team Leader - Environmental Compliance
Northern Indiana Public Service Company LLC

CC Jeff Loewe (NIPSCO), Joe Gormley, Danielle Sylvia Cofelice, Jim Peace, Cody Johnson

FROM Mark Haney **EMAIL mark.haney@wsp.com**

**RE: NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC
R.M. SCHAHFER GENERATING STATION, CCR UNIT CONSISTING OF MSRB, MCWB AND DA
CORRECTIVE MEASURES SELECTION OF REMEDY, SEMI-ANNUAL PROGRESS REPORT #22-01**

On behalf of Northern Indiana Public Service Company LLC (NIPSCO) and in conformance with 40 Code of Federal Regulations (CFR) §257.97(a), Golder Associates USA Inc., *a member of WSP,* (Golder) has prepared this semi-annual progress report for the NIPSCO R.M. Schahfer Generating Station (RMSGS or Site), 2723 E 1500 N Road, Wheatfield, Jasper County, Indiana. This report summarizes progress toward selection of a Corrective Measures remedy for three Coal Combustion Residuals (CCR) impoundments (the Material Storage Runoff Basin [MSRB], Metal Cleaning Waste Basin [MCWB], and Drying Area [DA]), collectively referred to as the Multi-Cell Unit (MCU). Specifically, this semi-annual progress report summarizes actions completed since the submittal of the fifth semi-annual progress report on October 11, 2021.

In April 2019, Golder prepared an Assessment of Corrective Measures (ACM) to address detections of Appendix IV parameters in groundwater downgradient of the MCU above the groundwater protection standards (GWPS). Specifically, the ACM addressed cobalt due to a detection at a Statistically Significant Level (SSL) in groundwater. In addition, the ACM addressed boron because of detections above the Indiana Department of Environmental Management (IDEM) 4 milligrams per liter (mg/l) groundwater screening level and based on information suggesting the United States Environmental Protection Agency (USEPA) was considering adding it to the Appendix IV list. The ACM was prepared in conformance with applicable requirements of 40 CFR §257.96 and was certified by a qualified Indiana-licensed professional engineer on April 19, 2019. Following certification, the ACM was placed in the facility operating record and NIPSCO posted it to their publicly accessible CCR website.

In November 2020, based upon informal feedback from USEPA officials regarding their interpretation of ACM content, Golder prepared an Addendum (hereinafter Addendum #1) to the 2019 ACM in accordance with the requirements of 40 CFR §257.96. Addendum #1 was certified by a qualified Indiana-licensed professional engineer on November 30, 2020. Following certification, the ACM was placed in the facility operating record and NIPSCO posted it to their publicly accessible CCR website. In July 2021, consistent with changes to the MCU closure design and resultant impacts on remedy alternatives, Golder prepared a second Addendum (hereinafter Addendum #2) to the 2020 ACM in accordance with the requirements of 40 CFR §257.96. Addendum #2 was certified by a qualified Indiana-licensed professional engineer on July 29, 2021. Following certification, the ACM was placed in the facility operating record and NIPSCO posted it to their publicly accessible CCR website. In March 2022, based on 1) feedback provided from USEPA to other utilities regarding Part A Demonstrations and

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interpretations about the applicability of certain proposed groundwater remedies, and 2) USEPA's lack of movement in regard to adding boron to the Appendix IV list, Golder began preparation of a third Addendum (hereinafter Addendum #3) to the previous ACM Addenda. ACM Addendum #3 was prepared in accordance with the requirements of 40 CFR §257.96. Although Addendum #3 refers to and, in part, relies on information used in the preparation of previous Addenda, it is a standalone document upon which the Selection of Remedy (SOR) process will be conducted. For the purposes of this progress report the initial ACM and all Addenda are collectively referred to simply as the ACM.

As discussed in the ACM, NIPSCO plans to close the MCU by removal in accordance with 40 CFR §257.102(c). NIPSCO initially submitted a Closure Application to IDEM in April 2019. On May 13, 2021, NIPSCO submitted what was intended to be a final Closure Application to IDEM that modified the closure design and provided supplemental information in response to IDEM review comments. This latest version of the Closure Application that included a low permeability cap design, was reviewed by IDEM, which in turn issued a request for additional information in March 2022. The previous and current versions of the Closure Application include modifications to the closure approach and low permeability cap design that impact the ACM findings and final selection of a groundwater corrective measure(s).

Earlier versions of the ACM initially identified eight potential Corrective Measure alternatives to be considered for implementation following excavation and closure of the MCU. However, Golder determined that additional data and further evaluation were required to refine and select one or more potential remedies from among these options. Concurrent with IDEM's prior review of the earlier and latest version of the Closure Application and further development by NIPSCO of the closure detailed design, Golder performed additional evaluations of potential corrective measures alternatives. As noted, USEPA's stated interpretations to other utilities regarding the appropriateness of certain potential groundwater remedies was the impetus for preparation of ACM Addendum #3. The following remedy selection-related activities have been performed in the past six months:

- Upon receipt of an additional request from IDEM for further information regarding the most recent (i.e., May 2021) Closure Application, NIPSCO LLC is continuing to refine the Closure Application/Design of the MCU in response to IDEM comments. In addition, NIPSCO will be meeting with IDEM in April 2022 in an attempt to 1) better understand IDEM's request for additional information about the Closure Application, and 2) gain its expedited approval.
- Following further evaluation of remedy alternatives in response to USEPA actions at other CCR sites, Golder began and completed preparation of ACM Addendum #3. This addendum focuses the scope of the corrective action response to cobalt in groundwater, which is the only Appendix IV constituent found at an SSL outside the MCU. Boron, which is not an Appendix IV constituent, but had been considered in Addenda #1 and #2 as discussed above, was removed from the list of constituents of concern.
- During the Fall 2021 Golder collected groundwater samples from the monitoring well network and evaluated the resulting analytical data to confirm plume extent and stability. Golder sampled groundwater monitoring wells for CCR Appendix III and IV parameters from September 15 to October 1, 2021.
- Golder began preliminary work on the draft Selection of Remedy report based on the results of ACM Addendum #3.

Throughout the spring – summer 2022 timeframe, Golder will continue to collect and evaluate additional information and perform, additional engineering evaluations of the alternatives identified in ACM Addendum #3 consistent with timing and implications of IDEM's Closure Application review and approval processes. Golder will summarize these additional evaluations along with a summary NIPSCO LLC's progress toward selection of remedy for groundwater Corrective Measures at the MCU in the next semi-annual progress report.

https://golderassociates.sharepoint.com/sites/nipscoccrgwmonitoring/shared documents/rmsgs/reports/selection of remedy progess updates/22-01/rmsgs selection of remedy semi annual progress report 6.docx

APPENDIX Q

Annual RCRA CCR Unit Inspection Report Waste Disposal Area – December 2021

REPORT

Northern Indiana Public Service Company, LLC
R.M. Schahfer Generating Station

Annual RCRA CCR Unit Inspection Report
Waste Disposal Area – Surface Impoundment

Submitted to:

Northern Indiana Public Service Company, LLC
2723 East 1500 North, Wheatfield, Indiana USA 46392

Submitted by:

Golder Associates Inc.
15851 South US 27, Suite 50 Lansing, Michigan, USA 48906

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21496761

December 31, 2021

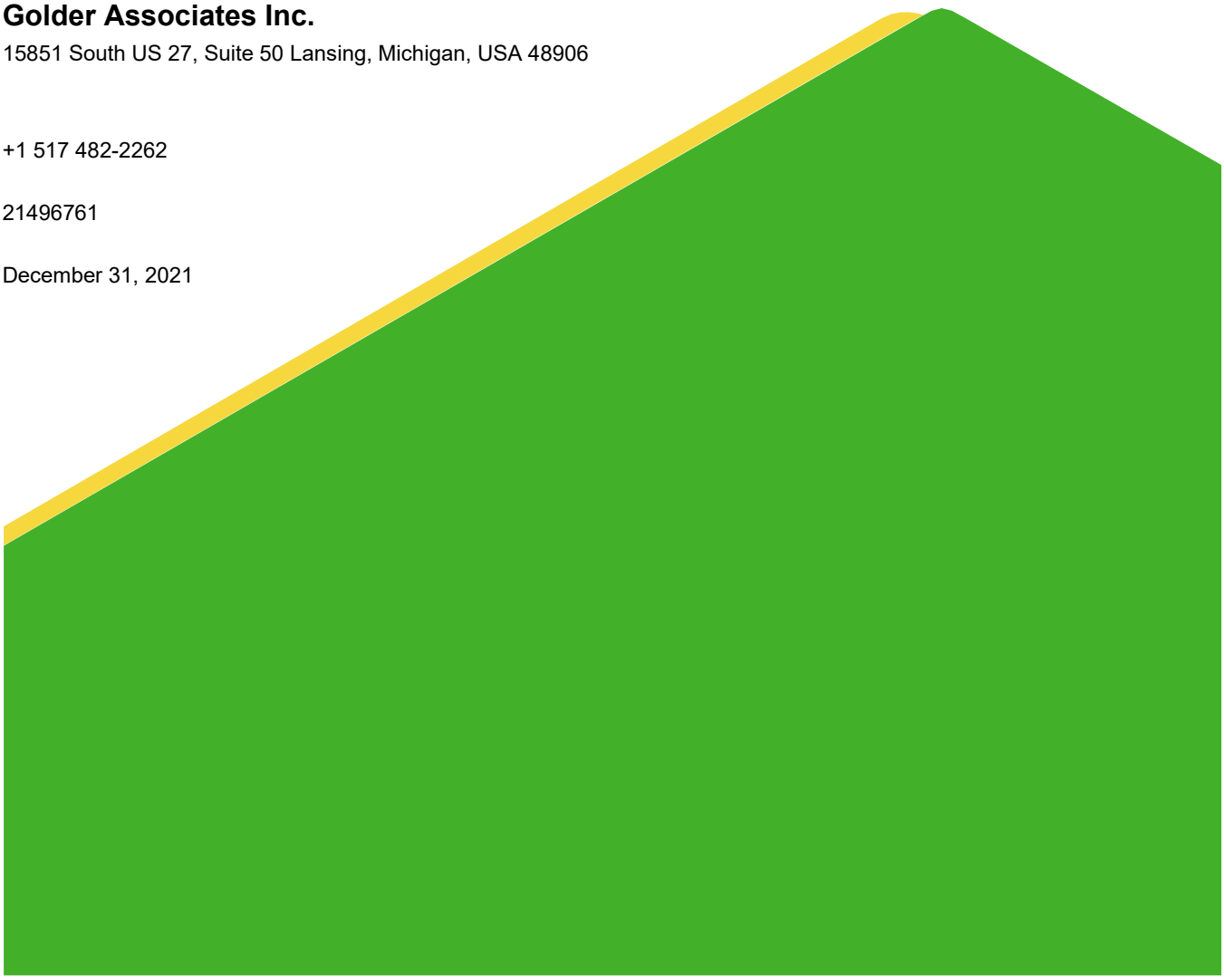


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Table 1 Summary of Background Document Review

1.0 INTRODUCTION

The United States Environmental Protection Agency (EPA) promulgated the Resource Conservation and Recovery Act (RCRA) Coal Combustion Residuals (CCR) Rule (Rule) on April 17, 2015, with an effective date of October 19, 2015. The Rule requires owners or operators of existing CCR surface impoundments to have those units inspected on an annual basis by a qualified professional engineer in accordance with 40 CFR 257.83(b)(1). The annual qualified professional engineer inspections are required to be completed and the results documented in inspection reports (per 40 CFR 257.83(b)(2)) for CCR surface impoundments. Golder Associates USA Inc. (Golder) was retained by Northern Indiana Public Service Company, LLC (NIPSCO) to perform the annual inspection of the Waste Disposal Area (WDA), a CCR surface impoundment located at the R.M. Schahfer Generating Station (RMSGS, Site).

This report presents the results of the 2021 annual inspection of the WDA CCR surface impoundment unit at the RMSGS, located in Wheatfield, Jasper County, Indiana. The inspection was conducted to comply with §257.83 of the CCR Rule.

Per 40 CFR 257.83(b)(1), Golder reviewed available information regarding the status and condition of the CCR unit and performed an onsite visual inspection which was conducted on October 26, 2021. The objectives of the inspection included the following:

- Review of Operational Records (as applicable, see Section 3):
  - Design and construction information.
  - Results of previous structural stability assessments.
  - Results of previous annual inspections.
- A visual inspection of the CCR unit to identify signs of distress or malfunction of the CCR unit and appurtenant structures.
- A visual inspection of hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit for structural integrity and continued safe and reliable operation.

In accordance with §257.83(b)(2), this inspection report has been prepared by a qualified professional engineer documenting the operational records review, visual inspection, and identifying the following since the previous annual inspection:

- Any changes in geometry of the CCR surface impoundment since the previous annual inspection.
- The location and type of existing instrumentation and the maximum recorded readings for each instrument since the previous annual inspection.
- The approximate minimum, maximum, and present depth and elevation of the impounded water and CCR since the previous annual inspection.
- The storage capacity of the impounding structure at the time of inspection.
- The approximate volume of the impounded water and CCR at the time of inspection.
- Any appearances of an actual or potential structural weakness of the CCR unit, in addition to any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit and appurtenant structures.

- Any other change(s) which may have affected the stability or operation of the impounding structure since the previous annual inspection.

2.0 FACILITY DESCRIPTION

The WDA was designed by Sargent & Lundy Engineers of Chicago, Illinois in 1982. The WDA, located in the southwest region of RMSGS, is unlined and formed by an approximately 17-foot-high perimeter earth-fill dike with slurry trench core that encloses an area of approximately 83 acres. The embankment crest has a nominal elevation of 681 feet above mean sea level (amsl), but surveyed crest elevations range from 680.0 to 682.3 feet amsl. The WDA receives primarily bottom ash/boiler slag from the generating station through pipes located at the northern end of the unit. Most of the deposited ash/slag is located in the northern half of the WDA. Due to size of the unit and settling/depositional properties of the materials, very little, if any, ash/slag is present in the southern half of the WDA. The east side of the WDA is common with the west side of the adjacent Recycle Settling Basin (RSB). Water exits the WDA via an overflow weir (standpipe), to the RSB, or through the auxiliary spillway located at the northwest side. The overflow weir is located at the southern end of the east side of the WDA. The WDA and the RSB are hydraulically connected and the water level within these impoundments will seek equilibrium when the water level is above the invert elevation of the standpipe connecting the impoundments. A survey of the WDA was performed by Marbach, Brady and Weaver, Inc. in December 2011 (Marbach, 2011).

The auxiliary spillway was modified in 2017 to allow for an increased invert elevation to account for the maximum flood levels. The modified spillway was operational in 2018. The modifications included removal of the former closed-conduit spillway and construction of a concrete open-channel spillway with a concrete down-chute and riprap armoring at the toe of the embankment. The completed spillway has an invert elevation of 677.5 feet amsl.

The revised analysis performed for the WDA's modified spillway and the actions by NIPSCO to operationally control the water surface elevation, satisfy the requirements of 40 CFR 257.82 (Golder, November 2017).

3.0 BACKGROUND AND DOCUMENT REVIEW SUMMARY

The existing reports reviewed for this assessment are summarized below.

Table 1: Summary of Background Document Review

Document	Date	Author
Various construction drawings	1982	Sargent & Lundy Engineers
Assessment of Dam Safety of Coal Combustion Surface Impoundments, NIPSCO, RM Schahfer Generating Station	July 2010	CDM for the EPA
Report on Inspection of The Waste Disposal Area	January 2011	Golder Associates Inc.
Final Hazard Classification Review Report – NIPSCO Schahfer Generating Station	January 2011	Golder Associates Inc.
Embankment Elevation Survey, Waste Disposal Area and Recycle Pond, NIPSCO Schahfer Generating Station	December 2011	Marbach, Brady and Weaver, Inc.

Document	Date	Author
Schahfer Spillway Hydrologic and Hydraulic Evaluation	December 2011	Golder Associates Inc.
Final Geotechnical Investigation and Embankment Stability Analyses	June 2012	Golder Associates Inc.
Report on Inspection of The Waste Disposal Area	September 2012	Golder Associates Inc.
Construction in a Floodway Permit Application, NIPSCO R.M. Schahfer Generating Station,	November 2012	Golder Associates Inc.
Basin Operation, Maintenance, and Inspection Plan, NIPSCO R. M. Schahfer Generating Station,	February 2013	Golder Associates Inc.
Emergency Action Plan, Final Settling Basin (FSB), Intake Settling Basin (ISB), Waste Disposal Area (WDA), Recycle Basin (RB), Northern Indiana Public Service Company (NIPSCO), R.M. Schahfer Generating Station	February 2013	Golder Associates Inc.
State of Indiana Department of Natural Resources (DNR), Certificate of Approval, After-the-Fact, Construction in a Floodway	April 23, 2013	State of Indiana DNR
Report on Inspection of The Waste Disposal Area	April 2014	Golder Associates Inc.
Construction Observation Documentation Report, Surface Water Basin Erosion Repairs, NIPSCO R.M. Schahfer Generating Station	October 2014	Golder Associates Inc.
Northern Indiana Public Service Company R.M. Schahfer Generating Station – First Annual RCRA CCR Unit Inspection Report – January 2016 – Waste Disposal Area – Surface Impoundment	January 2016	Golder Associates Inc.
NIPSCO, R.M. Schahfer Generating Station, Hazard Potential Classification Assessment and Visual Inspection Report – RCRA CCR Units	September 2016	Golder Associates Inc.
NIPSCO – R.M. Schahfer Generating Station, Waste Disposal Area, History of Construction	September 2016	Golder Associates Inc.
Statement of Certification, NIPSCO RMSGS, Liner Design Criteria for Existing CCR Surface Impoundments	September 2016	Golder Associates Inc.

Document	Date	Author
NIPSCO R.M. Schahfer Generating Station, CCR Surface Impoundment Inflow Design Flood Control System Plan	October 2016	Golder Associates Inc.
NIPSCO, R.M. Schahfer Generating Station, Waste Disposal Area, Structural Stability and Safety Factor Assessment	October 2016	Golder Associates Inc.
Waste Disposal Area Spillway Improvement Drawings – Bid Drawings, NIPSCO, RMSGS	August 2017	Golder Associates Inc.
Northern Indiana Public Service Company, R.M. Schahfer Generating Station – Second Annual RCRA CCR Unit Inspection Report – January 2017 – Waste Disposal Area – Surface Impoundment	January 2017	Golder Associates Inc.
Weekly Inspection Reports	2017- October 2020	NIPSCO
WDA Bathymetric Survey	2017	DLZ
Amendment to the R.M. Schahfer Generating Station Inflow Design Flood Control System Plan – Hydraulic Evaluation of the Waste Disposal Area Auxiliary Spillway	November 2017	Golder Associates Inc.
Northern Indiana Public Service Company, R.M. Schahfer Generating Station – Third Annual RCRA CCR Unit Inspection Report – January 2018 – Waste Disposal Area – Surface Impoundment	January 2018	Golder Associates Inc.
Northern Indiana Public Service Company, R.M. Schahfer Generating Station – Fourth Annual RCRA CCR Unit Inspection Report – January 2019 – Waste Disposal Area – Surface Impoundment	January 2019	Golder Associates Inc.
Northern Indiana Public Service Company, R.M Schahfer Generating Station – Fifth Annual RCRA CCR Unit Inspection Report – January 2020 – Waste Disposal Area – Surface Impoundment	January 2020	Golder Associates Inc.
Northern Indiana Public Service Company, R.M Schahfer Generating Station – Sixth Annual RCRA CCR Unit Inspection Report – Waste Disposal Area – Surface Impoundment	December 31, 2020	Golder Associates Inc.

4.0 2021 VISUAL INSPECTION

The 2021 onsite inspection of the WDA was performed by Ms. Tiffany Johnson, P.E. and Mr. Peter Joplin, P.E. of Golder on October 26, 2021. Both Ms. Johnson and Mr. Joplin are Professional Engineers, licensed in the State of Indiana. Golder's inspectors were directed by Mr. Joseph Kutch, Manager, Environmental Compliance with NiSource Corporate Services.

The inspection provides the following information as stipulated in 40 CFR 257.83(b)(2):

- Any changes in geometry of the CCR surface impoundment since the previous annual inspection.
  - None observed.
- The location and type of existing instrumentation and the maximum recorded readings for each instrument since the previous annual inspection.
  - There is currently no instrumentation in place designed to monitor structural stability of the WDA.
- The approximate minimum, maximum, and present depth and elevation of the impounded water and CCR since the previous annual inspection.
  - Maximum: approximately 677.5 feet above mean sea level (based on invert elevation of the improved spillway (Golder, November 2017)
  - Minimum: approximately 676.5 feet above mean sea level (based on visual observation)
  - Present Depth: approximately 12.5 feet (based on visual observation at overflow weir staff gauge, approximate elevation of 676 ft amsl)
- The storage capacity of the impounding structure at the time of inspection.
  - 1,530 acre-feet (based on review of available information)
- The approximate volume of the impounded water and CCR at the time of inspection.
  - Impounded water = approximately 183,880,000 gallons (from NIPSCO based on 13-feet depth, no significant change from 2020)
  - CCR = approximately 640,000 cubic yards (from NIPSCO)
- Any appearances of an actual or potential structural weakness of the CCR unit, in addition to any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit and appurtenant structures.
  - None were observed at the time of the inspection. However, in July 2021, NIPSCO informed Golder of a seep located on the northwest corner of the WDA downstream embankment slope. Golder inspected the location on July 30, 2021 and after visual inspection and interviews with workers on site it was determined that the likely cause of the seep was a leak in the Unit 14 Yard Sump Pit pipe which had broken at near the same spot in February of 2020. A subsequent investigation confirmed the leak in the pipe and the section was replaced in August of 2021 and backfilled. There were no issues observed in this area during the October 26, 2021 inspection.
- Any other change(s) which may have affected the stability or operation of the impounding structure since the previous annual inspection.
  - None were observed.

Based on visual observations made on October 26, 2021, the overall condition of the WDA is acceptable. No structural weaknesses or safety issues were observed within the upstream, downstream, crest, or hydraulic

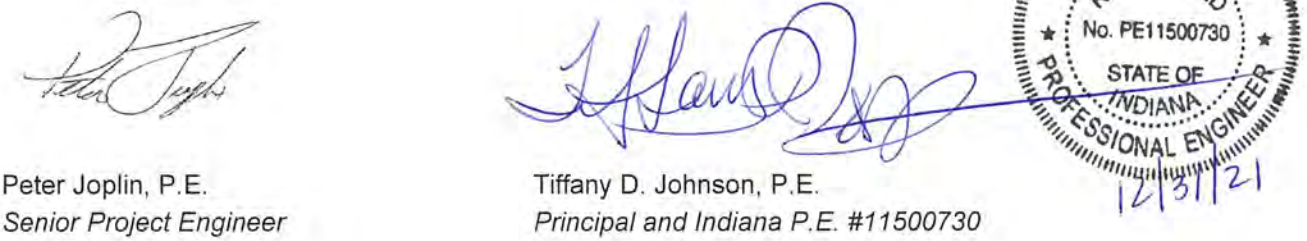
structures of the WDA. Based on visual observations made on October 26, 2021, there were no visual conditions identified that would negatively impact the operation of the WDA.

5.0 CLOSING

This report has been prepared in general accordance with normally accepted civil engineering practices to fulfill the Resource Conservation and Recovery Act (RCRA) reporting requirements in accordance with 40 CFR 257.83(b). Based on our review of the information provided by NIPSCO and on Golder's on-site visual inspection, the overall condition of the WDA is acceptable. Golder's assessment is limited to the information provided to us by NIPSCO and to the features that could be inspected visually in a safe manner. Golder cannot attest to the condition of subsurface or submerged structures.

Sincerely,

Golder Associates Inc.



Peter Joplin, P.E.
Senior Project Engineer

Tiffany D. Johnson, P.E.
Principal and Indiana P.E. #11500730

https://golderassociates.sharepoint.com/sites/153481/project files/5 technical work/wda/2021_nipsco ccr wda rcra inspection report_final.docx

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-25-12
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	))))	Order No. 202-25-13

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 26
Culley 2025 Air Permit Modification

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

100 N. Senate Avenue • Indianapolis, IN 46204
(800) 451-6027 • (317) 232-8603 • Fax (317) 233-6647 • www.idem.IN.gov

Mike Braun
Governor

Clint Woods
Commissioner

To:	Interested Parties
Date:	July 7, 2025
From:	Jenny Acker, Chief Permits Branch Office of Air Quality
Source Name:	Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station
Permit Level:	TV Minor Permit Modification
Permit Number:	173-48980-00001
Source Location:	3711 Darlington Rd, Newburgh, IN 47630
Type of Action Taken:	Modification at an existing source

Notice of Decision: Approval - Effective Immediately

Please be advised that on behalf of the Commissioner of the Department of Environmental Management, I have issued a decision regarding the matter referenced above.

The final decision is available on the IDEM website at: https://www.in.gov/apps/idem/caats/
To view the document, choose Search Option **by Permit Number**, then enter permit 48980. This search will also provide the application received date, **draft permit** public notice start and end date, **proposed permit** EPA review period start and end date, and **final** permit issuance date.

The final decision is also available via IDEM's Virtual File Cabinet (VFC). Please go to: https://www.in.gov/idem and enter VFC in the search box. You will then have the option to search for permit documents using a variety of criteria.

(continues on next page)

If you would like to request a paper copy of the permit document, please contact IDEM's Office of Records Management:

IDEM - Office of Records Management
Indiana Government Center North
100 North Senate Avenue
Indianapolis, IN 46204-2251
Phone: (317) 232-8667
Fax: (317) 233-6647
Email: IDEMFILEROOM@idem.in.gov

Pursuant to IC 13-17-3-4 and 326 IAC 2, this permit modification is effective immediately, unless a petition for stay of effectiveness is filed and granted, and may be revoked or modified in accordance with the provisions of IC 13-15-7-1.

If you wish to challenge this decision, IC 4-21.5-3-7 and IC 13-15-7-3 require that you file a petition for administrative review. This petition may include a request for stay of effectiveness and must be submitted to Indiana Office of Administrative Law Proceedings, 100 N. Senate Avenue Suite N802, Indianapolis, IN 46204, **within eighteen (18) days of the mailing of this notice**. The filing of a petition for administrative review is complete on the earliest of the following dates that apply to the filing:

(1) the date the document is delivered to the Indiana Office of Administrative Law Proceedings (OALP); or
(2) the date of the postmark on the envelope containing the document, if the document is mailed to OALP by U.S. mail; or
(3) The date on which the document is deposited with a private carrier, as shown by receipt issued by the carrier, if the document is sent to the OALP by private carrier.

The petition must include facts demonstrating that you are either the applicant, a person aggrieved or adversely affected by the decision or otherwise entitled to review by law. Please identify the permit, decision, or other order for which you seek review by permit number, name of the applicant, location, date of this notice and all of the following:

(1) the name and address of the person making the request;
(2) the interest of the person making the request;
(3) identification of any persons represented by the person making the request;
(4) the reasons, with particularity, for the request;
(5) the issues, with particularity, proposed for considerations at any hearing; and
(6) identification of the terms and conditions which, in the judgment of the person making the request, would be appropriate in the case in question to satisfy the requirements of the law governing documents of the type issued by the Commissioner.

Pursuant to 326 IAC 2-7-18(d), any person may petition the U.S. EPA to object to the issuance of an initial Title V operating permit, permit renewal, or permit modification within sixty (60) days of the end of the forty-five (45) day EPA review period. Such an objection must be based only on issues that were raised with reasonable specificity during the public comment period, unless the petitioner demonstrates that it was impractible to raise such issues, or if the grounds for such objection arose after the comment period.

The EPA requests that you file Title V petitions electronically through the Central Data Exchange. To do so, please go to: https://cdx.epa.gov/ .

If you tried but you are unable to use the Central Data Exchange to file your petition, the EPA requests that you send your petition and associated attachments via email to: titleVpetitions@epa.gov.

If you have made every effort to electronically submit your petition but are simply unable to successfully do so, please submit a hardcopy of your petition to the following address:

US EPA
Office of Air Quality Planning and Standards
Air Quality Policy Division
Operating Permits Group Leader
109 T.W. Alexander Dr. (C-504-01)
Research Triangle Park, NC 27711

If you have technical questions regarding the enclosed documents, please contact the Office of Air Quality, Permits Branch at (317) 233-0178. Callers from within Indiana may call toll-free at 1-800-451-6027, ext. 3-0178.

Enclosures
Decision-Title V-Mod 1/13/25

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

100 N. Senate Avenue • Indianapolis, IN 46204
(800) 451-6027 • (317) 232-8603 • Fax (317) 233-6647 • www.idem.IN.gov

Mike Braun
Governor

Clint Woods
Commissioner

July 7, 2025

Greg Dick
SIGECO - F.B. Culley Generating Station
P.O. Box 209
Evansville, IN 47702

Re: 173-48980-00001
Minor Permit Modification

Dear Mr. Dick:

SIGECO - F.B. Culley Generating Station was issued Part 70 Operating Permit Renewal No. T173-43264-00001 on August 17, 2021for a stationary electric utility generating station located at 3711 Darlington Road, Newburgh, Indiana 47630. An application requesting changes to this permit was received on April 3, 2025. Pursuant to the provisions of 326 IAC 2-7-12, a Minor Permit Modification to this permit is hereby approved as described in the attached Technical Support Document.

Please find attached the entire Part 70 Operating Permit as modified. The permit references the below listed attachment(s). Since these attachments have been provided in previously issued approvals for this source, IDEM OAQ has not included a copy of these attachments with this modification:

Attachment A: Fugitive Dust Control Plan
Attachment B: 40 CFR 60, Subpart OOO, Nonmetallic Mineral Processing Plants
Attachment C: 40 CFR 63, Subpart UUUUU, Coal and Oil Fired Electric Utility Steam Generating Units
Attachment D: 40 CFR 63, Subpart ZZZZ, Stationary Reciprocating Internal Combustion Engines
Attachment E: 40 CFR 60, Subpart Da, Electric Utility Steam Generating Units

Previously issued approvals for this source containing these attachments are available on the Internet at: http://www.in.gov/ai/appfiles/idem-caats/.

Previously issued approvals for this source are also available via IDEM's Virtual File Cabinet (VFC). To access VFC, please go to: https://www.in.gov/idem/legal/public-records/virtual-file-cabinet/. Once you have accessed VFC, you will then have the option to search for source related documents using a variety of criteria.

Federal rules under Title 40 of United States Code of Federal Regulations may also be found on the U.S. Government Printing Office's Electronic Code of Federal Regulations (eCFR) website, located on the Internet at: http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40tab_02.tpl.

A copy of the permit is available on the Internet at: http://www.in.gov/ai/appfiles/idem-caats/. A copy of the application and permit is also available via IDEM's Virtual File Cabinet (VFC) located at https://www.in.gov/idem/legal/public-records/virtual-file-cabinet/. Once you have accessed VFC, you will then have the option to search for source related documents using a variety of criteria. To find documents related to this air permit, click on "Advanced Search", specify "OAQ" in the Program search field, specify the five-digit permit number "48980" in the Permit # search field, then click the Search button at the top or bottom of the webpage.

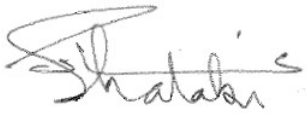
For additional information about air permits and how the public and interested parties can participate, refer to the IDEM Air Permits page on the Internet at: https://www.in.gov/idem/airpermit/public-participation/; and the Citizens' Guide to IDEM on the Internet at:

https://www.in.gov/idem/resources/citizens-guide-to-idem/.

This decision is subject to the Indiana Administrative Orders and Procedures Act - IC 4-21.5-3-5.

If you have any questions regarding this matter, please contact Hachem Ismaili Alaoui, Indiana Department Environmental Management, Office of Air Quality, Permits Branch, Indiana Government Center North, 100 North Senate Avenue, Room 13W, Indianapolis, Indiana 46204-2251, or by telephone at (317) 232-2827 or (800) 451-6027, and ask for Hachem Ismaili Alaoui or (317) 232-2827.

Sincerely,



Ghassan Shalabi, Section Chief
Permits Branch
Office of Air Quality

Attachments: Modified Permit and Technical Support Document
cc: File - Warrick County
Warrick County Health Department
U.S. EPA, Region 5
Compliance and Enforcement Branch
IDEM Northwest Regional Office

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

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Mike Braun
Governor

Clint Woods
Commissioner

Part 70 Operating Permit Renewal
OFFICE OF AIR QUALITY

Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station
3711 Darlington Road
Newburgh, Indiana 47630

(herein known as the Permittee) is hereby authorized to operate subject to the conditions contained herein, the source described in Section A (Source Summary) of this permit.

The Permittee must comply with all conditions of this permit. Noncompliance with any provisions of this permit is grounds for enforcement action; permit termination, revocation and reissuance, or modification; or denial of a permit renewal application. Noncompliance with any provision of this permit, except any provision specifically designated as not federally enforceable, constitutes a violation of the Clean Air Act. It shall not be a defense for the Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

This permit is issued in accordance with 326 IAC 2 and 40 CFR Part 70 Appendix A and contains the conditions and provisions specified in 326 IAC 2-7 as required by 42 U.S.C. 7401, et. seq. (Clean Air Act as amended by the 1990 Clean Air Act Amendments), 40 CFR Part 70.6, IC 13-15 and IC 13-17.

Operation Permit No.: T173-43264-00001 Master Agency Interest ID.: 11786	
Issued by: Original signed by: Ghassan Shalabi, Section Chief Permits Branch, Office of Air Quality	Issuance Date: August 17, 2021 Expiration Date: August 17, 2026

Significant Permit Modification No.: 173-44874-00001, issued on April 25, 2022

Minor Permit Modification No.: 173-48980-00001	
Issued by: Ghassan Shalabi, Section Chief Permits Branch Office of Air Quality	Issuance Date: July 7, 2025 Expiration Date: August 17, 2026

Visit on.IN.gov/survey or scan the QR code to provide feedback.
We appreciate your input!

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Attachment B New Source Performance Standard (NSPS): Nonmetallic Mineral Processing Plants [40 CFR 60, Subpart OOO]

Attachment C National Emission Standards for Hazardous Air Pollutants (NESHAP) for Coal and Oil-Fired Electric Utility Steam Generating Units [40 CFR 63, Subpart UUUUU]

Attachment D National Emission Standards for Hazardous Air Pollutants (NESHAP) for Stationary Reciprocating Internal Combustion Engines [40 CFR 63, Subpart ZZZZ]

Attachment E New Source Performance Standard (NSPS): Electric Utility Steam Generating Units [40 CFR 60, Subpart Da]

SECTION A SOURCE SUMMARY

This permit is based on information requested by the Indiana Department of Environmental Management (IDEM), Office of Air Quality (OAQ). The information describing the source contained in conditions A.1 through A.4 is descriptive information and does not constitute enforceable conditions. However, the Permittee should be aware that a physical change or a change in the method of operation that may render this descriptive information obsolete or inaccurate may trigger requirements for the Permittee to obtain additional permits or seek modification of this permit pursuant to 326 IAC 2, or change other applicable requirements presented in the permit application.

A.1 General Information [326 IAC 2-7-4(c)][326 IAC 2-7-5(14)][326 IAC 2-7-1(20)]

The Permittee owns and operates a stationary electric utility generating station.

Source Address:	3711 Darlington Road, Newburgh, Indiana 47630
General Source Phone Number:	(812) 491-4769
SIC Code:	4911 and 4922 (Electric Services & Natural Gas Transmission)
County Location:	Warrick
Source Location Status:	Attainment for all criteria pollutants
Source Status:	Part 70 Operating Permit Program Major Source, under PSD Rules Major Source, Section 112 of the Clean Air Act 1 of 28 Source Categories

A.2 Emission Units and Pollution Control Equipment Summary [326 IAC 2-7-4(c)(3)][326 IAC 2-7-5(14)]

This stationary source consists of the following emission units and pollution control devices:

(a) One (1) coal/natural gas fired boiler, identified as Unit No. 2, constructed in 1963, with a maximum fuel heat input rating of 1031 MMBtu per hour (HHV basis), using an electrostatic precipitator for particulate matter (PM) emissions control, and a low NOx burner for NOx control, and exhausting to Stack No. 3. Unit No. 2 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and an exhaust stack with Unit No. 3.

Unit No. 2 has continuous emissions monitoring systems (CEMs) for Sulfur Dioxide (SO_2), Nitrogen Oxides (NOx), Particulate Matter (PM), Carbon Dioxide (CO_2), and sorbent trap monitor for Mercury (Hg), which are shared with Unit No. 3.

[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(b) One (1) coal/natural gas fired boiler, identified as Unit No. 3, constructed in 1970, with a maximum fuel heat input rating of 2,724 MMBtu per hour (HHV basis), using a fabric filter for particulate matter (PM) emissions control, and low NOx burner and selective catalytic reduction (SCR) for NOx reduction, with a sorbent injection system for control of sulfur trioxide (SO3) and resulting sulfuric acid (H2SO4) emissions, and exhausting to Stack No. 3. Unit No. 3 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and an exhaust stack with Unit No. 2.

Unit No. 3 has continuous emissions monitoring systems (CEMS) for SO2, NOx, PM, CO2, and a sorbent trap monitor for mercury (Hg), which are shared with Unit No. 2. Unit 3 is equipped with a spray dryer evaporator (SDE), commissioned in 2023, which eliminates FGD wastewater discharges.

[Under 40 CFR 60, Subpart Da, this is an affected source.]

[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(c) Coal storage and handling operations, identified as Unit 5F, constructed in 1954, expanded in 1963 and 1970, and modified in 1994, consisting of the following activities:

(1) Floating dock unloading clamshell serving both coal and limestone unloading operations (served by S/V 6).

(2) Truck load-out station serving both coal and limestone unloading operations (served by S/V 9).

(3) Unit No. 2 coal pile hopper with a maximum coal feed belt capacity of 600 tons per hour.

(4) Unit No. 2 coal hopper conveyor (C1) with a maximum coal feed belt capacity of 600 tons per hour.

(5) Unit No. 2 coal transfer house conveyor drop with a maximum coal feed belt capacity of 600 tons per hour.

(6) Unit No. 2 coal transfer house conveyor (#4) with a maximum coal feed belt capacity of 1240 tons per hour.

(7) Unit No. 2 coal transfer house conveyor drop with a maximum coal feed belt capacity of 1240 tons per hour.

(8) Unit No. 2 coal transfer house conveyor with a maximum coal feed belt capacity of 1240 tons per hour.

(9) Unit No. 2 powerhouse coal tripper conveyor bunker drop with a maximum coal feed belt capacity of 1240 tons per hour and with an enclosed powerhouse and sealed transfer points.

(10) Unit No. 2 powerhouse coal tripper conveyor with a maximum coal feed belt capacity of 1240 tons per hour and with an enclosed powerhouse and sealed transfer points.

(11) Unit No. 2 powerhouse coal bunkers with a maximum coal feed belt capacity of 1240 tons per hour and with an enclosed powerhouse and sealed transfer points.

(12) Units No. 2 and 3 coal pile of 645,000 tons.

(13) Unit No. 2 coal pile hopper with a maximum coal feed belt capacity of 640 tons per hour.

(14) Unit No. 2 coal pile hopper conveyor with a maximum coal feed belt capacity of 640 tons per hour.

(15) Unit No. 3 coal pile hopper with a maximum coal feed belt capacity of 640 tons per hour.

(16) Unit No. 3 coal pile hopper conveyor with a maximum coal feed belt capacity of 640 tons per hour.

(17) Unit No. 3 coal transfer house conveyor, with a maximum coal feed belt capacity of 640 tons per hour.

(18) Unit No. 3 coal transfer house conveyor drop with a maximum coal feed belt capacity of 640 tons per hour with an enclosed transfer house and fabric filter (served by S/V 8).

(19) Unit No. 3 powerhouse coal tripper conveyor with a maximum coal feed belt capacity of 640 tons per hour and with an enclosed powerhouse and sealed transfer points.

(20) Unit No. 3 powerhouse coal tripper conveyor bunker drop with a maximum coal feed belt capacity of 640 tons per hour and with an enclosed powerhouse and sealed transfer points.

(21) Unit No. 3 powerhouse coal bunker with a maximum coal feed belt capacity of 640 tons per hour and with an enclosed powerhouse and sealed transfer points.

(22) Miscellaneous enclosed coal bunker and weigh-scales with vents.

(d) A fly ash handling facility, identified as Unit 6, constructed in 1994, consisting of the following operations:

(1) One (1) fly ash storage silo receiving fly ash via a close-pipe vacuum handling system from the electrostatic precipitator and fabric filter hoppers of Units No. 2 and No. 3, respectively, with a maximum capacity of 1000 tons, and a maximum throughput of 179.9 tons per hour, with a fabric filter separator exhausting to stack 16 and a bin filter exhausting to stack 17. The filter/separator is designed for operation 50% of the time.

(2) One (1) fly ash silo truck loadout station, with a maximum capacity of 25 tons per hour (the coal trucks have a maximum capacity of 25 tons and haul ash at the rate of one truck per hour), with an enclosed telescoping discharged chute and emissions reduced by fly ash wetting and partial loading of the trucks.

(3) One (1) East Ash Pond receiving sluiced (closed-pipe) bottom ash from Units No. 2 and No. 3. The ash is discharged to the pond at a maximum annual rate of 4.65 tons per hour and stored in wet form, that is, a layer of water maintained above the ponded ash and dredging operations conducted periodically to maintain the ponded storage state.

(e) A limestone handling facility, identified as Unit 7, constructed in 1994, consisting of the following operations:

(1) One (1) limestone unloading floating clamshell dock with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 6. (This operation serves both coal and limestone unloading operations.)

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(2) One (1) covered conveyor, identified as Conveyor 1 (CL-1), with a maximum throughput of 550 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(3) One (1) limestone truck loadout to conveyor with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 9. (This operation serves both coal and limestone unloading operations.)

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(4) One (1) covered conveyor, identified as Conveyor 2 (L-1), with a maximum throughput of 800 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(5) One (1) limestone storage building with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 10.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(6) One (1) limestone reclaim system located inside a totally-enclosed building adjacent to the limestone storage building.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(7) One (1) limestone storage building loadout with a maximum capacity of 750 tons per hour, an enclosed building for dust control, and exhausting indoors.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(8) One (1) covered conveyor, identified as Conveyor 3 (L-2), with a maximum throughput of 300 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(9) One (1) limestone transfer house (No. 1) with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 12.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(10) One (1) covered conveyor, identified as Conveyor 4 (L-3), with a maximum throughput of 300 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(11) One (1) coal and limestone transfer house (serving Unit No. 3) with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 8. (This operation serves both coal and limestone transferring operations.)

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(12) One (1) covered conveyor, identified as Conveyor 5 (L-4), with a maximum throughput of 300 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(13) One (1) limestone transfer house (No. 2) with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 14.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(14) One (1) covered conveyor, identified as Conveyor 6 (L-5), with a maximum throughput of 300 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(15) One (1) limestone day silo with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 15.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(16) One (1) limestone drop to storage pile, approved in 2025 for construction, with a maximum capacity of 11.42 tons per hour, using no controls, and exhausting outdoors.

(17) One (1) limestone storage pile, approved in 2025 for construction, covering an area of two (2) acres.

(18) One (1) limestone drop to truck, approved in 2025 for construction, with a maximum capacity of 11.42 tons per hour, using no controls, and exhausting outdoors.

(f) A gypsum wet filter cake handling facility, identified as Unit 8, constructed in 1994, consisting of the following operations:

(1) One (1) gypsum filter cake conveyor drop, with a maximum capacity of 35 tons per hour, with a fabric filter for dust control, exhausting to stack 11.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(2) One (1) gypsum filter cake conveyor drop, with a maximum capacity of 35 tons per hour, with a fabric filter for dust control, exhausting to stack 13.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(3) One (1) covered conveyor, identified as G1A, with a maximum capacity of 50 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(4) One (1) covered conveyor, identified as G1B (operates only when G1A is offline), with a maximum capacity of 50 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(5) One (1) gypsum filter cake transfer house conveyor drop with a maximum capacity of 35 tons per hour, a fabric filter for dust control, and exhausting to stack 4.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(6) One (1) covered conveyor, identified as G2A, with a maximum capacity of 50 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(7) One (1) covered conveyor, identified as G2B (operates only when G2A is offline), with a maximum capacity of 50 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(8) One (1) gypsum storage building consisting of two (2) 1000-ton gypsum storage silos and one (1) storage pile designated for truck haul-away exhausting indoors.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(9) One (1) covered silo to barge loadout primary filter cake transfer conveyor, identified as Conveyor 4, with a maximum capacity of 400 tons per hour, with a fabric filter for dust control, exhausting to stack 7.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(10) One (1) covered silo to truck secondary transfer conveyor, identified as Conveyor 3, with a maximum capacity of 400 tons per hour and exhausting indoors.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(11) One (1) gypsum barge loadout conveyor drop, with a maximum capacity of 35 tons per hour, with a fabric filter for dust control and exhausting to stack 5.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(12) One (1) gypsum barge loadout with two (2) telescoping transfer chutes delivering filter cake gypsum to river barges with a maximum capacity of 400 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(g) One (1) flue gas desulfurization (FGD) system for Units No. 2 and 3, constructed in 1994, consisting of the following limestone operations:

(1) Two (2) wet ball mills (one operational and one full capacity spare), receiving limestone from the day silo of the limestone handling facility (Unit 7). Each ball mill is a closed-device (hard-piped, enclosed design), wet mill capable of handling 20.5 tons per hour of dry limestone feed.

[Under 40 CFR 60, Subpart OOO, these units are affected sources.]

(2) Two (2) limestone slurry storage tanks, receiving the ball mill product (fresh limestone slurry), which is then discharged into the scrubber system. The scrubbed gas stream exits the absorber tower through the scrubber stack.

[Under 40 CFR 60, Subpart OOO, these units are affected sources.]

(h) One (1) diesel-fired Emergency Generator, constructed in March 2005, with a rated output capacity of 267 hp.

[Under 40 CFR Part 63, Subpart ZZZZ, this is an existing affected source.]

(i) One (1) emergency diesel-fired fire pump, constructed in 1994 with a rated output capacity of 500 hp.

[Under 40 CFR Part 63, Subpart ZZZZ, this is an existing affected source.]

A.3 Specifically Regulated Insignificant Activities [326 IAC 2-7-1(19)][326 IAC 2-7-4(c)][326 IAC 2-7-5(14)]

This stationary source also includes the following insignificant activities which are specifically regulated, as defined in 326 IAC 2-7-1(19):

(a) Vents from ash transport systems not operated at positive pressure.

(b) Coal bunker and coal scale exhausts and associated dust collector vents.

(c) Degreasing operations that do not exceed 145 gallons per 12 months, except if subject to 326 IAC 20-6.

(d) Two (2) Natural Gas-Fired water heaters located in the Maintenance Shop, each with heat input capacity of 0.04 MMBtu/hr; each constructed in 2008 and exhausting to stacks.

A.4 Insignificant Activities [326 IAC 2-7-1(19)][326 IAC 2-7-4(c)][326 IAC 2-7-5(14)]

This stationary source also includes the following insignificant activities, as defined in 326 IAC 2-7-1(19):

(a) Small Natural Gas-Fired combustion units which are described as follows:

(1) Three (3) Natural Gas-Fired forced air unit heaters, each with a heat input capacity of 0.06 MMBtu/hr; each constructed prior to 2015 and exhausting to stacks.

(2) Four (4) Natural Gas-Fired furnaces located in the Planning Offices, each with a heat input capacity of 0.09 MMBtu/hr; each constructed in 2008 and exhausting to stacks.

(3) Three (3) Natural Gas-Fired radiant heaters located in the Maintenance Shop, each with heat input capacity of 0.16 MMBtu/hr; each constructed in 2008 and exhausting to stacks.

(b) Small Propane-Fired or Liquefied Petroleum Gas-Fired (LPG), combustion units described as follows:

(1) Five (5) Propane-Fired portable heaters, each with a heat input capacity of 0.05 MMBtu/hr (Assumed); each constructed prior to 2015 and exhausting to atmosphere.

(c) Small units which combust either Kerosene fuel or Distillate fuel oil and are described as follows:

(1) Ten (10) Kerosene-Fired portable heaters, each with a heat input capacity of 0.05 MMBtu/hr (Assumed); each constructed prior to 2015 and exhausting to atmosphere.

(d) Combustion source flame safety purging on startup.

(e) One (1) unleaded-gasoline fuel dispensing operation consisting of a 500 gallon above ground storage tank, dispensing a maximum of 1,300 gallons per day; constructed in 2006.

(f) One (1) diesel-fuel dispensing operation consisting of a 10,000 gallon above ground storage tank, dispensing a maximum of 230,000 gallons per month; constructed in 2006.

(g) Machining where an aqueous cutting coolant continuously floods the machining interface.

(h) Cleaners and solvents characterized as follows:

(1) having a vapor pressure equal to or less than 2 kPa; 15mm Hg; or 0.3 psi measured at 38 degrees C (100^{o}F) or;

(2) having a vapor pressure equal to or less than 0.7 kPa; 5 mm Hg; or 0.1 psi measured at 20oC (68^{o}F); the use of which for all cleaners and solvents combined does not exceed 145 gallons per 12 months.

(i) Closed loop heating and cooling systems.

(j) Solvent recycling systems with batch capacity less than or equal to 100 gallons.

(k) Activities associated with the treatment of wastewater streams with an oil and grease content less than or equal to 1% by volume.

(l) Water runoff ponds-.

(m) Any operation using aqueous solutions containing less than 1% by weight VOCs excluding HAPs.

(n) Replacement or repair of electrostatic precipitators, bags in baghouses and filters in other air filtration equipment.

(o) Heat exchanger cleaning and repair.

(p) Process vessel degassing and cleaning to prepare for internal repairs.

(q) Stockpiled soils from soil remediation activities that are covered and waiting transport for disposal.

(r) Underground conveyors.

(s) VOC and HAP storage containers all constructed prior to 1960: Storage tanks with capacity less than or equal to 1,000 gallons and annual throughputs less than 12,000 gallons; storage tanks which contain lubricating oils, hydraulic oils, and machining fluids.

(t) Asbestos abatement projects regulated by 326 IAC 14-10.

(u) Purging of gas lines and vessels that are related to routine maintenance and repair of buildings, structures, or vehicles at the source where air emissions from those activities would not be associated with any production process.

(v) Flue gas conditioning systems and associated chemicals such as the following: sodium sulfate; ammonia; and sulfur trioxide.

(w) Equipment used to collect any material that might be released during a malfunction, process upset, or spill cleanup, including catch tanks, temporary liquid separators, tanks, and fluid handling equipment.

(x) Blowdown for any of the following: sight glass; boiler; compressors; pumps; and cooling tower.

(y) On-site fire and emergency response training approved by the department.

(z) Filter or coalescer media changeout.

(aa) A laboratory as defined in 326 IAC 2-7-1(19)(D).

(bb) Farm operations (landscaping/brush clearing, grass/weed cutting, grounds maintenance).

(cc) Activities with emissions equal to or less than the following thresholds: 5 lb/hr or 25 lb/day PM; 5 lb/hr or 25 lb/day SO_2; 5 lb/hr or 25 lb/day NOx; 3 lb/hr or 15 lb/day VOC; 0.6 tons per year Pb; 1.0 ton/yr of a single HAP, or 2.5 ton/yr of any combination of HAPs:

(1) Boiler chemical cleaning waste evaporation, which involves the evaporation of boiler chemical cleaning wastes that may occur during episodic scheduled boiler outages.

(dd) One (1) diesel-fuel storage tank with a maximum capacity of 650 gallons.

(ee) Paved and unpaved roads and parking lots with public access.

A.5 Part 70 Permit Applicability [326 IAC 2-7-2]

This stationary source is required to have a Part 70 permit by 326 IAC 2-7-2 (Applicability) because:

(a) It is a major source, as defined in 326 IAC 2-7-1(20);

(b) It is a source in a source category designated by the United States Environmental Protection Agency (U.S. EPA) under 40 CFR 70.3 (Part 70 - Applicability).

(c) It is an affected source under Title IV (Acid Deposition Control) of the Clean Air Act, as defined in 326 IAC 2-7-1(3);

SECTION B GENERAL CONDITIONS

B.1 Definitions [326 IAC 2-7-1]

Terms in this permit shall have the definition assigned to such terms in the referenced regulation. In the absence of definitions in the referenced regulation, the applicable definitions found in the statutes or regulations (IC 13-11, 326 IAC 1-2 and 326 IAC 2-7) shall prevail.

B.2 Permit Term [326 IAC 2-7-5(2)][326 IAC 2-1.1-9.5][326 IAC 2-7-4(a)(1)(D)][IC 13-15-3-6(a)]

(a) This permit, T173-43264-00001, is issued for a fixed term of five (5) years from the issuance date of this permit, as determined in accordance with IC 4-21.5-3-5(f) and IC 13-15-5-3. Subsequent revisions, modifications, or amendments of this permit do not affect the expiration date of this permit or of permits issued pursuant to Title IV of the Clean Air Act and 326 IAC 21 (Acid Deposition Control).

(b) If IDEM, OAQ, upon receiving a timely and complete renewal permit application, fails to issue or deny the permit renewal prior to the expiration date of this permit, this existing permit shall not expire and all terms and conditions shall continue in effect, including any permit shield provided in 326 IAC 2-7-15, until the renewal permit has been issued or denied.

B.3 Term of Conditions [326 IAC 2-1.1-9.5]

Notwithstanding the permit term of a permit to construct, a permit to operate, or a permit modification, any condition established in a permit issued pursuant to a permitting program approved in the state implementation plan shall remain in effect until:

(a) the condition is modified in a subsequent permit action pursuant to Title I of the Clean Air Act; or

(b) the emission unit to which the condition pertains permanently ceases operation.

B.4 Enforceability [326 IAC 2-7-7][IC 13-17-12]

Unless otherwise stated, all terms and conditions in this permit, including any provisions designed to limit the source's potential to emit, are enforceable by IDEM, the United States Environmental Protection Agency (U.S. EPA) and by citizens in accordance with the Clean Air Act.

B.5 Severability [326 IAC 2-7-5(5)]

The provisions of this permit are severable; a determination that any portion of this permit is invalid shall not affect the validity of the remainder of the permit.

B.6 Property Rights or Exclusive Privilege [326 IAC 2-7-5(6)(D)]

This permit does not convey any property rights of any sort or any exclusive privilege.

B.7 Duty to Provide Information [326 IAC 2-7-5(6)(E)]

(a) The Permittee shall furnish to IDEM, OAQ, within a reasonable time, any information that IDEM, OAQ may request in writing to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. Upon request, the Permittee shall also furnish to IDEM, OAQ copies of records required to be kept by this permit.

(b) For information furnished by the Permittee to IDEM, OAQ, the Permittee may include a claim of confidentiality in accordance with 326 IAC 17.1. When furnishing copies of requested records directly to U. S. EPA, the Permittee may assert a claim of confidentiality in accordance with 40 CFR 2, Subpart B.

B.8 Certification [326 IAC 2-7-4(f)][326 IAC 2-7-6(1)][326 IAC 2-7-5(3)(C)]

(a) A certification required by this permit meets the requirements of 326 IAC 2-7-6(1) if:

(1) it contains a certification by a "responsible official" as defined by 326 IAC 2-7-1(33), and

(2) the certification states that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

(b) The Permittee may use the attached Certification Form, or its equivalent with each submittal requiring certification. One (1) certification may cover multiple forms in one (1) submittal.

(c) A "responsible official" is defined at 326 IAC 2-7-1(33).

B.9 Annual Compliance Certification [326 IAC 2-7-6(5)]

(a) The Permittee shall annually submit a compliance certification report which addresses the status of the source's compliance with the terms and conditions contained in this permit, including emission limitations, standards, or work practices. All certifications shall cover the time period from January 1 to December 31 of the previous year, and shall be submitted no later than July 1 of each year to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

and

United States Environmental Protection Agency, Region 5
Air and Radiation Division, Air Enforcement Branch - Indiana (AE-17J)
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

(b) The annual compliance certification report required by this permit shall be considered timely if the date postmarked on the envelope or certified mail receipt, or affixed by the shipper on the private shipping receipt, is on or before the date it is due. If the document is submitted by any other means, it shall be considered timely if received by IDEM, OAQ on or before the date it is due.

(c) The annual compliance certification report shall include the following:

(1) The appropriate identification of each term or condition of this permit that is the basis of the certification;

(2) The compliance status;

(3) Whether compliance was continuous or intermittent;

(4) The methods used for determining the compliance status of the source, currently and over the reporting period consistent with 326 IAC 2-7-5(3); and

(5) Such other facts, as specified in Sections D of this permit, as IDEM, OAQ may require to determine the compliance status of the source.

The submittal by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

B.10 Preventive Maintenance Plan [326 IAC 2-7-5(12)][326 IAC 1-6-3]

(a) A Preventive Maintenance Plan meets the requirements of 326 IAC 1-6-3 if it includes, at a minimum:

(1) Identification of the individual(s) responsible for inspecting, maintaining, and repairing emission control devices;

(2) A description of the items or conditions that will be inspected and the inspection schedule for said items or conditions; and

(3) Identification and quantification of the replacement parts that will be maintained in inventory for quick replacement.

The Permittee shall implement the PMPs.

(b) If required by specific condition(s) in Section D of this permit where no PMP was previously required, the Permittee shall prepare and maintain Preventive Maintenance Plans (PMPs) no later than ninety (90) days after issuance of this permit or ninety (90) days after initial start-up, whichever is later, including the following information on each facility:

(1) Identification of the individual(s) responsible for inspecting, maintaining, and repairing emission control devices;

(2) A description of the items or conditions that will be inspected and the inspection schedule for said items or conditions; and

(3) Identification and quantification of the replacement parts that will be maintained in inventory for quick replacement.

If, due to circumstances beyond the Permittee’s control, the PMPs cannot be prepared and maintained within the above time frame, the Permittee may extend the date an additional ninety (90) days provided the Permittee notifies:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

The PMP extension notification does not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

The Permittee shall implement the PMPs.

(c) A copy of the PMPs shall be submitted to IDEM, OAQ upon request and within a reasonable time, and shall be subject to review and approval by IDEM, OAQ. IDEM, OAQ may require the Permittee to revise its PMPs whenever lack of proper maintenance

causes or is the primary contributor to an exceedance of any limitation on emissions. The PMPs and their submittal do not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

(d) To the extent the Permittee is required by 40 CFR Part 60/63 to have an Operation Maintenance, and Monitoring (OMM) Plan for a unit, such Plan is deemed to satisfy the PMP requirements of 326 IAC 1-6-3 for that unit.

B.11 Reserved

B.12 Permit Shield [326 IAC 2-7-15][326 IAC 2-7-20][326 IAC 2-7-12]

(a) Pursuant to 326 IAC 2-7-15, the Permittee has been granted a permit shield. The permit shield provides that compliance with the conditions of this permit shall be deemed compliance with any applicable requirements as of the date of permit issuance, provided that either the applicable requirements are included and specifically identified in this permit or the permit contains an explicit determination or concise summary of a determination that other specifically identified requirements are not applicable. The Indiana statutes from IC 13 and rules from 326 IAC, referenced in conditions in this permit, are those applicable at the time the permit was issued. The issuance or possession of this permit shall not alone constitute a defense against an alleged violation of any law, regulation or standard, except for the requirement to obtain a Part 70 permit under 326 IAC 2-7 or for applicable requirements for which a permit shield has been granted.

This permit shield does not extend to applicable requirements which are promulgated after the date of issuance of this permit unless this permit has been modified to reflect such new requirements.

(b) If, after issuance of this permit, it is determined that the permit is in nonconformance with an applicable requirement that applied to the source on the date of permit issuance, IDEM, OAQ shall immediately take steps to reopen and revise this permit and issue a compliance order to the Permittee to ensure expeditious compliance with the applicable requirement until the permit is reissued. The permit shield shall continue in effect so long as the Permittee is in compliance with the compliance order.

(c) No permit shield shall apply to any permit term or condition that is determined after issuance of this permit to have been based on erroneous information supplied in the permit application. Erroneous information means information that the Permittee knew to be false, or in the exercise of reasonable care should have been known to be false, at the time the information was submitted.

(d) Nothing in 326 IAC 2-7-15 or in this permit shall alter or affect the following:

(1) The provisions of Section 303 of the Clean Air Act (emergency orders), including the authority of the U.S. EPA under Section 303 of the Clean Air Act;

(2) The liability of the Permittee for any violation of applicable requirements prior to or at the time of this permit's issuance;

(3) The applicable requirements of the acid rain program, consistent with Section 408(a) of the Clean Air Act; and

(4) The ability of U.S. EPA to obtain information from the Permittee under Section 114 of the Clean Air Act.

(e) This permit shield is not applicable to any change made under 326 IAC 2-7-20(b)(2) (Sections 502(b)(10) of the Clean Air Act changes) and 326 IAC 2-7-20(c)(2) (trading based on State Implementation Plan (SIP) provisions).

(f) This permit shield is not applicable to modifications eligible for group processing until after IDEM, OAQ, has issued the modifications. [326 IAC 2-7-12(c)(7)]

(g) This permit shield is not applicable to minor Part 70 permit modifications until after IDEM, OAQ, has issued the modification. [326 IAC 2-7-12(b)(8)]

B.13 Prior Permits Superseded [326 IAC 2-1.1-9.5][326 IAC 2-7-10.5]

(a) All terms and conditions of permits established prior to T173-43264-00001 and issued pursuant to permitting programs approved into the state implementation plan have been either:

(1) incorporated as originally stated,

(2) revised under 326 IAC 2-7-10.5, or

(3) deleted under 326 IAC 2-7-10.5.

(b) Provided that all terms and conditions are accurately reflected in this permit, all previous registrations and permits are superseded by this Part 70 operating permit, except for permits issued pursuant to Title IV of the Clean Air Act and 326 IAC 21 (Acid Deposition Control)

B.14 Termination of Right to Operate [326 IAC 2-7-10][326 IAC 2-7-4(a)]

The Permittee's right to operate this source terminates with the expiration of this permit unless a timely and complete renewal application is submitted at least nine (9) months prior to the date of expiration of the source's existing permit, consistent with 326 IAC 2-7-3 and 326 IAC 2-7-4(a).

B.15 Permit Modification, Reopening, Revocation and Reissuance, or Termination [326 IAC 2-7-5(6)(C)][326 IAC 2-7-8(a)][326 IAC 2-7-9]

(a) This permit may be modified, reopened, revoked and reissued, or terminated for cause. The filing of a request by the Permittee for a Part 70 Operating Permit modification, revocation and reissuance, or termination, or of a notification of planned changes or anticipated noncompliance does not stay any condition of this permit. [326 IAC 2-7-5(6)(C)] The notification by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

(b) This permit shall be reopened and revised under any of the circumstances listed in IC 13-15-7-2 or if IDEM, OAQ determines any of the following:

(1) That this permit contains a material mistake.

(2) That inaccurate statements were made in establishing the emissions standards or other terms or conditions.

(3) That this permit must be revised or revoked to assure compliance with an applicable requirement. [326 IAC 2-7-9(a)(3)]

(c) Proceedings by IDEM, OAQ to reopen and revise this permit shall follow the same procedures as apply to initial permit issuance and shall affect only those parts of this

permit for which cause to reopen exists. Such reopening and revision shall be made as expeditiously as practicable. [326 IAC 2-7-9(b)]

(d) The reopening and revision of this permit, under 326 IAC 2-7-9(a), shall not be initiated before notice of such intent is provided to the Permittee by IDEM, OAQ at least thirty (30) days in advance of the date this permit is to be reopened, except that IDEM, OAQ may provide a shorter time period in the case of an emergency. [326 IAC 2-7-9(c)]

B.16 Permit Renewal [326 IAC 2-7-3][326 IAC 2-7-4][326 IAC 2-7-8(e)]

(a) The application for renewal shall be submitted using the application form or forms prescribed by IDEM, OAQ and shall include the information specified in 326 IAC 2-7-4. Such information shall be included in the application for each emission unit at this source, except those emission units included on the trivial or insignificant activities list contained in 326 IAC 2-7-1(19) and 326 IAC 2-7-1(39). The renewal application does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

Request for renewal shall be submitted to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

(b) A timely renewal application is one that is:

(1) Submitted at least nine (9) months prior to the date of the expiration of this permit; and

(2) If the date postmarked on the envelope or certified mail receipt, or affixed by the shipper on the private shipping receipt, is on or before the date it is due. If the document is submitted by any other means, it shall be considered timely if received by IDEM, OAQ on or before the date it is due.

(c) If the Permittee submits a timely and complete application for renewal of this permit, the source's failure to have a permit is not a violation of 326 IAC 2-7 until IDEM, OAQ takes final action on the renewal application, except that this protection shall cease to apply if, subsequent to the completeness determination, the Permittee fails to submit by the deadline specified, pursuant to 326 IAC 2-7-4(a)(2)(D), in writing by IDEM, OAQ any additional information identified as being needed to process the application.

B.17 Permit Amendment or Modification [326 IAC 2-7-11][326 IAC 2-7-12][40 CFR 72]

(a) Permit amendments and modifications are governed by the requirements of 326 IAC 2-7-11 or 326 IAC 2-7-12 whenever the Permittee seeks to amend or modify this permit.

(b) Pursuant to 326 IAC 2-7-11(b) and 326 IAC 2-7-12(a), administrative Part 70 operating permit amendments and permit modifications for purposes of the acid rain portion of a Part 70 permit shall be governed by regulations promulgated under Title IV of the Clean Air Act. [40 CFR 72]

(c) Any application requesting an amendment or modification of this permit shall be submitted to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

Any such application does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

(d) The Permittee may implement administrative amendment changes addressed in the request for an administrative amendment immediately upon submittal of the request. [326 IAC 2-7-11(c)(3)]

B.18 Permit Revision Under Economic Incentives and Other Programs [326 IAC 2-7-5(8)][326 IAC 2-7-12(b)(2)]

(a) No Part 70 permit revision or notice shall be required under any approved economic incentives, marketable Part 70 permits, emissions trading, and other similar programs or processes for changes that are provided for in a Part 70 permit.

(b) Notwithstanding 326 IAC 2-7-12(b)(1) and 326 IAC 2-7-12(c)(1), minor Part 70 permit modification procedures may be used for Part 70 modifications involving the use of economic incentives, marketable Part 70 permits, emissions trading, and other similar approaches to the extent that such minor Part 70 permit modification procedures are explicitly provided for in the applicable State Implementation Plan (SIP) or in applicable requirements promulgated or approved by the U.S. EPA.

B.19 Operational Flexibility [326 IAC 2-7-20][326 IAC 2-7-10.5]

(a) The Permittee may make any change or changes at the source that are described in 326 IAC 2-7-20(b) or (c) without a prior permit revision, if each of the following conditions is met:

(1) The changes are not modifications under any provision of Title I of the Clean Air Act;

(2) Any preconstruction approval required by 326 IAC 2-7-10.5 has been obtained;

(3) The changes do not result in emissions which exceed the limitations provided in this permit (whether expressed herein as a rate of emissions or in terms of total emissions);

(4) The Permittee notifies the:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

and

United States Environmental Protection Agency, Region 5
Air and Radiation Division, Regulation Development Branch - Indiana (AR-18J)
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

in advance of the change by written notification at least ten (10) days in advance of the proposed change. The Permittee shall attach every such notice to the Permittee's copy of this permit; and

(5) The Permittee maintains records on-site, on a rolling five (5) year basis, which document all such changes and emission trades that are subject to 326 IAC 2-7-20(b)(1) and (c)(1). The Permittee shall make such records available, upon reasonable request, for public review.

Such records shall consist of all information required to be submitted to IDEM, OAQ in the notices specified in 326 IAC 2-7-20(b)(1) and (c)(1).

(b) The Permittee may make Section 502(b)(10) of the Clean Air Act changes (this term is defined at 326 IAC 2-7-1(35)) without a permit revision, subject to the constraint of 326 IAC 2-7-20(a). For each such Section 502(b)(10) of the Clean Air Act change, the required written notification shall include the following:

(1) A brief description of the change within the source;

(2) The date on which the change will occur;

(3) Any change in emissions; and

(4) Any permit term or condition that is no longer applicable as a result of the change.

The notification which shall be submitted is not considered an application form, report or compliance certification. Therefore, the notification by the Permittee does not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

(c) Emission Trades [326 IAC 2-7-20(c)]
The Permittee may trade emissions increases and decreases at the source, where the applicable SIP provides for such emission trades without requiring a permit revision, subject to the constraints of Section (a) of this condition and those in 326 IAC 2-7-20(c).

(d) Alternative Operating Scenarios [326 IAC 2-7-20(d)]
The Permittee may make changes at the source within the range of alternative operating scenarios that are described in the terms and conditions of this permit in accordance with 326 IAC 2-7-5(9). No prior notification of IDEM, OAQ or U.S. EPA is required.

(e) Backup fuel switches specifically addressed in, and limited under, Section D of this permit shall not be considered alternative operating scenarios. Therefore, the notification requirements of part (a) of this condition do not apply.

(f) This condition does not apply to emission trades of SO_2 or NO_X under 326 IAC 21.

B.20 Source Modification Requirement [326 IAC 2-7-10.5]

A modification, construction, or reconstruction is governed by the requirements of 326 IAC 2.

B.21 Inspection and Entry [326 IAC 2-7-6][IC 13-14-2-2][IC 13-30-3-1][IC 13-17-3-2]

Upon presentation of proper identification cards, credentials, and other documents as may be required by law, and subject to the Permittee's right under all applicable laws and regulations to assert that the information collected by the agency is confidential and entitled to be treated as such, the Permittee shall allow IDEM, OAQ, U.S. EPA, or an authorized representative to perform the following:

(a) Enter upon the Permittee's premises where a Part 70 source is located, or emissions related activity is conducted, or where records must be kept under the conditions of this permit;

(b) As authorized by the Clean Air Act, IC 13-14-2-2, IC 13-17-3-2, and IC 13-30-3-1, have access to and copy any records that must be kept under the conditions of this permit;

(c) As authorized by the Clean Air Act, IC 13-14-2-2, IC 13-17-3-2, and IC 13-30-3-1, inspect any facilities, equipment (including monitoring and air pollution control equipment), practices, or operations regulated or required under this permit;

(d) As authorized by the Clean Air Act, IC 13-14-2-2, IC 13-17-3-2, and IC 13-30-3-1, sample or monitor substances or parameters for the purpose of assuring compliance with this permit or applicable requirements; and

(e) As authorized by the Clean Air Act, IC 13-14-2-2, IC 13-17-3-2, and IC 13-30-3-1, utilize any photographic, recording, testing, monitoring, or other equipment for the purpose of assuring compliance with this permit or applicable requirements.

B.22 Transfer of Ownership or Operational Control [326 IAC 2-7-11]

(a) The Permittee must comply with the requirements of 326 IAC 2-7-11 whenever the Permittee seeks to change the ownership or operational control of the source and no other change in the permit is necessary.

(b) Any application requesting a change in the ownership or operational control of the source shall contain a written agreement containing a specific date for transfer of permit responsibility, coverage and liability between the current and new Permittee. The application shall be submitted to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

Any such application does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

(c) The Permittee may implement administrative amendment changes addressed in the request for an administrative amendment immediately upon submittal of the request. [326 IAC 2-7-11(c)(3)]

B.23 Annual Fee Payment [326 IAC 2-7-19][326 IAC 2-7-5(7)][326 IAC 2-1.1-7]

(a) The Permittee shall pay annual fees to IDEM, OAQ within thirty (30) calendar days of receipt of a billing. Pursuant to 326 IAC 2-7-19(b), if the Permittee does not receive a bill from IDEM, OAQ the applicable fee is due April 1 of each year.

(b) Except as provided in 326 IAC 2-7-19(e), failure to pay may result in administrative enforcement action or revocation of this permit.

(c) The Permittee may call the following telephone numbers: 1-800-451-6027 or 317-233-8590 (ask for OAQ, Billing, Licensing, and Training Section), to determine the appropriate permit fee.

B.24 Credible Evidence [326 IAC 2-7-5(3)][326 IAC 2-7-6][62 FR 8314][326 IAC 1-1-6]

For the purpose of submitting compliance certifications or establishing whether or not the Permittee has violated or is in violation of any condition of this permit, nothing in this permit shall preclude the use, including the exclusive use, of any credible evidence or information relevant to whether the Permittee would have been in compliance with the condition of this permit if the appropriate performance or compliance test or procedure had been performed.

SECTION C SOURCE OPERATION CONDITIONS

Entire Source

Emission Limitations and Standards [326 IAC 2-7-5(1)]

C.1 Particulate Emission Limitations For Processes with Process Weight Rates Less Than One Hundred (100) Pounds per Hour [326 IAC 6-3-2]

Pursuant to 326 IAC 6-3-2(e)(2), particulate emissions from any process not exempt under 326 IAC 6-3-1(b) or (c) which has a maximum process weight rate less than 100 pounds per hour and the methods in 326 IAC 6-3-2(b) through (d) do not apply shall not exceed 0.551 pounds per hour.

C.2 Opacity [326 IAC 5-1]

Pursuant to 326 IAC 5-1-2 (Opacity Limitations), except as provided in 326 IAC 5-1-1 (Applicability) and 326 IAC 5-1-3 (Temporary Alternative Opacity Limitations), opacity shall meet the following, unless otherwise stated in this permit:

(a) Opacity shall not exceed an average of forty percent (40%) in any one (1) six (6) minute averaging period as determined in 326 IAC 5-1-4.

(b) Opacity shall not exceed sixty percent (60%) for more than a cumulative total of fifteen (15) minutes (sixty (60) readings as measured according to 40 CFR 60, Appendix A, Method 9 or fifteen (15) one (1) minute nonoverlapping integrated averages for a continuous opacity monitor) in a six (6) hour period.

C.3 Open Burning [326 IAC 4-1][IC 13-17-9]

The Permittee shall not open burn any material except as provided in 326 IAC 4-1-3, 326 IAC 4-1-4 or 326 IAC 4-1-6. The previous sentence notwithstanding, the Permittee may open burn in accordance with an open burning approval issued by the Commissioner under 326 IAC 4-1-4.1.

C.4 Incineration [326 IAC 4-2][326 IAC 9-1-2]

The Permittee shall not operate an incinerator except as provided in 326 IAC 4-2 or in this permit. The Permittee shall not operate a refuse incinerator or refuse burning equipment except as provided in 326 IAC 9-1-2 or in this permit.

C.5 Fugitive Dust Emissions [326 IAC 6-4]

The Permittee shall not allow fugitive dust to escape beyond the property line or boundaries of the property, right-of-way, or easement on which the source is located, in a manner that would violate 326 IAC 6-4 (Fugitive Dust Emissions). 326 IAC 6-4-2(4) is not federally enforceable.

C.6 Fugitive Particulate Matter Emission Limitations [326 IAC 6-5]

Pursuant to 326 IAC 6-5 (Fugitive Particulate Matter Emission Limitations), fugitive particulate matter emissions shall be controlled according to the attached plan as in Attachment A. The provisions of 326 IAC 6-5 are not federally enforceable.

C.7 Stack Height [326 IAC 1-7]

The Permittee shall comply with the applicable provisions of 326 IAC 1-7 (Stack Height Provisions), for all exhaust stacks through which a potential (before controls) of twenty-five (25) tons per year or more of particulate matter or sulfur dioxide is emitted. The provisions of 326 IAC 1-7-1(3), 326 IAC 1-7-2, 326 IAC 1-7-3(c) and (d), 326 IAC 1-7-4, and 326 IAC 1-7-5(a), (b), and (d) are not federally enforceable.

C.8 Asbestos Abatement Projects [326 IAC 14-10][326 IAC 18][40 CFR 61, Subpart M]

(a) Notification requirements apply to each owner or operator. If the combined amount of regulated asbestos containing material (RACM) to be stripped, removed or disturbed is at least 260 linear feet on pipes or 160 square feet on other facility components, or at least thirty-five (35) cubic feet on all facility components, then the notification requirements of 326 IAC 14-10-3 are mandatory. All demolition projects require notification whether or not asbestos is present.

(b) The Permittee shall ensure that a written notification is sent on a form provided by the Commissioner at least ten (10) working days before asbestos stripping or removal work or before demolition begins, per 326 IAC 14-10-3, and shall update such notice as necessary, including, but not limited to the following:

(1) When the amount of affected asbestos containing material increases or decreases by at least twenty percent (20%); or

(2) If there is a change in the following:

(A) Asbestos removal or demolition start date;

(B) Removal or demolition contractor; or

(C) Waste disposal site.

(c) The Permittee shall ensure that the notice is postmarked or delivered according to the guidelines set forth in 326 IAC 14-10-3(c).

(d) The notice to be submitted shall include the information enumerated in 326 IAC 14-10-3(d).

All required notifications shall be submitted to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

The notice shall include a signed certification from the owner or operator that the information provided in this notification is correct and that only Indiana licensed workers and project supervisors will be used to implement the asbestos removal project. The notifications do not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

(e) Procedures for Asbestos Emission Control
The Permittee shall comply with the applicable emission control procedures in 326 IAC 14-10-4 and 40 CFR 61.145(c). Per 326 IAC 14-10-1, emission control requirements are applicable for any removal or disturbance of RACM greater than three (3) linear feet on pipes or three (3) square feet on any other facility components or a total of at least 0.75 cubic feet on all facility components.

(f) Demolition and Renovation
The Permittee shall thoroughly inspect the affected facility or part of the facility where the demolition or renovation will occur for the presence of asbestos pursuant to 40 CFR 61.145(a).

(g) Indiana Licensed Asbestos Inspector
The Permittee shall comply with 326 IAC 14-10-1(a) that requires the owner or operator, prior to a renovation/demolition, to use an Indiana Licensed Asbestos Inspector to thoroughly inspect the affected portion of the facility for the presence of asbestos. The requirement to use an Indiana Licensed Asbestos inspector is not federally enforceable.

Testing Requirements [326 IAC 2-7-6(1)]

C.9 Performance Testing [326 IAC 3-6]

(a) For performance testing required by this permit, a test protocol, except as provided elsewhere in this permit, shall be submitted to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

no later than thirty-five (35) days prior to the intended test date. The protocol submitted by the Permittee does not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

(b) The Permittee shall notify IDEM, OAQ of the actual test date at least fourteen (14) days prior to the actual test date. The notification submitted by the Permittee does not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

(c) Pursuant to 326 IAC 3-6-4(b), all test reports must be received by IDEM, OAQ not later than forty-five (45) days after the completion of the testing. An extension may be granted by IDEM, OAQ if the Permittee submits to IDEM, OAQ a reasonable written explanation not later than five (5) days prior to the end of the initial forty-five (45) day period.

Compliance Requirements [326 IAC 2-1.1-11]

C.10 Compliance Requirements [326 IAC 2-1.1-11]

The commissioner may require stack testing, monitoring, or reporting at any time to assure compliance with all applicable requirements by issuing an order under 326 IAC 2-1.1-11. Any monitoring or testing shall be performed in accordance with 326 IAC 3 or other methods approved by the commissioner or the U. S. EPA.

Compliance Monitoring Requirements [326 IAC 2-7-5(1)][326 IAC 2-7-6(1)]

C.11 Compliance Monitoring [326 IAC 2-7-5(3)][326 IAC 2-7-6(1)][40 CFR 64][326 IAC 3-8]

(a) For new units:
Unless otherwise specified in the approval for the new emission unit(s), compliance monitoring for new emission units shall be implemented on and after the date of initial start-up.

(b) For existing units:
Unless otherwise specified in this permit, for all monitoring requirements not already legally required, the Permittee shall be allowed up to ninety (90) days from the date of

permit issuance to begin such monitoring. If, due to circumstances beyond the Permittee's control, any monitoring equipment required by this permit cannot be installed and operated no later than ninety (90) days after permit issuance, the Permittee may extend the compliance schedule related to the equipment for an additional ninety (90) days provided the Permittee notifies:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

in writing, prior to the end of the initial ninety (90) day compliance schedule, with full justification of the reasons for the inability to meet this date.

The notification which shall be submitted by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

(c) For monitoring required by CAM, at all times, the Permittee shall maintain the monitoring, including but not limited to, maintaining necessary parts for routine repairs of the monitoring equipment.

(d) For monitoring required by CAM, except for, as applicable, monitoring malfunctions, associated repairs, and required quality assurance or control activities (including, as applicable, calibration checks and required zero and span adjustments), the Permittee shall conduct all monitoring in continuous operation (or shall collect data at all required intervals) at all times that the pollutant-specific emissions unit is operating. Data recorded during monitoring malfunctions, associated repairs, and required quality assurance or control activities shall not be used for purposes of this part, including data averages and calculations, or fulfilling a minimum data availability requirement, if applicable. The owner or operator shall use all the data collected during all other periods in assessing the operation of the control device and associated control system. A monitoring malfunction is any sudden, infrequent, not reasonably preventable failure of the monitoring to provide valid data. Monitoring failures that are caused in part by poor maintenance or careless operation are not malfunctions.

C.12 Instrument Specifications [326 IAC 2-1.1-11][326 IAC 2-7-5(3)][326 IAC 2-7-6(1)]

(a) When required by any condition of this permit, an analog instrument used to measure a parameter related to the operation of an air pollution control device shall have a scale such that the expected maximum reading for the normal range shall be no less than twenty percent (20%) of full scale. The analog instrument shall be capable of measuring values outside of the normal range.

(b) The Permittee may request that the IDEM, OAQ approve the use of an instrument that does not meet the above specifications provided the Permittee can demonstrate that an alternative instrument specification will adequately ensure compliance with permit conditions requiring the measurement of the parameters.

Corrective Actions and Response Steps [326 IAC 2-7-5][326 IAC 2-7-6]

C.13 Emergency Reduction Plans [326 IAC 1-5-2][326 IAC 1-5-3]

Pursuant to 326 IAC 1-5-2 (Emergency Reduction Plans; Submission):

(a) The Permittee shall maintain the most recently submitted written emergency reduction plans (ERPs) consistent with safe operating procedures.

(b) Upon direct notification by IDEM, OAQ that a specific air pollution episode level is in effect, the Permittee shall immediately put into effect the actions stipulated in the approved ERP for the appropriate episode level. [326 IAC 1-5-3]

C.14 Risk Management Plan [326 IAC 2-7-5(11)][40 CFR 68]

If a regulated substance, as defined in 40 CFR 68, is present at a source in more than a threshold quantity, the Permittee must comply with the applicable requirements of 40 CFR 68.

C.15 Response to Excursions or Exceedances [40 CFR 64][326 IAC 3-8][326 IAC 2-7-5][326 IAC 2-7-6]

(I) Upon detecting an excursion where a response step is required by the D Section, or an exceedance of a limitation, not subject to CAM, in this permit:

(a) The Permittee shall take reasonable response steps to restore operation of the emissions unit (including any control device and associated capture system) to its normal or usual manner of operation as expeditiously as practicable in accordance with good air pollution control practices for minimizing excess emissions.

(b) The response shall include minimizing the period of any startup, shutdown or malfunction. The response may include, but is not limited to, the following:

(1) initial inspection and evaluation;

(2) recording that operations returned or are returning to normal without operator action (such as through response by a computerized distribution control system); or

(3) any necessary follow-up actions to return operation to normal or usual manner of operation.

(c) A determination of whether the Permittee has used acceptable procedures in response to an excursion or exceedance will be based on information available, which may include, but is not limited to, the following:

(1) monitoring results;

(2) review of operation and maintenance procedures and records; and/or

(3) inspection of the control device, associated capture system, and the process.

(d) Failure to take reasonable response steps shall be considered a deviation from the permit.

(e) The Permittee shall record the reasonable response steps taken.

(II)

(a) CAM *Response to excursions or exceedances.*

(1) Upon detecting an excursion or exceedance, subject to CAM, the Permittee shall restore operation of the pollutant-specific emissions unit (including the control device and associated capture system) to its normal or usual manner of operation as expeditiously as practicable in accordance with good air pollution control practices for minimizing emissions. The response shall include minimizing the period of any startup, shutdown or malfunction and taking any necessary corrective actions to restore normal operation and prevent the likely recurrence of the cause of an excursion or exceedance (other than those caused by excused startup or shutdown conditions). Such actions may include initial inspection and evaluation, recording that operations returned to normal without operator action (such as through response by a computerized distribution control system), or any necessary follow-up actions to return operation to within the indicator range, designated condition, or below the applicable emission limitation or standard, as applicable.

(2) Determination of whether the Permittee has used acceptable procedures in response to an excursion or exceedance will be based on information available, which may include but is not limited to, monitoring results, review of operation and maintenance procedures and records, and inspection of the control device, associated capture system, and the process.

(b) If the Permittee identifies a failure to achieve compliance with an emission limitation, subject to CAM, or standard, subject to CAM, for which the approved monitoring did not provide an indication of an excursion or exceedance while providing valid data, or the results of compliance or performance testing document a need to modify the existing indicator ranges or designated conditions, the Permittee shall promptly notify the IDEM, OAQ and, if necessary, submit a proposed significant permit modification to this permit to address the necessary monitoring changes. Such a modification may include, but is not limited to, reestablishing indicator ranges or designated conditions, modifying the frequency of conducting monitoring and collecting data, or the monitoring of additional parameters.

(c) Based on the results of a determination made under paragraph (II)(a)(2) of this condition, the EPA or IDEM, OAQ may require the Permittee to develop and implement a Quality Improvement Plan (QIP). The Permittee shall develop and implement a QIP if notified to in writing by the EPA or IDEM, OAQ.

(d) Elements of a QIP:
The Permittee shall maintain a written QIP, if required, and have it available for inspection. The plan shall conform to 40 CFR 64.8 b (2).

(e) If a QIP is required, the Permittee shall develop and implement a QIP as expeditiously as practicable and shall notify the IDEM, OAQ if the period for completing the improvements contained in the QIP exceeds 180 days from the date on which the need to implement the QIP was determined.

(f) Following implementation of a QIP, upon any subsequent determination pursuant to paragraph (II)(a)(2) of this condition the EPA or the IDEM, OAQ may require that the Permittee make reasonable changes to the QIP if the QIP is found to have:

(1) Failed to address the cause of the control device performance problems; or

(2) Failed to provide adequate procedures for correcting control device performance problems as expeditiously as practicable in accordance with good air pollution control practices for minimizing emissions.

(g) Implementation of a QIP shall not excuse the Permittee from compliance with any existing emission limitation or standard, or any existing monitoring, testing, reporting or recordkeeping requirement that may apply under federal, state, or local law, or any other applicable requirements under the Act.

(h) *CAM recordkeeping requirements.*

(1) The Permittee shall maintain records of monitoring data, monitor performance data, corrective actions taken, any written quality improvement plan required pursuant to paragraph (II)(c) of this condition and any activities undertaken to implement a quality improvement plan, and other supporting information required to be maintained under this condition (such as data used to document the adequacy of monitoring, or records of monitoring maintenance or corrective actions). Section C - General Record Keeping Requirements of this permit contains the Permittee's obligations with regard to the records required by this condition.

(2) Instead of paper records, the owner or operator may maintain records on alternative media, such as microfilm, computer files, magnetic tape disks, or microfiche, provided that the use of such alternative media allows for expeditious inspection and review, and does not conflict with other applicable recordkeeping requirements

C.16 Actions Related to Noncompliance Demonstrated by a Stack Test [326 IAC 2-7-5][326 IAC 2-7-6]

(a) When the results of a stack test performed in conformance with Section C - Performance Testing, of this permit exceed the level specified in any condition of this permit, the Permittee shall submit a description of its response actions to IDEM, OAQ no later than seventy-five (75) days after the date of the test.

(b) A retest to demonstrate compliance shall be performed no later than one hundred eighty (180) days after the date of the test. Should the Permittee demonstrate to IDEM, OAQ that retesting in one hundred eighty (180) days is not practicable, IDEM, OAQ may extend the retesting deadline.

(c) IDEM, OAQ reserves the authority to take any actions allowed under law in response to noncompliant stack tests.

The response action documents submitted pursuant to this condition do require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

Record Keeping and Reporting Requirements [326 IAC 2-7-5(3)][326 IAC 2-7-19]

C.17 Malfunctions Report [326 IAC 1-6-2]

Pursuant to 326 IAC 1-6-2 (Records; Notice of Malfunction):

(a) A record of all malfunctions, startups or shutdowns of any emission unit or emission control equipment, that results in violations of applicable air pollution control regulations or applicable emission limitations must be kept and retained for a period of three (3) years and be made available to the Indiana Department of Environmental Management (IDEM), Office of Air Quality (OAQ) or appointed representative upon request.

(b) When a malfunction of any emission unit or emission control equipment occurs that lasts more than one (1) hour, the condition shall be reported to OAQ, using the Malfunction Report Forms (2 pages). Notification must be made by telephone or other electronic means, as soon as practicable, but in no event later than four (4) daytime business hours after the beginning of the occurrence.

(c) Failure to report a malfunction of any emission unit or emission control equipment shall constitute a violation of 326 IAC 1-6, and any other applicable rules. Information on the scope and expected duration of the malfunction must be provided, including the items specified in 326 IAC 1-6-2(c)(3)(A) through (E).

(d) Malfunction is defined as any sudden, unavoidable failure of any air pollution control equipment, process, or combustion or process equipment to operate in a normal and usual manner. [326 IAC 1-2-39]

C.18 Emission Statement [326 IAC 2-7-5(3)(C)(iii)][326 IAC 2-7-5(7)][326 IAC 2-7-19(c)][326 IAC 2-6]

Pursuant to 326 IAC 2-6-3(a)(1), the Permittee shall submit by July 1 of each year an emission statement covering the previous calendar year. The emission statement shall contain, at a minimum, the information specified in 326 IAC 2-6-4(c) and shall meet the following requirements:

(1) Indicate estimated actual emissions of all pollutants listed in 326 IAC 2-6-4(a);

(2) Indicate estimated actual emissions of regulated pollutants as defined by 326 IAC 2-7-1(31) (“Regulated pollutant, which is used only for purposes of Section 19 of this rule”) from the source, for purpose of fee assessment.

The statement must be submitted to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

The emission statement does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

C.19 General Record Keeping Requirements [326 IAC 2-7-5(3)][326 IAC 2-7-6][326 IAC 2-2][326 IAC 2-3]

(a) Records of all required monitoring data, reports and support information required by this permit shall be retained for a period of at least five (5) years from the date of monitoring sample, measurement, report, or application. Support information includes the following, where applicable:
  (AA) All calibration and maintenance records.
  (BB) All original strip chart recordings for continuous monitoring instrumentation.
  (CC) Copies of all reports required by the Part 70 permit.

Records of required monitoring information include the following, where applicable:
  (AA) The date, place, as defined in this permit, and time of sampling or measurements.
  (BB) The dates analyses were performed.
  (CC) The company or entity that performed the analyses.
  (DD) The analytical techniques or methods used.
  (EE) The results of such analyses.

(FF) The operating conditions as existing at the time of sampling or measurement.

These records shall be physically present or electronically accessible at the source location for a minimum of three (3) years. The records may be stored elsewhere for the remaining two (2) years as long as they are available upon request. If the Commissioner makes a request for records to the Permittee, the Permittee shall furnish the records to the Commissioner within a reasonable time.

(b) Unless otherwise specified in this permit, for all record keeping requirements not already legally required, the Permittee shall be allowed up to ninety (90) days from the date of permit issuance or the date of initial start-up, whichever is later, to begin such record keeping.

(c) If there is a reasonable possibility (as defined in 326 IAC 2-2-8 (b)(6)(A), 326 IAC 2-2-8 (b)(6)(B), 326 IAC 2-3-2 (l)(6)(A), and/or 326 IAC 2-3-2 (l)(6)(B)) that a "project" (as defined in 326 IAC 2-2-1(oo) and/or 326 IAC 2-3-1(jj)) at an existing emissions unit, other than projects at a source with a Plantwide Applicability Limitation (PAL), which is not part of a "major modification" (as defined in 326 IAC 2-2-1(dd) and/or 326 IAC 2-3-1(y)) may result in significant emissions increase and the Permittee elects to utilize the "projected actual emissions" (as defined in 326 IAC 2-2-1(pp) and/or 326 IAC 2-3-1(kk)), the Permittee shall comply with following:

(1) Before beginning actual construction of the "project" (as defined in 326 IAC 2-2-1(oo) and/or 326 IAC 2-3-1(jj)) at an existing emissions unit, document and maintain the following records:

(A) A description of the project.

(B) Identification of any emissions unit whose emissions of a regulated new source review pollutant could be affected by the project.

(C) A description of the applicability test used to determine that the project is not a major modification for any regulated NSR pollutant, including:

(i) Baseline actual emissions;

(ii) Projected actual emissions;

(iii) Amount of emissions excluded under section 326 IAC 2-2-1(pp)(2)(A)(iii) and/or 326 IAC 2-3-1 (kk)(2)(A)(iii); and

(iv) An explanation for why the amount was excluded, and any netting calculations, if applicable.

(d) If there is a reasonable possibility (as defined in 326 IAC 2-2-8 (b)(6)(A) and/or 326 IAC 2-3-2 (l)(6)(A)) that a "project" (as defined in 326 IAC 2-2-1(oo) and/or 326 IAC 2-3-1(jj)) at an existing emissions unit, other than projects at a source with a Plantwide Applicability Limitation (PAL), which is not part of a "major modification" (as defined in 326 IAC 2-2-1(dd) and/or 326 IAC 2-3-1(y)) may result in significant emissions increase and the Permittee elects to utilize the "projected actual emissions" (as defined in 326 IAC 2-2-1(pp) and/or 326 IAC 2-3-1(kk)), the Permittee shall comply with following:

(1) Monitor the emissions of any regulated NSR pollutant that could increase as a result of the project and that is emitted by any existing emissions unit identified in (1)(B) above; and

(2) Calculate and maintain a record of the annual emissions, in tons per year on a calendar year basis, for a period of five (5) years following resumption of regular operations after the change, or for a period of ten (10) years following resumption of regular operations after the change if the project increases the design capacity of or the potential to emit that regulated NSR pollutant at the emissions unit.

C.20 General Reporting Requirements [326 IAC 2-7-5(3)(C)][326 IAC 2-1.1-11][326 IAC 2-2][326 IAC 2-3][40 CFR 64][326 IAC 3-8]

(a) The Permittee shall submit the attached Quarterly Deviation and Compliance Monitoring Report or its equivalent. Proper notice submittal under Section C - Malfunctions Report satisfies the reporting requirements of this paragraph. Any deviation from permit requirements, the date(s) of each deviation, the cause of the deviation, and the response steps taken must be reported except that a deviation required to be reported pursuant to an applicable requirement that exists independent of this permit, shall be reported according to the schedule stated in the applicable requirement and does not need to be included in this report. This report shall be submitted not later than thirty (30) days after the end of the reporting period. The Quarterly Deviation and Compliance Monitoring Report shall include a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33). A deviation is an exceedance of a permit limitation or a failure to comply with a requirement of the permit.

On and after the date by which the Permittee must use monitoring that meets the requirements of 40 CFR Part 64 and 326 IAC 3-8, the Permittee shall submit CAM reports to the IDEM, OAQ.

A report for monitoring under 40 CFR Part 64 and 326 IAC 3-8 shall include, at a minimum, the information required under paragraph (a) of this condition and the following information, as applicable:

(1) Summary information on the number, duration and cause (including unknown cause, if applicable) of excursions or exceedances, as applicable, and the corrective actions taken;

(2) Summary information on the number, duration and cause (including unknown cause, if applicable) for monitor downtime incidents (other than downtime associated with zero and span or other daily calibration checks, if applicable); and

(3) A description of the actions taken to implement a QIP during the reporting period as specified in Section C-Response to Excursions or Exceedances. Upon completion of a QIP, the owner or operator shall include in the next summary report documentation that the implementation of the plan has been completed and reduced the likelihood of similar levels of excursions or exceedances occurring.

The Permittee may combine the Quarterly Deviation and Compliance Monitoring Report and a report pursuant to 40 CFR 64 and 326 IAC 3-8.

(b) The address for report submittal is:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

(c) Unless otherwise specified in this permit, any notice, report, or other submission required by this permit shall be considered timely if the date postmarked on the envelope or certified mail receipt, or affixed by the shipper on the private shipping receipt, is on or before the date it is due. If the document is submitted by any other means, it shall be considered timely if received by IDEM, OAQ on or before the date it is due.

(d) Reporting periods are based on calendar years, unless otherwise specified in this permit. For the purpose of this permit "calendar year" means the twelve (12) month period from January 1 to December 31 inclusive.

(e) If the Permittee is required to comply with the recordkeeping provisions of (d) in Section C - General Record Keeping Requirements for any "project" (as defined in 326 IAC 2-2-1 (oo) and/or 326 IAC 2-3-1 (jj)) at an existing emissions unit, and the project meets the following criteria, then the Permittee shall submit a report to IDEM, OAQ:

(1) The annual emissions, in tons per year, from the project identified in (c)(1) in Section C- General Record Keeping Requirements exceed the baseline actual emissions, as documented and maintained under Section C- General Record Keeping Requirements (c)(1)(C)(i), by a significant amount, as defined in 326 IAC 2-2-1 (ww) and/or 326 IAC 2-3-1 (pp), for that regulated NSR pollutant, and

(2) The emissions differ from the preconstruction projection as documented and maintained under Section C - General Record Keeping Requirements (c)(1)(C)(ii).

(f) The report for project at an existing emissions unit shall be submitted no later than sixty (60) days after the end of the year and contain the following:

(1) The name, address, and telephone number of the major stationary source.

(2) The annual emissions calculated in accordance with (d)(1) and (2) in Section C - General Record Keeping Requirements.

(3) The emissions calculated under the actual-to-projected actual test stated in 326 IAC 2-2-2(d)(3) and/or 326 IAC 2-3-2(c)(3).

(4) Any other information that the Permittee wishes to include in this report such as an explanation as to why the emissions differ from the preconstruction projection.

Reports required in this part shall be submitted to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

(g) The Permittee shall make the information required to be documented and maintained in accordance with (c) in Section C- General Record Keeping Requirements available for review upon a request for inspection by IDEM, OAQ. The general public may request this information from the IDEM, OAQ under 326 IAC 17.1.

Stratospheric Ozone Protection

C.21 Compliance with 40 CFR 82 and 326 IAC 22-1

Pursuant to 40 CFR 82 (Protection of Stratospheric Ozone), Subpart F, except as provided for motor vehicle air conditioners in Subpart B, the Permittee shall comply with applicable standards for recycling and emissions reduction.

SECTION D.1 EMISSIONS UNIT OPERATION CONDITIONS

Emissions Unit Description:

(a) One (1) coal/natural gas fired boiler, identified as Unit No. 2, constructed in 1963, with a maximum fuel heat input rating of 1031 MMBtu per hour (HHV basis), using an electrostatic precipitator for particulate matter (PM) emissions control, and a low NOx burner for NOx control, and exhausting to Stack No. 3. Unit No. 2 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and an exhaust stack with Unit No. 3.

Unit No. 2 has continuous emissions monitoring systems (CEMs) for Sulfur Dioxide (SO_2), Nitrogen Oxides (NOx), Particulate Matter (PM), Carbon Dioxide (CO_2), and a sorbent trap monitor for Mercury (Hg), which are shared with Unit No. 3.

[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

Emission Limitations and Standards [326 IAC 2-7-5(1)]

D.1.1 Consent Decree [IP99-1692 C-M/F]

Pursuant to Consent Decree Civil Action No. IP99-1692 C-M/F, effective June 6, 2003, the FGD scrubber serving Unit No. 2 shall achieve and maintain a 30-Day Rolling Average SO_2 Removal Efficiency of at least ninety-five percent (95%).

D.1.2 Particulate Emission Limitations for Sources of Indirect Heating [326 IAC 6-2-3]

Pursuant to 326 IAC 6-2-3(b), (Particulate Emission Limitations for Sources of Indirect Heating), the particulate matter (PM) emissions from Unit No. 2 shall not exceed the 0.38 pounds per million Btu heat input.

D.1.3 Warrick County Sulfur Dioxide (SO_2) Emission Limitations [326 IAC 7-4-10]

(a) Pursuant to 326 IAC 7-4-10, the Sulfur Dioxide (SO_2) emissions from Unit No. 2 shall not exceed 2.79 pounds per MMBtu as specified in 326 IAC 7-4-10(a)(1). Unit No. 2 has an alternative SO_2 limit; the SO_2 emissions shall not exceed 4.40 pounds per MMBtu, as specified in 326 IAC 7-4-10(a)(1)(B). SO_2 emissions shall be calculated on a 30-day rolling weighted average basis.

(b) Pursuant to 326 IAC 7-4-10(a)(1)(C), SIGECO shall notify IDEM, OAQ and the U.S. EPA via certified mail at least fourteen (14) days prior to its intention to rely on the alternative SO_2 limit (4.4 pounds per MMBtu), or to switch between the primary limit (2.79 pounds per MMBtu) and the alternative SO_2 limit (4.4 pounds per MMBtu).

D.1.4 Preventive Maintenance Plan [326 IAC 2-7-5(12)]

A Preventive Maintenance Plan is required for these facilities and any control devices. Section B - Preventive Maintenance Plan contains the Permittee's obligation with regard to the preventive maintenance plan required by this condition.

Compliance Determination Requirements [326 IAC 2-7-5(1)]

D.1.5 Particulate Control [326 IAC 2-7-6(1)]

(a) In order to assure compliance with Condition D.1.2, the Permittee shall operate the electrostatic precipitator (ESP) at all times Unit No. 2 is combusting coal (except as otherwise specified in this permit or when firing only natural gas).

(b) Pursuant to Consent Decree Civil Action No. IP99-1692 C-M/F, effective June 6, 2003, the Permittee shall operate the electrostatic precipitators (ESP) at all times Unit No. 2 is combusting coal to maximize PM emission reductions, consistent with the operational and maintenance limitations of the unit.

D.1.6 Sulfur Dioxide Control [326 IAC 2-7-6(1)][326 IAC 2-7-5(1)][326 IAC 7-4-10]

(a) Pursuant to Consent Decree Civil Action No. IP99-1692 C-M/F, effective June 6, 2003, and in order to maintain compliance with all applicable SO_2 limits and the Conditions D.1.1 and D.1.3, the Permittee shall operate the FGD scrubber at all times that Unit No. 2 is in operation (except as otherwise specified in this permit or when firing only natural gas).

(b) Pursuant to Consent Decree Civil Action No. IP99-1692 C-M/F, effective June 6, 2003, the Permittee shall continuously operate the FGD serving Units No. 2 and 3 at all times that the Unit No. 2 is in operation, except in the event of a planned FGD outage. Following startup of natural gas, the Permittee does not need to operate the FGD until the unit is fired with coal.

(c) Pursuant to Consent Decree Civil Action No. IP99-1692 C-M/F, effective June 6, 2003, in the event of a planned FGD outage, SIGECO may continue to operate Unit No. 2 but shall burn down the coal existing in the Unit No. 2 bunker to the extent practicable, and, prior to shutting down the FGD, load Compliance Coal into the bunker for use until such time as the FGD resumes operation. In the event of an unplanned FGD outage, SIGECO shall feed Compliance Coal to the Unit No. 2 bunker until such time as the FGD resumes operation. Compliance Coal is defined as 2.0 lb/MMBtu SO_2 as demonstrated by a 4-hour composite sample of the feed stock.

D.1.7 Continuous Emission Monitoring [326 IAC 3-5][326 IAC 2-7-6(1),(6)][40 CFR 63]

(a) Pursuant to 326 IAC 3-5 (Continuous Monitoring of Emissions), continuous emission monitoring systems (CEMS) for Unit No. 2, which are shared with Unit No. 3, shall be calibrated, maintained, and operated for measuring SO_2, PM, NO_X, and CO_2, and shall meet all applicable performance specifications of 326 IAC 3-5-2. The data from the respective CEMS shall be used to determine compliance with Conditions D.1.1, D.1.2, and D.1.3.

(b) The CEMS must operate and record data during all periods of operation of the affected facilities including periods of startup, shutdown, malfunction or emergency conditions, except for CEMS breakdowns, repairs, calibration checks, and zero and span adjustments.

(c) All continuous emissions monitoring systems are subject to monitor system certification requirements pursuant to 326 IAC 3-5-3.

(d) Nothing in this permit shall excuse the Permittee from complying with the requirements to operate a continuous emission monitoring system pursuant to 326 IAC 3-5 and 40 CFR 63.

D.1.8 Sulfur Dioxide Emissions [326 IAC 3][326 IAC 7-2][326 IAC 7-1.1-2][326 IAC 7-4-10]

(a) Pursuant to 326 IAC 7-2-1(a), the Permittee shall demonstrate that the Sulfur Dioxide emissions do not exceed the applicable limits in Condition D.1.3. Compliance with these limits shall be determined using SO_2 CEMS data and demonstrated using a thirty (30) day rolling weighted average.

(b) In order to demonstrate compliance with Condition D.1.1, the Permittee shall demonstrate that the FGD scrubber operates with the minimum Sulfur Dioxide (SO_2) removal efficiency according to the following:

(1) Pursuant to Consent Decree Civil Action No. IP99-1692 C-M/F, effective June 6, 2003, the inlet SO_2 emission rate shall be determined in accordance with 40 CFR 75.15, using CEMS data from the inlet to the scrubber.

(2) The continuous emission monitoring (CEM) data (Condition D.1.7) shall be used to determine the SO_2 emissions following the scrubber.

(3) A comparison of the data from (1) and (2) above shall be used to determine the efficiency of the FGD scrubber.

Compliance Monitoring Requirements [326 IAC 2-7-5(1)][326 IAC 2-7-6(1)]

D.1.9 SO_2 Continuous Emissions Monitoring System (CEMS) Equipment Downtime

(a) In the event that a breakdown of a SO2 continuous emissions monitoring system (CEMS) occurs, a record shall be made of the time and reason of the breakdown and efforts made to correct the problem.

(b) Whenever the SO_2 continuous emission monitoring (CEMS) system is malfunctioning or down for maintenance or repairs and a backup CEM is not brought on-line, the following shall be used to provide information related to SO_2 emissions:

(1) If the CEM system is down for less than twenty-four (24) hours and a backup CEM is not brought on-line, the Permittee shall substitute an average of the quality-assured data from the hour immediately before and the hour immediately after the missing data period for each hour of missing data.

(2) Whenever the SO2 continuous emission monitoring system (CEMS) is malfunctioning or down for repairs or adjustments for twenty-four (24) hours or more, and a backup CEMs cannot be brought on-line, the Permittee shall comply with the requirements of 40 CFR 75, Subpart D to demonstrate compliance with Condition D.1.3 until the primary CEMS or a backup CEMS is brought online.

D.1.10 PM Continuous Emissions Monitoring System (CEMS) Equipment Downtime

(a) In the event that a breakdown of a PM continuous emissions monitoring system (CEMS) occurs, a record shall be made of the time and reason of the breakdown and efforts made to correct the problem.

(b) Whenever a PM continuous emissions monitoring system (CEMS) is malfunctioning or is down for maintenance or repairs for a period of twenty-four (24) hours or more and a backup PM CEMS is not online within twenty-four (24) hours of shutdown or malfunction of the primary PM CEMS, the Permittee shall comply with the following:

(1) The primary and secondary currents of the transformer-rectifier (T-R) sets;

(2) The primary and secondary voltages of the T-R sets; and

(3) The daily number of T-R sets in service.

(c) Parametric monitoring shall begin not more than twenty-four (24) hours after the start of the malfunction or down time at least twice per day during normal operations, with at least four (4) hours between each set of readings, until a PM CEMS is online.

Record Keeping and Reporting Requirements [326 IAC 2-7-5(3)][326 IAC 2-7-19][326 IAC 3-5]

D.1.11 Record Keeping Requirements

(a) In order to document the compliance status with Conditions D.1.1, D.1.2, D.1.3, and D.1.7, the Permittee shall record the output of the continuous monitoring system(s) and shall perform the required record keeping pursuant to 326 IAC 3-5-6 and 326 IAC 3-5-7.

(b) In the event that a breakdown of the SO2 or PM continuous emission monitoring systems (CEMS) occurs, the Permittee shall maintain records of all CEMS malfunctions, out of control periods, calibration and adjustment activities, and repair or maintenance activities.

(c) The Permittee shall maintain records of the information in Condition D.1.9(b) during SO2 CEMS system downtime, including the following:

(1) Boiler load, absorber recirculation slurry stream, slurry feed rate and number of re-circulation pumps in service during SO_2 CEMS downtime.

(2) Actual fuel usage during each SO_2 CEMS downtime.

(d) The Permittee shall maintain records of the information in Condition D.1.10(b) during PM CEMS system downtime.

(e) Section C - General Record Keeping Requirements contains the Permittee's obligations with regard to the records required by this condition.

D.1.12 Reporting Requirements

(a) A quarterly summary of the thirty (30) day rolling weighted average PM emissions rate in pound per million Btu to document the compliance status with Condition D.1.2, as well as a quarterly summary of the information to document compliance with Condition D.1.3 shall be submitted not later than thirty (30) days after the end of the quarter being reported. Section C - General Reporting contains the Permittee's obligation with regard to the reporting required by this condition. The report submitted by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official," as defined by 326 IAC 2-7-1(33).

(b) Pursuant to 326 IAC 3-5-5(f)(1), the Permittee shall prepare and submit to IDEM, OAQ a written report for performance audits as follows:

(1) Owners or operators of emissions units required to conduct a:

(A) cylinder gas audit;
(B) relative accuracy test audit; or
(C) continuous opacity monitor calibration error audit;

on continuous emission monitors shall prepare a written report of the results of the performance audit for each calendar quarter, or for other periods required by the department. The owner or operator shall submit quarterly reports to the department within thirty (30) calendar days after the end of each quarter for cylinder gas audits and continuous opacity monitor calibration error audits and within forty-five (45) calendar days after the completion of the test for relative accuracy test audits.

(2) The report must contain the information required by 326 IAC 3-5-5(f)(2).

The report submitted by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a “responsible official,” as defined by 326 IAC 2-7-1 (35).

(c) Pursuant to 326 IAC 3-5-7(c)(4), reporting of continuous monitoring system instrument downtime, (except for zero (0) and span checks, which shall be reported separately), shall include the following:

(1) Date of downtime.

(2) Time of commencement.

(3) Duration of each downtime.

(4) Reasons for each downtime.

(5) Nature of system repairs and adjustments.

The report submitted by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a “responsible official,” as defined by 326 IAC 2-7-1 (35).

SECTION D.2 EMISSIONS UNIT OPERATION CONDITIONS

Emissions Unit Description:

(b) One (1) coal/natural gas fired boiler, identified as Unit No. 3, constructed in 1970, with a maximum fuel heat input rating of 2,724 MMBtu per hour (HHV basis), using a fabric filter for particulate matter (PM) emissions control, and low NOx burner and selective catalytic reduction (SCR) for NOx reduction, with a sorbent injection system for control of sulfur trioxide (SO3) and resulting sulfuric acid (H2SO4) emissions, and exhausting to Stack No. 3. Unit No. 3 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and an exhaust stack with Unit No. 2.

Unit No. 3 has continuous emissions monitoring systems (CEMS) for SO2, NOx, PM, CO2, and a sorbent trap monitor for mercury (Hg), which are shared with Unit No. 2. Unit 3 is equipped with a spray dryer evaporator (SDE), commissioned in 2023, which eliminates FGD wastewater discharges.

[Under 40 CFR 60, Subpart Da, this is an affected source.]
[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

Emission Limitations and Standards [326 IAC 2-7-5(1)]

D.2.1 Consent Decree [Civil Action No. IP99-1692 C-M/F][326 IAC 10-6-1]

Pursuant to Consent Decree: Civil Action No. IP99-1692 C-M/F and 326 IAC 10-6-1, effective June 6, 2003 and Joint Stipulation to Modify Consent Decree, effective December 16, 2015:

(a) SIGECO shall continuously operate the SCR to achieve and maintain a 30-day rolling average emission rate for NOx of not greater than 0.100 lb/MMBtu.

(b) The FGD serving Unit No. 3 shall achieve and maintain a 30-day rolling average SO_2 removal efficiency of at least ninety-five percent (95%).

(c) By no later than June 30, 2007, SIGECO shall install and operate a fabric filter at Unit No. 3 that achieves and maintains a PM emission rate of less than or equal to 0.015 lb/MMBtu, on a 3-hour rolling average basis.

(d) SIGECO shall install and continuously operate on a permanent basis a sorbent injection system at F.B. Culley Unit No. 3 to mitigate sulfur trioxide (SO_3) and resulting sulfuric acid (H_2SO_4) emissions from the unit to achieve and maintain an emission limit of 0.009 lb/MMBtu.

D.2.2 Particulate Emission Limitations for Southern Indiana Gas and Electric Company [326 IAC 6-7-1]

Pursuant to 326 IAC 6-7-1, PM emissions from Unit No.3 shall not exceed 0.015 pounds per MMBtu.

D.2.3 Warrick County Sulfur Dioxide (SO2) Emission Limitations [326 IAC 7-4-10]

Pursuant to 326 IAC 7-4-10, the sulfur dioxide (SO_2) emissions from Unit No. 3 shall not exceed 5.41 pounds per MMBtu as specified in 326 IAC 7-4-10(a)(1).

D.2.4 Preventive Maintenance Plan [326 IAC 2-7-5(12)]

A Preventive Maintenance Plan is required for these facilities and any control devices. Section B

- Preventive Maintenance Plan contains the Permittee's obligation with regard to the preventive maintenance plan required by this condition.

Compliance Determination Requirements [326 IAC 2-7-5(1)]

D.2.5 SO_2 Control [326 IAC 2-7-6(1)][326 IAC 2-7-5(1)][326 IAC 7-4-10]

(a) In order to assure compliance with Condition D.2.3, the Permittee shall continuously operate the FGD scrubber at all times Unit No. 3 is in operation (except as otherwise specified in this permit or when firing only natural gas).

(b) Pursuant to Consent Decree Civil Action No. IP99-1692 C-M/F, effective June 6, 2003, the Permittee shall continuously operate the FGD at all times that the Unit No. 3 is in operation, except in the event of a planned FGD outage. Following startup of natural gas, the Permittee does not need to operate the FGD until the unit is fired with coal.

D.2.6 Particulate Control [326 IAC 2-7-6(6)][326 IAC 6-7-1]

In order to assure compliance with Condition D.2.2, the Permittee shall operate the fabric filter at all times (except as otherwise specified in this permit) Unit No. 3 is in operation.

D.2.7 Nitrogen Oxide Control [326 IAC 10-6-1]

(a) The SCR for NOx control shall be in operation at all times (except as otherwise specified in this permit) when Unit No. 3 is in operation.

(b) Pursuant to Consent Decree Civil Action No. IP99-1692 C-M/F, effective June 6, 2003, the Permittee shall operate the SCR on Unit No. 3 at all times that the facility is in operation, consistent with the technological limitations, manufacturers' specifications, and good operating practices for the SCR.

(c) In order to determine compliance with Condition D.2.1(a), the NOx emissions from Unit No. 3 shall be determined using the following equation:

$$N = \frac{\sum_{i=1}^{30}\sum_{j=1}^{n} x_{j,i}}{\sum_{i=1}^{30} n_i}$$

Where:
N = 30-day rolling average NOx emissions, lb/MMBtu
i = Each operating day
j = Each hour on an operating day during which the unit combusted fuel
n = Number of operating hours in an operating day
$x_{j,j}$ = Hourly NOx emissions, lb/MMBtu

D.2.8 Continuous Emission Monitoring [326 IAC 3-5][326 IAC 2-7-6(1),(6)][40 CFR 63]

(a) Pursuant to 326 IAC 3-5 (Continuous Monitoring of Emissions) continuous emission monitoring systems for Unit No. 3, which are shared with Unit No. 2, shall be calibrated, maintained, and operated for measuring SO_2, PM, NO_X, and CO_2, and shall meet all applicable performance specifications of 326 IAC 3-5-2. The data from the respective CEMS shall be used to determine compliance with Conditions D.2.1, D.2.2, and D.2.3.

(b) The CEMS must operate and record data during all periods of operation of the affected facilities including periods of startup, shutdown, malfunction or emergency conditions, except for CEMS breakdowns, repairs, calibration checks, and zero and span adjustments.

(c) All continuous emissions monitoring systems are subject to monitor system certification

requirements pursuant to 326 IAC 3-5-3.

(d) Nothing in this permit shall excuse the Permittee from complying with the requirements to operate a CEMS pursuant to 326 IAC 3-5 and 40 CFR 63.

D.2.9 Sulfur Dioxide Emissions [326 IAC 3][326 IAC 7-2][326 IAC 7-1.1-2]

(a) Pursuant to 326 IAC 7-2-1(a), the Permittee shall demonstrate that the sulfur dioxide emissions do not exceed the applicable limits in Condition D.2.3. Compliance with these limits shall be determined using SO_2 CEMS data and demonstrated using a thirty (30) day rolling weighted average.

(b) In order to demonstrate compliance with Condition D.2.1, the Permittee shall demonstrate that the FGD scrubber operates with the minimum sulfur dioxide (SO_2) removal efficiency required by Condition D.2.1.

(1) Pursuant to Consent Decree Civil Action No. IP99-1692 C-M/F, effective June 6, 2003, the inlet SO_2 emission rate shall be determined in accordance with 40 CFR 75.15, using CEMS data from the inlet to the scrubber.

(2) The continuous emission monitoring (CEM) data (Condition D.2.8) shall be used to determine the SO_2 emissions following the scrubber.

(3) A comparison of the data from (1) and (2) above shall be used to determine the efficiency of the FGD scrubber.

D.2.10 Testing Requirements [326 IAC 2-1.1-11]

Pursuant to Consent Decree: Civil Action No. IP99-1692 C-M/F, effective June 6, 2003, and Joint Stipulation to Modify Consent Decree, effective December 16, 2015, within six (6) months of this modified consent decree, the Permittee shall perform H_2SO_4 testing of the Unit No. 3 Stack utilizing methods approved by the commissioner annually from the date of the most recent valid compliance demonstration. Testing shall be conducted in accordance with the provisions of 326 IAC 3-6 (Source Sampling Procedures). Section C - Performance Testing contains the Permittee's obligation with regard to the performance testing required by this condition.

Compliance Monitoring Requirements [326 IAC 2-7-5(1)][326 IAC 2-7-6(1)]

D.2.11 SO2 Continuous Emissions Monitoring System (CEMS) Equipment Downtime

(a) In the event that a breakdown of a SO2 continuous emissions monitoring system (CEMS) occurs, a record shall be made of the time and reason of the breakdown and efforts made to correct the problem.

(b) Whenever the SO_2 continuous emission monitoring (CEMS) system is malfunctioning or down for maintenance or repairs and a backup CEM is not brought on-line, the following shall be used to provide information related to SO_2 emissions:

(1) If the CEM system is down for less than twenty-four (24) hours and a backup CEM is not brought on-line, the Permittee shall substitute an average of the quality-assured data from the hour immediately before and the hour immediately after the missing data period for each hour of missing data.

(2) Whenever the SO2 continuous emission monitoring system (CEMS) is malfunctioning or down for maintenance or repairs for twenty-four (24) hours or more, and a backup CEMs cannot be brought on-line, the Permittee shall comply with the requirements of 40 CFR 75, Subpart D to demonstrate compliance with Condition D.2.3 until the primary CEMS or a backup CEMS is brought online.

D.2.12 NOx Continuous Emissions Monitoring (CEMS) Equipment Downtime

(a) In the event that a breakdown of a NOx continuous emissions monitoring system (CEMS) occurs, a record shall be made of the time and reason of the breakdown and efforts made to correct the problem.

(b) Whenever a NO_x CEMS is down for more than twenty-four (24) hours, the Permittee shall monitor the catalyst bed inlet temperature with a continuous temperature monitoring system no less often than once per four (4) hours. When for any one reading, the catalyst bed inlet temperature is below the minimum temperature, the Permittee shall take a reasonable response. The minimum temperature for this catalyst bed inlet is 380 °F, unless a new minimum temperature is determined during the most recent valid compliant stack test.

Section C - Response to Excursions or Exceedances contains the Permittee's obligation with regard to the reasonable response steps required by this condition. A temperature reading that is below the minimum temperature is not a deviation from this permit. Failure to take response steps shall be considered a deviation from this permit.

D.2.13 PM Continuous Emissions Monitoring (CEMS) Equipment Downtime

(a) In the event that a breakdown of a PM continuous emissions monitoring system (CEMS) occurs, a record shall be made of the time and reason of the breakdown and efforts made to correct the problem.

(b) Whenever a PM continuous emissions monitoring system (CEMS) is malfunctioning or is down for maintenance or repairs for a period of twenty-four (24) hours or more and a backup PM CEMS is not online within twenty-four (24) hours of shutdown or malfunction of the primary PM CEMS, the Permittee shall comply with the following:

(1) The Fabric Filter shall be monitored once per day, when the unit is in operation, by monitoring and recording the number of Fabric Filter compartments in service.

(A) The number of Fabric Filter compartments in service shall be maintained at a level consistent with the net air-to-cloth ratio operating condition of two compartments out of service or greater.

(B) Failure to maintain the number of operating compartments in service at a level equal to or greater with the net-net air-to-cloth ratio operating condition will not be considered a deviation from this permit; rather, failure to take response steps to remedy the situation shall be considered a deviation from this permit.

(2) The Permittee shall record the pressure drop across the Fabric Filter at least once per day when Unit No. 3 is in operation. When, for any one reading, the pressure drop across a fabric filter is outside the normal range, the Permittee shall take a reasonable response. The normal range for this unit is a pressure drop between 6.0 and 8.0 inches of water unless a different upper-bound or lower-bound value for this range is determined during the latest stack test.

Record Keeping and Reporting Requirements [326 IAC 2-7-5(3)][326 IAC 2-7-19][326 IAC 3-5]

D.2.14 Record Keeping Requirements

(a) In order to document the compliance status with Conditions D.2.1, 2.2, 2.3, and D.2.8, the Permittee shall record the output of the continuous monitoring system(s) and shall

perform the required record keeping pursuant to 326 IAC 3-5-6 and 326 IAC 3-5-7.

(b) In the event that a breakdown of the SO2, NOx, or PM continuous emission monitoring systems (CEMS) occurs, the Permittee shall maintain records of all CEMS malfunctions, out of control periods, calibration and adjustment activities, and repair or maintenance activities.

(c) The Permittee shall maintain records of the information in Condition D.2.11(b) during SO2 CEMS system downtime, including the following:

(1) Boiler load, absorber recirculation slurry stream, slurry feed rate and number of re-circulation pumps in service during SO_2 CEMS downtime.

(2) Actual fuel usage during each SO_2 CEMS downtime.

(d) The Permittee shall maintain records of the information in Condition D.2.12(b) during NOx CEMS system downtime.

(e) The Permittee shall maintain records of the information in Condition D.2.13(b) during PM CEMS system downtime, including the following:

(1) The number of Fabric Filter compartments in service shall be maintained at a level consistent with the net air-to-cloth ratio operating condition of two compartments out of service or greater;

(2) The pressure drop across the Fabric Filter at least once per day when Unit No. 3 is in operation. When, for any one reading, the pressure drop across a fabric filter is outside the normal range, the Permittee shall take a reasonable response. The normal range for this unit is a pressure drop between 6.0 and 8.0 inches of water unless a different upper-bound or lower-bound value for this range is determined during the latest stack test.

(f) Section C - General Record Keeping Requirements contains the Permittee's obligations with regard to the records required by this condition.

D.2.15 Reporting Requirements

(a) A quarterly summary of the information to document the compliance status with Conditions D.2.2 and D.2.3 shall be submitted not later than thirty (30) days after the end of the quarter being reported. Section C - General Reporting contains the Permittee's obligation with regard to the reporting required by this condition. The report submitted by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official," as defined by 326 IAC 2-7-1(33).

(b) Pursuant to 326 IAC 3-5-5(f)(1), the Permittee shall prepare and submit to IDEM, OAQ a written report for performance audits as follows:

(1) Owners or operators of emissions units required to conduct a:

(A) Cylinder gas audit;
(B) Relative accuracy test audit; or
(C) Continuous opacity monitor calibration error audit;

on continuous emission monitors shall prepare a written report of the results of the performance audit for each calendar quarter, or for other periods required by the department. The owner or operator shall submit quarterly reports to the

department within thirty (30) calendar days after the end of each quarter for cylinder gas audits and continuous opacity monitor calibration error audits and within forty-five (45) calendar days after the completion of the test for relative accuracy test audits.

(2) The report must contain the information required by 326 IAC 3-5-5(f)(2).

The report submitted by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a “responsible official,” as defined by 326 IAC 2-7-1 (35).

(c) Pursuant to 326 IAC 3-5-7(c)(4), reporting of continuous monitoring system instrument downtime, (except for zero (0) and span checks, which shall be reported separately), shall include the following:

(1) Date of downtime.

(2) Time of commencement.

(3) Duration of each downtime.

(4) Reasons for each downtime.

(5) Nature of system repairs and adjustments.

The report submitted by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a “responsible official,” as defined by 326 IAC 2-7-1 (35).

SECTION D.3 EMISSIONS UNIT OPERATION CONDITIONS

Emissions Unit Description:

(c) Coal storage and handling operations, identified as Unit 5F, constructed in 1954, expanded in 1963 and 1970, and modified in 1994, consisting of the following activities:

(1) Floating dock unloading clamshell serving both coal and limestone unloading operations (served by S/V 6).

(2) Truck load-out station serving both coal and limestone unloading operations (served by S/V 9).

(3) Unit No. 2 coal pile hopper with a maximum coal feed belt capacity of 600 tons per hour.

(4) Unit No. 2 coal hopper conveyor (C1) with a maximum coal feed belt capacity of 600 tons per hour.

(5) Unit No. 2 coal transfer house conveyor drop with a maximum coal feed belt capacity of 600 tons per hour.

(6) Unit No. 2 coal transfer house conveyor (#4) with a maximum coal feed belt capacity of 1240 tons per hour.

(7) Unit No. 2 coal transfer house conveyor drop with a maximum coal feed belt capacity of 1240 tons per hour.

(8) Unit No. 2 coal transfer house conveyor with a maximum coal feed belt capacity of 1240 tons per hour.

(9) Unit No. 2 powerhouse coal tripper conveyor bunker drop with a maximum coal feed belt capacity of 1240 tons per hour and with an enclosed powerhouse and sealed transfer points.

(10) Unit No. 2 powerhouse coal tripper conveyor with a maximum coal feed belt capacity of 1240 tons per hour and with an enclosed powerhouse and sealed transfer points.

(11) Unit No. 2 powerhouse coal bunkers with a maximum coal feed belt capacity of 1240 tons per hour and with an enclosed powerhouse and sealed transfer points.

(12) Units No. 2 and No. 3 coal pile of 645,000 tons.

(13) Unit No. 2 coal pile hopper with a maximum coal feed belt capacity of 640 tons per hour.

(14) Unit No. 2 coal pile hopper conveyor with a maximum coal feed belt capacity of 640 tons per hour.

(15) Unit No. 3 coal pile hopper with a maximum coal feed belt capacity of 640 tons per hour.

(16) Unit No. 3 coal pile hopper conveyor with a maximum coal feed belt capacity of 640 tons per hour.

(17) Unit No. 3 coal transfer house conveyor, with a maximum coal feed belt capacity of 640 tons per hour.

(18) Unit No. 3 coal transfer house conveyor drop with a maximum coal feed belt capacity of 640 tons per hour with an enclosed transfer house and fabric filter (served by S/V 8).

(19) Unit No. 3 powerhouse coal tripper conveyor with a maximum coal feed belt capacity of 640 tons per hour and with an enclosed powerhouse and sealed transfer points.

(20) Unit No. 3 powerhouse coal tripper conveyor bunker drop with a maximum coal feed belt capacity of 640 tons per hour and with an enclosed powerhouse and sealed transfer points.

(21) Unit No. 3 powerhouse coal bunker with a maximum coal feed belt capacity of 640 tons per hour and with an enclosed powerhouse and sealed transfer points.

(22) Miscellaneous enclosed coal bunker and weigh-scales with vents.

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

Emission Limitations and Standards [326 IAC 2-7-5(1)]

D.3.1 Particulate Emission Limitations for Manufacturing Processes [326 IAC 6-3-2]

(a) Pursuant to 326 IAC 6-3-2, (Particulate Emission Limitations for Manufacturing Processes) the allowable particulate emissions from the:

(1) Unit No. 2 coal pile hopper, coal hopper conveyor, coal transfer house and conveyor drop shall each not exceed 71.16 pounds per hour when each operating at a process weight rate of 600 tons per hour.

(2) Unit No. 2 coal handling system consisting of: coal transfer house conveyor drop, coal transfer house conveyor, powerhouse coal tripper conveyor, powerhouse coal tripper conveyor bunker drop, power house coal bunkers shall each not exceed 80.4 pounds per hour each when operating at a process weight rate of 1240 tons per hour.

(3) Unit No. 2 coal handling system consisting of: coal pile hopper and coal pile hopper conveyor shall each not exceed 71.95 pounds per hour when each operating at a process weight rate of 640 tons per hour.

(4) Unit No. 3 coal handling system consisting of: coal pile hopper, coal pile hopper conveyor, coal transfer house conveyor drop 1, coal transfer house conveyor, coal transfer house conveyor drop 2, powerhouse coal tripper conveyor, powerhouse coal tripper conveyor bunker drop, and powerhouse coal bunker shall each not exceed 71.95 pounds per hour each when operating at a process weight rate of 640 tons per hour.

The pound per hour limitation was calculated with the following equation:

Interpolation and extrapolation of the data for the process weight rate in excess of sixty thousand (60,000) pounds per hour shall be accomplished by use of the equation:

$$E = (55.0) \times (P^{0.11}) - 40$$

where E = rate of emission in pounds per hour and
P = process weight rate in tons per hour

(b) Pursuant to 326 IAC 6-3-2(e)(3), when the process weight exceeds 200 tons per hour, the maximum allowable emissions may exceed the emission limits shown paragraph (a), provided the concentration of particulate matter in the gas discharged to the atmosphere is less than 0.10 pounds per 1,000 pounds of gases.

D.3.2 Preventive Maintenance Plan [326 IAC 2-7-5(12)]

A Preventive Maintenance Plan is required for these facilities and any control devices. Section B - Preventive Maintenance Plan contains the Permittee's obligation with regard to the preventive maintenance plan required by this condition.

Compliance Determination Requirements [326 IAC 2-7-5(1)]

D.3.3 Particulate Control [326 IAC 2-7-6(6)]

(a) Except as otherwise provided by statute or rule or in this permit, in order to assure compliance with Condition D.3.1 the enclosures and fabric filters for particulate control shall be in place and operate at all times the associated coal handling facilities are in operation.

(b) In the event that bag failure is observed in a multi-compartment fabric filters, if operations will continue for ten (10) days or more after the failure is observed before the failed units will be repaired or replaced, the Permittee shall promptly notify the IDEM, OAQ of the expected date the failed units will be repaired or replaced. The notification shall also include the status of the applicable compliance monitoring parameters with respect to normal, and the results of any response actions taken up to the time of notification.

Compliance Monitoring Requirements [326 IAC 2-7-5(1)][326 IAC 2-7-6(1)]

D.3.4 Visible Emissions Notations [326 IAC 2-7-6(1)][326 IAC 2-7-5(1)]

(a) Visible emission notations for all coal storage piles, coal transfer points, and stack exhausts (Nos. 6, 8, & 9) shall be performed once per week during normal daylight operations when transferring coal. A trained employee shall record whether emissions are normal or abnormal.

(b) For processes operated continuously, "normal" means those conditions prevailing, or expected to prevail, eighty percent (80%) of the time the process is in operation, not counting startup or shut down time.

(c) In the case of batch or discontinuous operations, readings shall be taken during that part of the operation that would normally be expected to cause the greatest emissions.

(d) A trained employee is an employee who has worked at the plant at least one (1) month and has been trained in the appearance and characteristics of normal visible emissions for that specific process.

(e) If abnormal emissions are observed, the Permittee shall take a reasonable response. Section C - Response to Excursions and Exceedances contains the Permittee's obligation with regard to the reasonable response steps required by this condition. Failure to take response steps shall be considered a deviation from this permit. Observation of abnormal emissions that do not violate 326 IAC 6-4 (Fugitive Dust Emissions) or an applicable opacity limit is not a deviation from this permit.

D.3.5 Broken or Failed Bag Detection

(a) For a single compartment baghouse/filter controlling emissions from a process operated continuously, a failed unit and the associated process shall be shut down immediately until the failed unit has been repaired or replaced.

(b) For a single compartment baghouse controlling emissions from a batch process, the feed to the process shall be shut down immediately until the failed unit has been repaired or replaced. The emissions unit shall be shut down no later than the completion of the processing of the material in the line.

Bag failure can be indicated by a significant drop in the baghouse's pressure reading with abnormal visible emissions, by an opacity violation, or by other means such as gas temperature, flow rate, air infiltration, leaks, dust traces or triboflows.

Record Keeping and Reporting Requirements [326 IAC 2-7-5(3)][326 IAC 2-7-19]

D.3.6 Record Keeping Requirements [326 IAC 2-7-5(3)][326 IAC 2-7-19]

(a) To document the compliance status with Condition D.3.4, the Permittee shall maintain records of the visible emission notations once per week. The Permittee shall include in its weekly record when a visible emission notation is not taken and the reason for the lack of visible emission notation (e.g. the process did not operate that week).

(b) Section C - General Record Keeping Requirements contains the Permittee's obligations with regard to the records required by this condition.

SECTION D.4 EMISSIONS UNIT OPERATION CONDITIONS

Emissions Unit Description:

(d) A fly ash handling facility, identified as Unit 6, constructed in 1994, consisting of the following operations:

(1) One (1) fly ash storage silo receiving fly ash via a close-pipe vacuum handling system from the electrostatic precipitator and fabric filter hoppers of Units No. 2 and No. 3, respectively, with a maximum capacity of 1000 tons, and a maximum throughput of 179.9 tons per hour, with a fabric filter separator exhausting to stack 16 and a bin filter exhausting to stack 17.

(2) One (1) fly ash silo truck loadout station, with a maximum capacity of 25 tons per hour, with an enclosed telescoping discharged chute and emissions reduced by fly ash wetting and partial loading of the trucks.

(3) One (1) Ash Pond (East and West) receiving sluiced (closed-pipe) bottom ash from Units No. 2 and No. 3. The ash is discharged to the pond at a maximum annual rate of 4.65 tons per hour and stored in wet form, that is, a layer of water maintained above the ponded ash and dredging operations conducted periodically to maintain the ponded storage state.

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

Emission Limitations and Standards [326 IAC 2-7-5(1)]

D.4.1 Particulate Emission Limitations for Manufacturing Processes [326 IAC 6-3-2]

(a) Pursuant to 326 IAC 6-3-2, the allowable particulate emissions from the fly ash storage silo shall not exceed 57.4 pounds per hour when operating at a process weight rate of 179.9 tons per hour.

The pound per hour limitation was calculated with the following equation:

Interpolation and extrapolation of the data for the process weight rate in excess of sixty thousand (60,000) pounds per hour shall be accomplished by use of the equation:

$$E = (55.0) \times (P^{0.11}) - 40$$

where E = rate of emission in pounds per hour and
P = process weight rate in tons per hour

(b) Pursuant to 326 IAC 6-3-2, the allowable particulate emissions from the fly ash silo truck loadout station shall not exceed 35.4 pounds per hour when operating at a process weight rate of 25 tons per hour.

The pound per hour limitation was calculated with the following equation:

Interpolation of the data for the process weight rate up to sixty thousand (60,000) pounds per hour shall be accomplished by use of the equation:

$$E = (4.10) \times (P^{0.67})$$

where E = rate of emission in pounds per hour and

P = process weight rate in tons per hour

D.4.2 Preventive Maintenance Plan [326 IAC 2-7-5(12)]

A Preventive Maintenance Plan is required for these facilities and any control devices. Section B - Preventive Maintenance Plan contains the Permittee's obligation with regard to the preventive maintenance plan required by this condition.

Compliance Determination Requirements [326 IAC 2-7-5(1)]

D.4.3 Particulate Control [326 IAC 2-7-6(6)]

Except as otherwise provided by statute or rule or in this permit, in order to comply with Condition D.4.1 the fabric filters and bin filters for particulate control shall be in place and operate at all times the associated fly ash handling facilities are in operation.

Compliance Monitoring Requirements [326 IAC 2-7-5(1)][326 IAC 2-7-6(1)]

D.4.4 Visible Emissions Notations [326 IAC 2-7-6(1)][326 IAC 2-7-5(1)][40 CFR 64]

(a) Visible emission notations of the exhaust from the fly ash silo truck loadout station shall be performed at least once per day during normal daylight operations. A trained employee shall record whether emissions are normal or abnormal.

(b) Visible emission notations of the exhaust from all fly ash transfer points shall be performed once per day during normal daylight when transferring the respective material. A trained employee shall record whether emissions are normal or abnormal.

(c) For processes operated continuously, "normal" means those conditions prevailing, or expected to prevail, eighty percent (80%) of the time the process is in operation.

(d) In the case of batch or discontinuous operations, readings shall be taken during that part of the operation that would normally be expected to cause the greatest emissions.

(e) A trained employee is an employee who has worked at the plant at least one (1) month and has been trained in the appearance and characteristics of normal visible emissions for that specific process.

(f) If abnormal emissions are observed from the fly ash silo truck loadout station, the Permittee shall take a reasonable response. Section C - Response to Excursions and Exceedances contains the Permittee's obligation with regard to the reasonable response steps required by this condition. Failure to take response steps shall be considered a deviation from this permit. Observation of abnormal emissions that do not violate an applicable opacity limit is not a deviation from this permit.

D.4.5 Broken or Failed Bag Detection [326 IAC 2-7-6(1)][326 IAC 2-7-5(1)][40 CFR 64]

(a) For a single compartment fabric filter controlling emissions from a process operated continuously, a failed unit and the associated process shall be shut down immediately until the failed unit has been repaired or replaced.

(b) For a single compartment fabric filter controlling emissions from a batch process, the feed to the process shall be shut down immediately until the failed unit has been repaired or replaced. The emissions unit shall be shut down no later than the completion of the processing of the material in the emission units.

Bag failure can be indicated by a significant drop in the baghouse’s pressure reading with abnormal visible emissions, by an opacity violation, or by other means such as gas temperature, flow rate, air infiltration, leaks, dust traces or triboflows.

Record Keeping and Reporting Requirements [326 IAC 2-7-5(3)][326 IAC 2-7-19]

D.4.6 Record Keeping Requirements [326 IAC 2-7-5(3)][326 IAC 2-7-19]

(a) To document the compliance status with Condition D.4.4, the Permittee shall maintain records of the once per day visible emission notations of the fly ash silo truck loadout station, fly ash and bottom ash storage pond areas, temporary stockpiles and transfer points. The Permittee shall include in its daily record when a visible emission notation is not taken and the reason for the lack of visible emission notation (e.g. the process did not operate that day).

(b) Section C - General Record Keeping Requirements contains the Permittee's obligations with regard to the records required by this condition.

SECTION D.5 EMISSIONS UNIT OPERATION CONDITIONS

Emissions Unit Description:

Insignificant Activities:

(a) Vents from ash transport systems not operated at positive pressure.

(b) Coal bunker and coal scale exhausts and associated dust collector vents.

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

Emission Limitations and Standards [326 IAC 2-7-5(1)]

D.5.1 Particulate Emission Limitations for Manufacturing Processes [326 IAC 6-3-2]

Pursuant to 326 IAC 6-3-2, the allowable particulate emissions from vents from ash transport systems not operated at positive pressure and from coal bunker and coal scale exhausts and associated dust collector vents shall be limited by the following:

Interpolation of the data for the process weight rate up to sixty thousand (60,000) pounds per hour shall be accomplished by use of the equation:

$$E = (4.10) \times (P^{0.67})$$

where E = rate of emission in pounds per hour; and
P = process weight rate in tons per hour

D.5.2 Preventive Maintenance Plan [326 IAC 2-7-5(12)]

A Preventive Maintenance Plan is required for these facilities and any control devices. Section B - Preventive Maintenance Plan contains the Permittee's obligation with regard to the preventive maintenance plan required by this condition.

SECTION D.6 EMISSIONS UNIT OPERATION CONDITIONS

Emissions Unit Description:

Insignificant activities:

(c) Degreasing operations that do not exceed 145 gallons per 12 months, except if subject to 326 IAC 20-6.

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

Emission Limitations and Standards [326 IAC 2-7-5(1)]

D.6.1 Volatile Organic Compounds (VOC) [326 IAC 8-3-2]

(a) Pursuant to 326 IAC 8-3-2 (Cold Cleaner Degreaser Control Equipment and Operating Requirements), for cold cleaning degreasers without remote solvent reservoirs constructed after July 1, 1990:

(1) Equip the degreaser with a cover.

(2) Equip the degreaser with a device for draining cleaned parts.

(3) Close the degreaser cover whenever parts are not being handled in the degreaser.

(4) Drain cleaned parts for at least fifteen (15) seconds or until dripping ceases.

(5) Provide a permanent, conspicuous label that lists the operating requirements in (a)(3), (a)(4), (a)(6), and (a)(7) of this condition.

(6) Store waste solvent only in closed containers.

(7) Prohibit the disposal or transfer of waste solvent in such a manner that could allow greater than twenty percent (20%) of the waste solvent (by weight) to evaporate into the atmosphere.

(b) The Permittee shall ensure the following additional control equipment and operating requirements are met:

(1) Equip the degreaser with one (1) of the following control devices if the solvent is heated to a temperature of greater than forty-eight and nine-tenths (48.9) degrees Celsius (one hundred twenty (120) degrees Fahrenheit):

(A) A freeboard that attains a freeboard ratio of seventy-five hundredths (0.75) or greater.

(B) A water cover when solvent used is insoluble in, and heavier than, water.

(C) A refrigerated chiller.

(D) Carbon adsorption.

(E) An alternative system of demonstrated equivalent or better control as those outlined in (b)(1)(A) through (D) of this condition that is approved

by the department. An alternative system shall be submitted to the U.S. EPA as a SIP revision.

(2) Ensure the degreaser cover is designed so that it can be easily operated with one (1) hand if the solvent is agitated or heated.

(3) If used, solvent spray:

(A) must be a solid, fluid stream; and

(B) shall be applied at a pressure that does not cause excessive splashing.

D.6.2 Material Requirements for Cold Cleaner Degreasers [326 IAC 8-3-8]

Pursuant to 326 IAC 8-3-8 (Material Requirements for Cold Cleaner Degreasers), on and after January 1, 2015, the Permittee shall not operate a cold cleaner degreaser with a solvent that has a VOC composite partial vapor pressure than exceeds one (1) millimeter of mercury (nineteen-thousandths (0.019) pound per square inch) measured at twenty (20) degrees Celsius (sixty-eight (68) degrees Fahrenheit).

D.6.3 Preventive Maintenance Plan [326 IAC 2-7-5(12)]

A Preventive Maintenance Plan is required for these facilities and any control devices. Section B - Preventive Maintenance Plan contains the Permittee's obligation with regard to the preventive maintenance plan required by this condition.

Record Keeping and Reporting Requirements [326 IAC 2-7-5(3)][326 IAC 2-7-19]

D.6.4 Record Keeping Requirements [326 IAC 2-7-5(3)][326 IAC 2-7-19]

(a) Pursuant to 326 IAC 8-3-8(c)(2), after January 1, 2015, the following records shall be maintained for each purchase of cold cleaner degreaser solvent:

(1) The name and address of the solvent supplier.

(2) The date of purchase (or invoice/bill dates of contract servicer indicating service date).

(3) The type of solvent purchased.

(4) The total volume of the solvent purchased.

(5) The true vapor pressure of the solvent measured in millimeters of mercury at twenty (20) degrees Celsius (sixty-eight (68) degrees Fahrenheit).

(b) Section C - General Record Keeping Requirements of this permit contains the Permittee’s obligations with regard to the records required by this condition.

SECTION D.7 EMISSIONS UNIT OPERATION CONDITIONS

Emissions Unit Description:

Insignificant activities:

(d) Two (2) Natural Gas-Fired water heaters located in the Maintenance Shop, each with heat input capacity of 0.04 MMBtu/hr; each constructed in 2008 and exhausting to stacks.

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

Emission Limitations and Standards [326 IAC 2-7-5(1)]

D.7.1 Particulate Emission Limitations for Sources of Indirect Heating [326 IAC 6-2-4]

Pursuant to 326 IAC 6-2-4, the allowable PM emissions from the natural gas-fired water heaters located in the Maintenance Shop, shall be limited to 0.22 pounds PM per MMBtu heat input.

D.7.2 Preventive Maintenance Plan [326 IAC 2-7-5(12)]

A Preventive Maintenance Plan is required for these facilities and any control devices. Section B - Preventive Maintenance Plan contains the Permittee's obligation with regard to the preventive maintenance plan required by this condition.

SECTION E.1 NSPS

Emission Unit Description:
Gypsum and Limestone Handling Facilities

(e) A limestone handling facility, identified as Unit 7, constructed in 1994, consisting of the following operations:

(1) One (1) limestone unloading floating clamshell dock with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 6. (This operation serves both coal and limestone unloading operations.)

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(2) One (1) covered conveyor, identified as Conveyor 1 (CL-1), with a maximum throughput of 550 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(3) One (1) limestone truck loadout to conveyor with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 9. (This operation serves both coal and limestone unloading operations.)

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(4) One (1) covered conveyor, identified as Conveyor 2 (L-1), with a maximum throughput of 800 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(5) One (1) limestone storage building with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 10.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(6) One (1) limestone reclaim system located inside a totally-enclosed building adjacent to the limestone storage building.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(7) One (1) limestone storage building loadout with a maximum capacity of 750 tons per hour, an enclosed building for dust control, and exhausting indoors.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(8) One (1) covered conveyor, identified as Conveyor 3 (L-2), with a maximum throughput of 300 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(9) One (1) limestone transfer house (No. 1) with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 12.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(10) One (1) covered conveyor, identified as Conveyor 4 (L-3), with a maximum throughput of 300 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(11) One (1) coal and limestone transfer house (serving Unit No. 3) with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 8. (This operation serves both coal and limestone transferring operations.)

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(12) One (1) covered conveyor, identified as Conveyor 5 (L-4), with a maximum throughput of 300 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(13) One (1) limestone transfer house (No. 2) with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 14.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(14) One (1) covered conveyor, identified as Conveyor 6 (L-5), with a maximum throughput of 300 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(15) One (1) limestone day silo with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 15.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(f) A gypsum wet filter cake handling facility, identified as Unit 8, constructed in 1994, consisting of the following operations:

(1) One (1) gypsum filter cake conveyor drop, with a maximum capacity of 35 tons per hour, with a fabric filter for dust control, exhausting to stack 11.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(2) One (1) gypsum filter cake conveyor drop, with a maximum capacity of 35 tons per hour, with a fabric filter for dust control, exhausting to stack 13.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(3) One (1) covered conveyor, identified as G1A, with a maximum capacity of 50 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(4) One (1) covered conveyor, identified as G1B (operates only when G1A is offline), with a maximum capacity of 50 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(5) One (1) gypsum filter cake transfer house conveyor drop with a maximum capacity of

35 tons per hour, a fabric filter for dust control, and exhausting to stack 4.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(6) One (1) covered conveyor, identified as G2A, with a maximum capacity of 50 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(7) One (1) covered conveyor, identified as G2B (operates only when G2A is offline), with a maximum capacity of 50 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(8) One (1) gypsum storage building consisting of two (2) 1000-ton gypsum storage silos and one (1) storage pile designated for truck haul-away exhausting indoors.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(9) One (1) covered silo to barge loadout primary filter cake transfer conveyor, identified as Conveyor 4, with a maximum capacity of 400 tons per hour, with a fabric filter for dust control, exhausting to stack 7.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(10) One (1) covered silo to truck secondary transfer conveyor, identified as Conveyor 3, with a maximum capacity of 400 tons per hour and exhausting indoors.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(11) One (1) gypsum barge loadout conveyor drop, with a maximum capacity of 35 tons per hour, with a fabric filter for dust control and exhausting to stack 5.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(12) One (1) gypsum barge loadout with two (2) telescoping transfer chutes delivering filter cake gypsum to river barges with a maximum capacity of 400 tons per hour.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(g) One (1) flue gas desulfurization (FGD) system for Units No. 2 and No. 3, constructed in 1994, consisting of the following limestone operations:

(1) Two (2) wet ball mills (one operational and one full capacity spare), receiving limestone from the day silo of the limestone handling facility (Unit 7). Each ball mill is a closed-device (hard-piped, enclosed design), wet mill capable of handling 20.5 tons per hour of dry limestone feed.

[Under 40 CFR 60, Subpart OOO, these units are affected sources.]

(2) Two (2) limestone slurry storage tanks, receiving the ball mill product (fresh limestone slurry), which is then discharged into the scrubber system. The scrubbed gas stream exits the absorber tower through the scrubber stack.

[Under 40 CFR 60, Subpart OOO, these units are affected sources.]

New Source Performance Standards (NSPS) Requirements [326 IAC 2-7-5(1)]

E.1.1 General Provisions Relating to New Source Performance Standards [326 IAC 12-1][40 CFR Part 60, Subpart A]

(a) Pursuant to 40 CFR 60.1, the Permittee shall comply with the provisions of 40 CFR Part 60, Subpart A - General Provisions, which are incorporated by reference as 326 IAC 12-1, for the emission unit(s) listed above, except as otherwise specified in 40 CFR Part 60, Subpart OOO.

(b) Pursuant to 40 CFR 60.4, the Permittee shall submit all required notifications and reports to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

E.1.2 Nonmetallic Mineral Processing Plants NSPS [326 IAC 12][40 CFR Part 60, Subpart OOO]

The Permittee shall comply with the following provisions of 40 CFR Part 60, Subpart OOO (included as Attachment B to the operating permit), which are incorporated by reference as 326 IAC 12, for the emission unit(s) listed above:

(1) 40 CFR 60.670(a)(1), (d)(1-3), (e-f)
(2) 40 CFR 60.671
(3) 40 CFR 60.672(a-b), (d-f), (e)(1-2), (f)
(4) 40 CFR 60.673
(5) 40 CFR 60.674(a)(1), (a)(2)
(6) 40 CFR 60.675(b)(1), (b)(2), (c)(1)(i-ii); (c)(2)(i-ii); (c)(3), (d)(2)
(7) 40 CFR 60.675(e)(1)(i-ii); (e)(2)(i-iii); (e)(3), (e)(4), (g)
(8) 40 CFR 60.676(a)(1), (a)(3), (a)(4), (f), (j), (k)
(9) 40 CFR 60, Subpart OOO, Table 1
(10) 40 CFR 60, Subpart OOO, Table 2
(11) 40 CFR 60, Subpart OOO, Table 3

E.1.3 Preventive Maintenance Plan [326 IAC 2-7-5(12)]

A Preventive Maintenance Plan is required for these facilities and any control devices. Section B - Preventive Maintenance Plan contains the Permittee's obligation with regard to the preventive maintenance plan required by this condition.

SECTION E.2 NSPS

Emissions Unit Description:

(b) One (1) coal/natural gas fired boiler, identified as Unit No. 3, constructed in 1970, with a maximum fuel heat input rating of 2,724 MMBtu per hour (HHV basis), using a fabric filter for particulate matter (PM) emissions control, and low NOx burner and selective catalytic reduction (SCR) for NOx reduction, with a sorbent injection system for control of sulfur trioxide (SO3) and resulting sulfuric acid (H2SO4) emissions, and exhausting to Stack No. 3. Unit No. 3 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and an exhaust stack with Unit No. 2.

Unit No. 3 has continuous emissions monitoring systems (CEMS) for SO2, NOx, PM, CO2, and a sorbent trap monitor for mercury (Hg), which are shared with Unit No. 2. Unit 3 is equipped with a spray dryer evaporator (SDE), commissioned in 2023, which eliminates FGD wastewater discharges.

[Under 40 CFR 60, Subpart Da, this is an affected source.]
[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

New Source Performance Standards (NSPS) Requirements [326 IAC 2-7-5(1)]

E.2.1 General Provisions Relating to New Source Performance Standards [326 IAC 12-1][40 CFR Part 60, Subpart A]

(a) Pursuant to 40 CFR 60.1, the Permittee shall comply with the provisions of 40 CFR Part 60, Subpart A - General Provisions, which are incorporated by reference as 326 IAC 12-1, for the emission unit(s) listed above, except as otherwise specified in 40 CFR Part 60, Subpart Da.

(b) Pursuant to 40 CFR 60.4, the Permittee shall submit all required notifications and reports to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

E.2.2 Electric Utility Steam Generating Units NSPS [326 IAC 12][40 CFR Part 60, Subpart Da]

The Permittee shall comply with the following provisions of 40 CFR Part 60, Subpart Da (included as Attachment E to the operating permit), which are incorporated by reference as 326 IAC 12, for the emission unit(s) listed above:

(1) 40 CFR 60.40Da(a)
(2) 40 CFR 60.41Da
(3) 40 CFR 60.42Da (b)(1), (e)(1)(ii), (e)(2)
(4) 40 CFR 60.43Da (g), (l)(2)
(5) 40 CFR 60.44Da (g)(3)
(6) 40 CFR 60.48Da (a) through (i), (m), (p), (q), (s)
(7) 40 CFR 60.49Da (b) through (e), (f)(2), (g) through (m), (s), (t), (v), (w)
(8) 40 CFR 60.50Da (a) through (e)

(9) 40 CFR 60.51Da (a) through (c), (f), (h) through (k)
(10) 40 CFR 60.52Da

SECTION E.3 NESHAP

Emissions Unit Description:

Unit No. 2 and Unit No. 3

(a) One (1) coal/natural gas fired boiler, identified as Unit No. 2, constructed in 1963, with a maximum fuel heat input rating of 1031 MMBtu per hour (HHV basis), using an electrostatic precipitator for particulate matter (PM) emissions control, and a low NOx burner for NOx control, and exhausting to Stack No. 3. Unit No. 2 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and exhaust stack with Unit No. 3.

Unit No. 2 has continuous emissions monitoring systems (CEMs) for Sulfur Dioxide (SO_2), Nitrogen Oxides (NOx), Particulate Matter (PM), Carbon Dioxide (CO_2), and sorbent trap monitor for Mercury (Hg), which are shared with Unit No. 3.

[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(b) One (1) coal/natural gas fired boiler, identified as Unit No. 3, constructed in 1970, with a maximum fuel heat input rating of 2,724 MMBtu per hour (HHV basis), using a fabric filter for particulate matter (PM) emissions control, and low NOx burner and selective catalytic reduction (SCR) for NOx reduction, with a sorbent injection system for control of sulfur trioxide (SO3) and resulting sulfuric acid (H2SO4) emissions, and exhausting to Stack No. 3. Unit No. 3 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and an exhaust stack with Unit No. 2.

Unit No. 3 has continuous emissions monitoring systems (CEMS) for SO2, NOx, PM, CO2, and a sorbent trap monitor for mercury (Hg), which are shared with Unit No. 2. Unit 3 is equipped with a spray dryer evaporator (SDE), commissioned in 2023, which eliminates FGD wastewater discharges.

[Under 40 CFR 60, Subpart Da, this is an affected source.]
[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

National Emission Standards for Hazardous Air Pollutants (NESHAP) Requirements [326 IAC 2-7-5(1)]

E.3.1 General Provisions Relating to National Emission Standards for Hazardous Air Pollutants under 40 CFR Part 63 [326 IAC 20-1][40 CFR Part 63, Subpart A]

(a) Pursuant to 40 CFR 63.1 the Permittee shall comply with the provisions of 40 CFR Part 63, Subpart A - General Provisions, which are incorporated by reference as 326 IAC 20-1, for the emission unit(s) listed above, except as otherwise specified in 40 CFR Part 63, Subpart UUUUU.

(b) Pursuant to 40 CFR 63.10, the Permittee shall submit all required notifications and reports to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

E.3.2 Coal and Oil Fired Electric Utility Steam Generating Units NESHAP [40 CFR Part 63, Subpart UUUUU]

The Permittee shall comply with the following provisions of 40 CFR Part 63, Subpart UUUUU (included as Attachment C to the operating permit for the emission unit(s) listed above:

(1) 40 CFR 63.9981
(2) 40 CFR 63.9982(a)(1), (d)
(3) 40 CFR 63.9984(b), (c), (f)
(4) 40 CFR 63.9990(a)(1), (a)(2)
(5) 40 CFR 63.9991(a)(1), (a)(2), (b), (c)(1), (c)(2)
(6) 40 CFR 63.10000(a), (b), (c)(1)(iv); (v), (vi)(B), (d)(1), (d)(2)(i), (d)(2)(ii), (d)(3), (d)(4), (d)(5)(i-vii); (e), (l)
(7) 40 CFR 63.10005(a), (a)(1), (a)(2)(i-iii); (b)(1-5); (d)(1), (d)(2)(i-iii); (d)(3), (e), (h)(1)(i)-(ii)(A-B); (h)(2)(i-ii); (h)(3)(i)(A-D); (h)(3)(ii); (h)(3)(iii)(A-B); (h)(3)(iii)(C)(1-5); (j), (k)
(8) 40 CFR 63.10006(b)(1-2); (c), (d), (f), (i), (j)
(9) 40 CFR 63.10007(a)(1), (a)(2), (b), (d), (e)(1), (e)(2), (f)(1)(ii) and (2); (g)
(10) 40 CFR 63.10009(a), (b)(1), (b)(2), (d), (e), (f)(1), (g)(1), (h- k), (n)
(11) 40 CFR 63.10010(a)(2)(ii); (b-e), (a)(4), (c-e), (f)(1-4); (g), (h)(1-7); (i)(1-5); (j)(1-4); (l)(1-5)
(12) 40 CFR 63.10011(a-g)
(13) 40 CFR 63.10020(a-d), (e)(1) - (3)(i)(A-D)
(14) 40 CFR 63.10021(a-c); (d)(1-2); (e-i)
(15) 40 CFR 63.10022
(16) 40 CFR 63.10023(a), (b)(1), (c)
(17) 40 CFR 63.10030(a), (b), (d), (e)
(18) 40 CFR 63.10031(a-g)
(19) 40 CFR 63.10032(a), (b), (d)(1)
(20) 40 CFR 63.10033(a-c)
(21) 40 CFR 63.10040
(22) 40 CFR 63.10041(a-b)
(23) 40 CFR 63.10042
(24) 40 CFR 63 Appendix A to Subpart UUUUU
(25) 40 CFR 63 Appendix B to Subpart UUUUU
(26) 40 CFR 63, Subpart UUUUU, Table 1
(27) 40 CFR 63, Subpart UUUUU, Table 2, Subcategory 1
(28) 40 CFR 63, Subpart UUUUU, Table 3, Subcategory 1
(29) 40 CFR 63, Subpart UUUUU, Table 4, Subcategory 1
(30) 40 CFR 63, Subpart UUUUU, Table 5, Subcategories 1-5
(31) 40 CFR 63, Subpart UUUUU, Table 6, Subcategory 1
(32) 40 CFR 63, Subpart UUUUU, Table 7, Subcategory 1
(33) 40 CFR 63, Subpart UUUUU, Table 8, Subcategory 1
(34) 40 CFR 63, Subpart UUUUU, Table 9

SECTION E.4 NESHAP

Emissions Unit Description:

(h) One (1) diesel-fired Emergency Generator, constructed in March 2005, with a rated output capacity of 267 hp.

[Under 40 CFR Part 63, Subpart ZZZZ, this is an existing affected source.]

(i) One (1) emergency diesel-fired fire pump, constructed in 1994 with a rated output capacity of 500 hp.

[Under 40 CFR Part 63, Subpart ZZZZ, this is an existing affected source.]

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

National Emission Standards for Hazardous Air Pollutants (NESHAP) Requirements [326 IAC 2-7-5(1)]

E.4.1 General Provisions Relating to National Emission Standards for Hazardous Air Pollutants under 40 CFR Part 63 [326 IAC 20-1][40 CFR Part 63, Subpart A]

(a) Pursuant to 40 CFR 63.1 the Permittee shall comply with the provisions of 40 CFR Part 63, Subpart A - General Provisions, which are incorporated by reference as 326 IAC 20-1, for the emission unit(s) listed above, except as otherwise specified in 40 CFR Part 63, Subpart ZZZZ.

(b) Pursuant to 40 CFR 63.10, the Permittee shall submit all required notifications and reports to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

E.4.2 Stationary Reciprocating Internal Combustion Engines NESHAP [40 CFR Part 63, Subpart ZZZZ][326 IAC 20-82]

The Permittee shall comply with the following provisions of 40 CFR Part 63, Subpart ZZZZ (included as Attachment D to the operating permit), which are incorporated by reference as 326 IAC 20-82, for the emission unit(s) listed above:

(1) 40 CFR 63.6585(a), (b)
(2) 40 CFR 63.6590(a)(1)(ii)
(3) 40 CFR 63.6595(a)(1), (c)
(4) 40 CFR 63.6602
(5) 40 CFR 63.6604(b)
(6) 40 CFR 63.6605(a)
(7) 40 CFR 63.6625(e)(2); (f)
(8) 40 CFR 63.6640(a); (e); (f)(1); (f)(2)(i); (f)(3)-(4)
(9) 40 CFR 63.6650(a); (h)
(10) 40 CFR 63.6655(d); (e)(2); (f)(1)
(11) 40 CFR 63.6660
(12) 40 CFR 63.6670
(13) 40 CFR 63.6675

(14) 40 CFR 63, Subpart ZZZZ, Table 2c, Subcategory 1
(15) 40 CFR 63, Subpart ZZZZ, Table 6, Subcategory 9
(16) 40 CFR 63, Subpart ZZZZ, Table 7, Subcategory 4
(17) 40 CFR 63, Subpart ZZZZ, Table 8

E.4.3 Preventive Maintenance Plan [326 IAC 2-7-5(12)]

A Preventive Maintenance Plan is required for these facilities and any control devices. Section B - Preventive Maintenance Plan contains the Permittee's obligation with regard to the preventive maintenance plan required by this condition.

SECTION F TITLE IV OPERATION CONDITIONS

Emissions Unit Description :

(a) One (1) coal/natural gas fired boiler, identified as Unit No. 2, constructed in 1963, with a maximum fuel heat input rating of 1031 MMBtu per hour (HHV basis), using an electrostatic precipitator for particulate matter (PM) emissions control, and a low NOx burner for NOx control, and exhausting to Stack No. 3. Unit No. 2 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and exhaust stack with Unit No. 3.

Unit No. 2 has continuous emissions monitoring systems (CEMs) for Sulfur Dioxide (SO_2), Nitrogen Oxides (NOx), Particulate Matter (PM), Carbon Dioxide (CO_2), and sorbent trap monitor for Mercury (Hg), which are shared with Unit No. 3.

[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(b) One (1) coal/natural gas fired boiler, identified as Unit No. 3, constructed in 1970, with a maximum fuel heat input rating of 2,724 MMBtu per hour (HHV basis), using a fabric filter for particulate matter (PM) emissions control, and low NOx burner and selective catalytic reduction (SCR) for NOx reduction, with a sorbent injection system for control of sulfur trioxide (SO3) and resulting sulfuric acid (H2SO4) emissions, and exhausting to Stack No. 3. Unit No. 3 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and an exhaust stack with Unit No. 2.

Unit No. 3 has continuous emissions monitoring systems (CEMS) for SO2, NOx, PM, CO2, and a sorbent trap monitor for mercury (Hg), which are shared with Unit No. 2. Unit 3 is equipped with a spray dryer evaporator (SDE), commissioned in 2023, which eliminates FGD wastewater discharges.

[Under 40 CFR 60, Subpart Da, this is an affected source.]
[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(The information describing the process contained in this facility description box is descriptive information and does not constitute enforceable conditions.)

Acid Rain Program

F.1 Acid Rain Permit [326 IAC 2-7-5(1)(C)][326 IAC 21][40 CFR 72 through 40 CFR 78]

Pursuant to 326 IAC 21 (Acid Deposition Control), the Permittee shall comply with all provisions of the Acid Rain permit issued for this source, and any other applicable requirements contained in 40 CFR 72 through 40 CFR 78.

F.2 Title IV Emissions Allowances [326 IAC 2-7-5(4)][326 IAC 21]

Emissions exceeding any allowances that the Permittee lawfully holds under the Title IV Acid Rain Program of the Clean Air Act are prohibited, subject to the following limitations:

(a) No revision of this permit shall be required for increases in emissions that are authorized by allowances acquired under the Title IV Acid Rain Program, provided that such increases do not require a permit revision under any other applicable requirement.

(b) No limit shall be placed on the number of allowances held by the Permittee. The Permittee may not use allowances as a defense to noncompliance with any other applicable requirement.

(c) Any such allowance shall be accounted for according to the procedures established in regulations promulgated under Title IV of the Clean Air Act.

SECTION G Reserved

SECTION H TR NOX Annual Trading Program, TR NOX Ozone Season Trading Program, and TR SO2 Group 1 Trading Program Requirements (40 CFR 97.406), (40 CFR 97.506), (40 CFR 97.606)

ORIS Code: 1012

Emissions Unit Description:

(a) One (1) coal/natural gas fired boiler, identified as Unit No. 2, constructed in 1963, with a maximum fuel heat input rating of 1031 MMBtu per hour (HHV basis), using an electrostatic precipitator for particulate matter (PM) emissions control, and a low NOx burner for NOx control, and exhausting to Stack No. 3. Unit No. 2 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and exhaust stack with Unit No. 3.

Unit No. 2 has continuous emissions monitoring systems (CEMs) for Sulfur Dioxide (SO2), Nitrogen Oxides (NOx), Particulate Matter (PM), and sorbent trap monitor for Mercury (Hg), which are shared with Unit No. 3.

[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(b) One (1) coal/natural gas fired boiler, identified as Unit No. 3, constructed in 1970, with a maximum fuel heat input rating of 2,724 MMBtu per hour (HHV basis), using a fabric filter for particulate matter (PM) emissions control, and low NOx burner and selective catalytic reduction (SCR) for NOx reduction, with a sorbent injection system for control of sulfur trioxide (SO3) and resulting sulfuric acid (H2SO4) emissions, and exhausting to Stack No. 3. Unit No. 3 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and an exhaust stack with Unit No. 2.

Unit No. 3 has continuous emissions monitoring systems (CEMS) for SO2, NOx, PM, CO2, and a sorbent trap monitor for mercury (Hg), which are shared with Unit No. 2. Unit 3 is equipped with a spray dryer evaporator (SDE), commissioned in 2023, which eliminates FGD wastewater discharges.

[Under 40 CFR 60, Subpart Da, this is an affected source.]
[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

H.1 Designated Representative Requirements

The owners and operators shall comply with the requirement to have a designated representative, and may have an alternate designated representative, in accordance with the following:

(a) 40 CFR 97.413 through 97.418;
(b) 40 CFR 97.513 through 97.518; and
(c) 40 CFR 97.613 through 97.618.

H.2 Emissions Monitoring, Reporting, and Recordkeeping Requirements

(a) The owners and operators, and the designated representative, of each TR NO_X Annual source, TR NOx Ozone Season source, and TR SO2 Group 1 source, and each TR NO_X Annual unit at the source, TR NOx Ozone Season unit at the source, and TR SO2 Group 1 unit at the source shall comply with the monitoring, reporting, and recordkeeping requirements of 40 CFR 97.430, 40 CFR 97.530, and 40 CFR 97.630 (general

requirements, including installation, certification, and data accounting, compliance deadlines, reporting data, prohibitions, and long-term cold storage), 97.431, 97.531, and 97.631 (initial monitoring system certification and recertification procedures), 97.432, 97.532, and 97.632 (monitoring system out-of-control periods), 97.433, 97.533, and 97.633 (notifications concerning monitoring), 97.434, 97.534, and 97.634 (recordkeeping and reporting, including monitoring plans, certification applications, quarterly reports, and compliance certification), and 97.435, 97.535, and 97.635 (petitions for alternatives to monitoring, recordkeeping, or reporting requirements).

(b) The emissions data determined in accordance with 40 CFR 97.430 through 97.435 shall be used to calculate allocations of TR NO_X Annual allowances under 40 CFR 97.411(a)(2) and (b) and 97.412 and to determine compliance with the TR NO_X Annual emissions limitation and assurance provisions under Condition H.3 below, provided that, for each monitoring location from which mass emissions are reported, the mass emissions amount used in calculating such allocations and determining such compliance shall be the mass emissions amount for the monitoring location determined in accordance with 40 CFR 97.430 through 97.435 and rounded to the nearest ton, with any fraction of a ton less than 0.50 being deemed to be zero.

(c) The emissions data determined in accordance with 40 CFR 97.530 through 97.535 shall be used to calculate allocations of TR NO_X Ozone Season allowances under 40 CFR 97.511(a)(2) and (b) and 97.512 and to determine compliance with the TR NO_X Ozone Season emissions limitation and assurance provisions under Condition H.4 below, provided that, for each monitoring location from which mass emissions are reported, the mass emissions amount used in calculating such allocations and determining such compliance shall be the mass emissions amount for the monitoring location determined in accordance with 40 CFR 97.530 through 97.535 and rounded to the nearest ton, with any fraction of a ton less than 0.50 being deemed to be zero.

(d) The emissions data determined in accordance with 40 CFR 97.630 through 97.635 shall be used to calculate allocations of TR SO_2 Group 1 allowances under 40 CFR 97.611(a)(2) and (b) and 97.612 and to determine compliance with the TR SO_2 Group 1 emissions limitation and assurance provisions under Condition H.5 below, provided that, for each monitoring location from which mass emissions are reported, the mass emissions amount used in calculating such allocations and determining such compliance shall be the mass emissions amount for the monitoring location determined in accordance with 40 CFR 97.630 through 97.635 and rounded to the nearest ton, with any fraction of a ton less than 0.50 being deemed to be zero.

H.3 NOX Annual Emissions Requirements

(a) TR NO_X Annual emissions limitation.

(1) As of the allowance transfer deadline for a control period in a given year, the owners and operators of each TR NO_X Annual source and each TR NO_X Annual unit at the source shall hold, in the source's compliance account, TR NO_X Annual allowances available for deduction for such control period under 40 CFR 97.424(a) in an amount not less than the tons of total NO_X emissions for such control period from all TR NO_X Annual units at the source.

(2) If total NO_X emissions during a control period in a given year from the TR NO_X Annual units at a TR NO_X Annual source are in excess of the TR NO_X Annual emissions limitation set forth in Condition H.3(a)(1) above, then:

(A) The owners and operators of the source and each TR NO_X Annual unit at the source shall hold the TR NO_X Annual allowances required for

deduction under 40 CFR 97.424(d); and

(B) The owners and operators of the source and each TR NO_X Annual unit at the source shall pay any fine, penalty, or assessment or comply with any other remedy imposed, for the same violations, under the Clean Air Act, and each ton of such excess emissions and each day of such control period shall constitute a separate violation of 40 CFR Part 97, Subpart AAAAA and the Clean Air Act.

(b) TR NO_X Annual assurance provisions.

(1) If total NO_X emissions during a control period in a given year from all TR NO_X Annual units at TR NO_X Annual sources in the state exceed the state assurance level, then the owners and operators of such sources and units in each group of one or more sources and units having a common designated representative for such control period, where the common designated representative's share of such NO_X emissions during such control period exceeds the common designated representative's assurance level for the state and such control period, shall hold (in the assurance account established for the owners and operators of such group) TR NO_X Annual allowances available for deduction for such control period under 40 CFR 97.425(a) in an amount equal to two times the product (rounded to the nearest whole number), as determined by the Administrator in accordance with 40 CFR 97.425(b), of multiplying— (A) The quotient of the amount by which the common designated representative's share of such NO_X emissions exceeds the common designated representative's assurance level divided by the sum of the amounts, determined for all common designated representatives for such sources and units in the state for such control period, by which each common designated representative's share of such NO_X emissions exceeds the respective common designated representative's assurance level; and (B) The amount by which total NO_X emissions from all TR NO_X Annual units at TR NO_X Annual sources in the state for such control period exceed the state assurance level.

(2) The owners and operators shall hold the TR NO_X Annual allowances required under Condition H.3(b)(1) above, as of midnight of November 1 (if it is a business day), or midnight of the first business day thereafter (if November 1 is not a business day), immediately after such control period.

(3) Total NO_X emissions from all TR NO_X Annual units at TR NO_X Annual sources in the State during a control period in a given year exceed the state assurance level if such total NO_X emissions exceed the sum, for such control period, of the state NO_X Annual trading budget under 40 CFR 97.410(a) and the state's variability limit under 40 CFR 97.410(b).

(4) It shall not be a violation of 40 CFR Part 97, Subpart AAAAA or of the Clean Air Act if total NO_X emissions from all TR NO_X Annual units at TR NO_X Annual sources in the State during a control period exceed the state assurance level or if a common designated representative's share of total NO_X emissions from the TR NO_X Annual units at TR NO_X Annual sources in the state during a control period exceeds the common designated representative's assurance level.

(5) To the extent the owners and operators fail to hold TR NO_X Annual allowances for a control period in a given year in accordance with Conditions H.3(b)(1) through (3) above,

(A) The owners and operators shall pay any fine, penalty, or assessment or comply with any other remedy imposed under the Clean Air Act; and

(B) Each TR NO_X Annual allowance that the owners and operators fail to hold for such control period in accordance with Conditions H.3(b)(1) through (3) above and each day of such control period shall constitute a separate violation of 40 CFR Part 97, Subpart AAAAA and the Clean Air Act.

(c) Compliance periods.

(1) A TR NO_X Annual unit shall be subject to the requirements under Condition H.3(a) above for the control period starting on the later of January 1, 2015, or the deadline for meeting the unit's monitor certification requirements under 40 CFR 97.430(b) and for each control period thereafter.

(2) A TR NO_X Annual unit shall be subject to the requirements under Condition H.3(b) above for the control period starting on the later of January 1, 2017 or the deadline for meeting the unit's monitor certification requirements under 40 CFR 97.430(b) and for each control period thereafter.

(d) Vintage of allowances held for compliance.

(1) A TR NO_X Annual allowance held for compliance with the requirements under Condition H.3(a)(1) above for a control period in a given year must be a TR NO_X Annual allowance that was allocated for such control period or a control period in a prior year.

(2) A TR NO_X Annual allowance held for compliance with the requirements under Condition H.3(a)(2)(1) and (b)(1) through (3) above for a control period in a given year must be a TR NO_X Annual allowance that was allocated for a control period in a prior year or the control period in the given year or in the immediately following year.

(e) Allowance Management System requirements. Each TR NO_X Annual allowance shall be held in, deducted from, or transferred into, out of, or between Allowance Management System accounts in accordance with 40 CFR Part 97, Subpart AAAAA.

(f) Limited authorization. A TR NO_X Annual allowance is a limited authorization to emit one ton of NO_X during the control period in one year. Such authorization is limited in its use and duration as follows:

(1) Such authorization shall only be used in accordance with the TR NO_X Annual Trading Program; and

(2) Notwithstanding any other provision of 40 CFR Part 97, the Administrator has the authority to terminate or limit the use and duration of such authorization to the extent the Administrator determines is necessary or appropriate to implement any provision of the Clean Air Act.

(g) Property right. A TR NO_X Annual allowance does not constitute a property right.

H.4 NOx Ozone Season Requirements

(a) TR NO_X Ozone Season emissions limitation.

(1) As of the allowance transfer deadline for a control period in a given year, the owners and operators of each TR NO_X Ozone Season source and each TR NO_X

Ozone Season unit at the source shall hold, in the source's compliance account, TR NO_X Ozone Season allowances available for deduction for such control period under 40 CFR 97.524(a) in an amount not less than the tons of total NO_X emissions for such control period from all TR NO_X Ozone Season units at the source.

(2) If total NO_X emissions during a control period in a given year from the TR NO_X Ozone Season units at a TR NO_X Ozone Season source are in excess of the TR NO_X Ozone Season emissions limitation set forth in Condition H.4(a)(1) above, then:

(A) The owners and operators of the source and each TR NO_X Ozone Season unit at the source shall hold the TR NO_X Ozone Season allowances required for deduction under 40 CFR 97.524(d); and

(B) The owners and operators of the source and each TR NO_X Ozone Season unit at the source shall pay any fine, penalty, or assessment or comply with any other remedy imposed, for the same violations, under the Clean Air Act, and each ton of such excess emissions and each day of such control period shall constitute a separate violation of 40 CFR Part 97, Subpart BBBBB and the Clean Air Act.

(b) TR NO_X Ozone Season assurance provisions.

(1) If total NO_X emissions during a control period in a given year from all TR NO_X Ozone Season units at TR NO_X Ozone Season sources in the state exceed the state assurance level, then the owners and operators of such sources and units in each group of one or more sources and units having a common designated representative for such control period, where the common designated representative's share of such NO_X emissions during such control period exceeds the common designated representative's assurance level for the state and such control period, shall hold (in the assurance account established for the owners and operators of such group) TR NO_X Ozone Season allowances available for deduction for such control period under 40 CFR 97.525(a) in an amount equal to two times the product (rounded to the nearest whole number), as determined by the Administrator in accordance with 40 CFR 97.525(b), of multiplying:

(A) The quotient of the amount by which the common designated representative's share of such NO_X emissions exceeds the common designated representative's assurance level divided by the sum of the amounts, determined for all common designated representatives for such sources and units in the state for such control period, by which each common designated representative's share of such NO_X emissions exceeds the respective common designated representative's assurance level; and

(B) The amount by which total NO_X emissions from all TR NO_X Ozone Season units at TR NO_X Ozone Season sources in the state for such control period exceed the state assurance level.

(2) The owners and operators shall hold the TR NO_X Ozone Season allowances required under Condition H.4(b)(1) above, as of midnight of November 1 (if it is a business day), or midnight of the first business day thereafter (if November 1 is not a business day), immediately after such control period.

(3) Total NO_X emissions from all TR NO_X Ozone Season units at TR NO_X Ozone Season sources in the state during a control period in a given year exceed the state assurance level if such total NO_X emissions exceed the sum, for such control period, of the State NO_X Ozone Season trading budget under 40 CFR 97.510(a) and the state's variability limit under 40 CFR 97.510(b).

(4) It shall not be a violation of 40 CFR part 97, subpart BBBBB or of the Clean Air Act if total NO_X emissions from all TR NO_X Ozone Season units at TR NO_X Ozone Season sources in the state during a control period exceed the state assurance level or if a common designated representative's share of total NO_X emissions from the TR NO_X Ozone Season units at TR NO_X Ozone Season sources in the state during a control period exceeds the common designated representative's assurance level.

(5) To the extent the owners and operators fail to hold TR NO_X Ozone Season allowances for a control period in a given year in accordance with Conditions H.4(b)(1) through (3) above,

(A) The owners and operators shall pay any fine, penalty, or assessment or comply with any other remedy imposed under the Clean Air Act; and

(B) Each TR NOX Ozone Season allowance that the owners and operators fail to hold for such control period in accordance with Conditions H.4(b)(1) through (3) above and each day of such control period shall constitute a separate violation of 40 CFR Part 97, Subpart BBBBB and the Clean Air Act.

(c) Compliance Periods.

(1) A TR NOx Ozone Season unit shall be subject to the requirements under Condition H.4(a) above for the control period starting on the later of May 1, 2015 or the deadline for meeting the unit's monitor certificate requirements under 40 CFR 97.530(b) and for each control period thereafter.

(2) A TR NOx Ozone Season unit shall be subject to the requirements under Condition H.4(b) above for the control period starting on the later of May 1, 2017 or the deadline for meeting the unit's monitor certification requirements under 40 CFR 97.530(b) and for each control period thereafter.

(d) Vintage of allowances held for compliance.

(1) A TR NOx Ozone Season allowance held for compliance with the requirements under Condition H.4(a)(1) above for a control period in a given year must be a TR NOx Ozone Season Allowance that was allocated for such control period or a control period in a prior year.

(2) A TR NOx Ozone Season allowance held for compliance with the requirements under Conditions H.4(a)(2)(A) and (b)(1) through (3) above for a control period in a given year must be a TR NOx Ozone Season allowance that was allocated for a control period in a prior year or the control period in the given year or in the immediately following year.

(e) Allowances Management System Requirements.

(1) Each TR NOx Ozone Season allowance shall be held in, deducted from, or transferred into, out of, or between Allowance Management System accounts in

accordance with 40 CFR Part 97, Subpart BBBBB.

(f) Limited Authorization.

(1) A TR NOx Ozone Season allowance is a limited authorization to emit one ton of NOx during the control period in one year. Such authorization is limited in its use and duration as follows:

(A) Such authorization shall only be used in accordance with the TR NOx Ozone Season Trading Program; and

(B) Notwithstanding any other provision of 40 CFR Part 97, Subpart BBBBB, the Administrator has the authority to terminate or limit the use and duration of such authorization to the extent the Administrator determines is necessary or appropriate to implement any provision of the Clean Air Act.

(g) Property Right.

(1) A TR NOx Ozone Season allowance does not constitute a property right.

H.5 SO_2 Emissions Requirements

(a) TR SO_2 Group 1 emissions limitation.

(1) As of the allowance transfer deadline for a control period in a given year, the owners and operators of each TR SO_2 Group 1 source and each TR SO2 Group 1 unit at the source shall hold, in the source's compliance account, TR SO_2 Group 1 allowances available for deduction for such control period under 40 CFR 97.624(a) in an amount not less than the tons of total SO_2 emissions for such control period from all TR SO_2 Group 1 units at the source.

(2) If total SO_2 emissions during a control period in a given year from the TR SO_2 Group 1 units at a TR SO_2 Group 1 source are in excess of the TR SO_2 Group 1 emissions limitation set forth in Condition H.5(a)(1) above, then:

(A) The owners and operators of the source and each TR SO_2 Group 1 unit at the source shall hold the TR SO_2 Group 1 allowances required for deduction under 40 CFR 97.624(d); and

(B) The owners and operators of the source and each TR SO_2 Group 1 unit at the source shall pay any fine, penalty, or assessment or comply with any other remedy imposed, for the same violations, under the Clean Air Act, and each ton of such excess emissions and each day of such control period shall constitute a separate violation 40 CFR Part 97, Subpart CCCCC and the Clean Air Act.

(b) TR SO_2 Group 1 assurance provisions

(1) If total SO_2 emissions during a control period in a given year from all TR SO_2 Group 1 units at TR SO_2 Group 1 sources in the state exceed the state assurance level, then the owners and operators of such sources and units in each group of one or more sources and units having a common designated representative for such control period, where the common designated representative's share of such SO_2 emissions during such control period exceeds the common designated representative's assurance level for the state and such

control period, shall hold (in the assurance account established for the owners and operators of such group) TR SO_2 Group 1 allowances available for deduction for such control period under 40 CFR 97.625(a) in an amount equal to two times the product (rounded to the nearest whole number), as determined by the Administrator in accordance with 40 CFR 97.625(b), of multiplying—

(2) The quotient of the amount by which the common designated representative's share of such SO_2 emissions exceeds the common designated representative's assurance level divided by the sum of the amounts, determined for all common designated representatives for such sources and units in the state for such control period, by which each common designated representative's share of such SO_2 emissions exceeds the respective common designated representative's assurance level; and

(3) The amount by which total SO_2 emissions from all TR SO_2 Group 1 units at TR SO_2 Group 1 sources in the state for such control period exceed the state assurance level.

(4) The owners and operators shall hold the TR SO_2 Group 1 allowances required under Condition H.5(b)(1) above, as of midnight of November 1 (if it is a business day), or midnight of the first business day thereafter (if November 1 is not a business day), immediately after such control period.

(5) Total SO_2 emissions from all TR SO_2 Group 1 units at TR SO_2 Group 1 sources in the state during a control period in a given year exceed the state assurance level if such total SO_2 emissions exceed the sum, for such control period, of the state SO_2 Group 1 trading budget under 40 CFR 97.610(a) and the state's variability limit under 40 CFR 97.610(b).

(6) It shall not be a violation of 40 CFR part 97, subpart CCCCC or of the Clean Air Act if total SO_2 emissions from all TR SO_2 Group 1 units at TR SO_2 Group 1 sources in the state during a control period exceed the state assurance level or if a common designated representative's share of total SO_2 emissions from the TR SO_2 Group 1 units at TR SO_2 Group 1 sources in the state during a control period exceeds the common designated representative's assurance level.

(7) To the extent the owners and operators fail to hold TR SO_2 Group 1 allowances for a control period in a given year in accordance with Conditions H.5(b)(1) through (3) above,

(A) The owners and operators shall pay any fine, penalty, or assessment or comply with any other remedy imposed under the Clean Air Act; and

(B) Each TR SO_2 Group 1 allowance that the owners and operators fail to hold for such control period in accordance with Conditions H.5(b)(1) through (3) above and each day of such control period shall constitute a separate violation of 40 CFR part 97, subpart CCCCC and the Clean Air Act.

(c) Compliance periods.

(1) A TR SO_2 Group 1 unit shall be subject to the requirements under Condition H.5(a) above for the control period starting on the later of January 1, 2015 or the deadline for meeting the unit's monitor certification requirements under 40 CFR 97.630(b) and for each control period thereafter.

(2) A TR SO_2 Group 1 unit shall be subject to the requirements under Condition H.5(b) above for the control period starting on the later of January 1, 2017 or the deadline for meeting the unit's monitor certification requirements under 40 CFR 97.630(b) and for each control period thereafter.

(d) Vintage of allowances held for compliance.

(1) A TR SO_2 Group 1 allowance held for compliance with the requirements under Condition H.5(a)(1) above for a control period in a given year must be a TR SO_2 Group 1 allowance that was allocated for such control period or a control period in a prior year.

(2) A TR SO_2 Group 1 allowance held for compliance with the requirements under Condition H.5(a)(2)(A) and (b)(1) through (3) above for a control period in a given year must be a TR SO_2 Group 1 allowance that was allocated for a control period in a prior year or the control period in the given year or in the immediately following year.

(e) Allowance Management System requirements. Each TR SO_2 Group 1 allowance shall be held in, deducted from, or transferred into, out of, or between Allowance Management System accounts in accordance with 40 CFR Part 97, Subpart CCCCC.

(f) Limited authorization. A TR SO_2 Group 1 allowance is a limited authorization to emit one ton of SO_2 during the control period in one year. Such authorization is limited in its use and duration as follows:

(1) Such authorization shall only be used in accordance with the TR SO_2 Group 1 Trading Program; and

(2) Notwithstanding any other provision of 40 CFR Part 97, Subpart CCCCC, the Administrator has the authority to terminate or limit the use and duration of such authorization to the extent the Administrator determines is necessary or appropriate to implement any provision of the Clean Air Act.

(g) Property right. A TR SO_2 Group 1 allowance does not constitute a property right.

H.6 Title V Permit Revision Requirements

(a) No title V permit revision shall be required for any allocation, holding, deduction, or transfer of TR NO_X Annual allowances in accordance with 40 CFR Part 97, Subpart AAAAA, TR NO_X Ozone Season allowances in accordance with 40 CFR Part 97, Subpart BBBBB, and TR SO_2 Group 1 allowances in accordance with 40 CFR Part 97, Subpart CCCCC.

(b) This permit incorporates the TR emissions monitoring, recordkeeping and reporting requirements pursuant to 40 CFR 97.430 through 97.435, 40 CFR 97.530 through 97.535, and 40 CFR 97.630 through 97.635, and the requirements for a continuous emission monitoring system (pursuant to 40 CFR part 75, subparts B and H), an excepted monitoring system (pursuant to 40 CFR part 75, appendices D and E), a low mass emissions excepted monitoring methodology (pursuant to 40 CFR 75.19), and an alternative monitoring system (pursuant to 40 CFR part 75, subpart E). Therefore, the Description of TR Monitoring Provisions table for units identified in this permit may be added to, or changed, in this title V permit using minor permit modification procedures in accordance with 40 CFR 97.406(d)(2), 40 CFR 97.506(d)(2), and 40 CFR 97.606(d)(2) and 70.7(e)(2)(i)(B) or 71.7(e)(1)(i)(B).

H.7 Additional recordkeeping and reporting requirements

(a) Unless otherwise provided, the owners and operators of each TR NO_X Annual source and each TR NO_X Annual unit, TR NO_X Ozone Season source and each TR NO_X Ozone Season unit, and TR SO_2 Group 1 source and each TR SO_2 Group 1 unit at the source shall keep on site at the source each of the following documents (in hardcopy or electronic format) for a period of 5 years from the date the document is created. This period may be extended for cause, at any time before the end of 5 years, in writing by the Administrator.

(1) The certificate of representation under 40 CFR 97.416, 40 CFR 97.516, and 40 CFR 97.616 for the designated representative for the source and each TR NO_X Annual unit, TR NOx Ozone Season unit, and TR SO_2 Group 1 unit at the source and all documents that demonstrate the truth of the statements in the certificate of representation; provided that the certificate and documents shall be retained on site at the source beyond such 5-year period until such certificate of representation and documents are superseded because of the submission of a new certificate of representation under 40 CFR 97.416, 40 CFR 97.516, and 40 CFR 97.616 changing the designated representative.

(2) All emissions monitoring information, in accordance with 40 CFR Part 97, Subpart AAAAA, 40 CFR Part 97, Subpart BBBBB, and 40 CFR Part 97, Subpart CCCCC.

(3) Copies of all reports, compliance certifications, and other submissions and all records made or required under, or to demonstrate compliance with the requirements of, the TR NO_X Annual Trading Program, TR NO_X Ozone Season Trading Program, and TR SO_2 Group 1 Trading Program.

(b) The designated representative of a TR NO_X Annual source and each TR NO_X Annual unit, a TR NO_X Ozone Season source and each TR NO_X Ozone Season unit, and a TR SO_2 Group 1 source and each TR SO_2 Group 1 unit at the source shall make all submissions required under the TR NO_X Annual Trading Program, TR NO_X Ozone Season Trading Program, and TR SO_2 Group 1 Trading Program, except as provided in 40 CFR 97.418, 40 CFR 97.518, and 40 CFR 97.618. This requirement does not change, create an exemption from, or otherwise affect the responsible official submission requirements under a title V operating permit program in 40 CFR Parts 70 and 71.

H.8 Liability

(a) Any provision of the TR NO_X Annual Trading Program that applies to a TR NO_X Annual source or the designated representative of a TR NO_X Annual source shall also apply to the owners and operators of such source and of the TR NO_X Annual units at the source.

(b) Any provision of the TR NO_X Annual Trading Program that applies to a TR NO_X Annual unit or the designated representative of a TR NO_X Annual unit shall also apply to the owners and operators of such unit.

(c) Any provision of the TR NO_X Ozone Season Trading Program that applies to a TR NO_X Ozone Season source or the designated representative of a TR NO_X Ozone Season source shall also apply to the owners and operators of such source and of the TR NO_X Ozone Season units at the source.

(d) Any provision of the TR NO_X Ozone Season Trading Program that applies to a TR NO_X Ozone Season unit or the designated representative of a TR NO_X Ozone Season unit shall also apply to the owners and operators of such unit.

(e) Any provision of the TR SO_2 Group 1 Trading Program that applies to a TR SO_2 Group 1 source or the designated representative of a TR SO_2 Group 1 source shall also apply to the owners and operators of such source and of the TR SO_2 Group 1 units at the source.

(f) Any provision of the TR SO_2 Group 1 Trading Program that applies to a TR SO_2 Group 1 unit or the designated representative of a TR SO_2 Group 1 unit shall also apply to the owners and operators of such unit.

H.9 Effect on Other Authorities

No provision of the TR NO_X Annual Trading Program or exemption under 40 CFR 97.405, TR NO_X Ozone Season Trading Program or exemption under 40 CFR 97.505, and TR SO_2 Group 1 Trading Program or exemption under 40 CFR 97.605 shall be construed as exempting or excluding the owners and operators, and the designated representative, of a TR NO_X Annual source or TR NO_X Annual unit, TR NO_X Ozone Season source or TR NO_X Ozone Season unit, and TR SO_2 Group 1 source or TR SO_2 Group 1 unit from compliance with any other provision of the applicable, approved state implementation plan, a federally enforceable permit, or the Clean Air Act.

H.10 Description of TR Monitoring Provisions

The TR subject unit(s) and the unit-specific monitoring provisions at this source are identified in the following table(s). These units are subject to the requirements for the TR NOx Annual Trading Program, TR NOx Ozone Season Trading Program, and TR SO2 Group 1 Trading Program.

Unit ID: 2 ORIS ID: 1012					
Parameter	Continuous emission monitoring system or systems (CEMS) requirements pursuant to 40 CFR part 75, subpart B (for SO_2 monitoring) and 40 CFR part 75, subpart H (for NO_X monitoring)	Excepted monitoring system requirements for gas- and oil-fired units pursuant to 40 CFR part 75, appendix D	Excepted monitoring system requirements for gas- and oil-fired peaking units pursuant to 40 CFR part 75, appendix E	Low Mass Emissions excepted monitoring (LME) requirements for gas- and oil-fired units pursuant to 40 CFR 75.19	EPA-approved alternative monitoring system requirements pursuant to 40 CFR part 75, subpart E
SO_2	x		----------		
NO_X	x	----------			
Heat input	x		----------		

Unit ID: 3 ORIS ID: 1012					
Parameter	Continuous emission monitoring system or systems (CEMS) requirements pursuant to 40 CFR part 75, subpart B (for SO_2 monitoring) and 40 CFR part 75, subpart H (for NO_X monitoring)	Excepted monitoring system requirements for gas- and oil-fired units pursuant to 40 CFR part 75, appendix D	Excepted monitoring system requirements for gas- and oil-fired peaking units pursuant to 40 CFR part 75, appendix E	Low Mass Emissions excepted monitoring (LME) requirements for gas- and oil-fired units pursuant to 40 CFR 75.19	EPA-approved alternative monitoring system requirements pursuant to 40 CFR part 75, subpart E
SO_2	x		----------		
NO_X	x	----------			
Heat input	x		----------		

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR QUALITY
COMPLIANCE AND ENFORCEMENT BRANCH
PART 70 OPERATING PERMIT
CERTIFICATION

Source Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station
Source Address: 3711 Darlington Road, Newburgh, Indiana 47630
Part 70 Permit No.: T173-43264-00001

This certification shall be included when submitting monitoring, testing reports/results or other documents as required by this permit.

Please check what document is being certified:

☐ Annual Compliance Certification Letter

☐ Test Result (specify) _____

☐ Report (specify) _____

☐ Notification (specify) _____

☐ Affidavit (specify) _____

☐ Other (specify) _____

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.
Signature:
Printed Name:
Title/Position:
Phone:
Date:

MALFUNCTION REPORT

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR QUALITY
COMPLIANCE AND ENFORCEMENT BRANCH
FAX NUMBER: (317) 233-6865
EMAIL: AirCompl@idem.in.gov

Source Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station
Source Address: 3711 Darlington Road, Newburgh, Indiana 47630
Permit No.: T173-43264-00001

For any malfunction lasting one (1) hour or longer, the Permittee must submit this form to the Office of Air Quality (OAQ), within four (4) daytime business hours of malfunction start.

If any of the following are not applicable, mark N/A. This form consists of two (2) pages.

Page 1 of 2

This malfunction resulted in a violation of the following Indiana Administrative Code, permit condition, and/or permit limit and meets the definition of "malfunction" as listed on reverse side (e.g., 326 IAC 5-1, Permit Condition D.1.1, 40 CFR 60.62, etc.):

Describe affected facility/equipment/operation (e.g., Coating Line #2, Boiler D, Diesel engine, No. 3 smelter, etc.):	
Control equipment (e.g., Baghouse B4, Thermal oxidizer for Paint Line #1, etc.):	
Description of the malfunction and cause:	
When the malfunction started:	Date (MM/DD/YYYY):
	Time (HH:MM):
When the malfunction was corrected or is expected to be corrected:	Date (MM/DD/YYYY):
	Time (HH:MM):

Type of pollutant(s) emitted (e.g., PM, PM10, PM2.5, VOC, etc.):
Estimated amount of pollutant(s) emitted during malfunction (e.g., VOC at 35 lbs/hr, 5 tons of PM, etc.):
Describe the corrective actions and interim control measures taken to minimize emissions (e.g., shut coating line down, isolated failing baghouse compartment, idled furnace operations until repairs completed, etc.):

Form completed by: _____

Title/position: _____

Signature:_____

Date:_____

Phone: _____

Email: _____

326 IAC 1-6-1 Applicability of rule

Sec. 1. This rule applies to the owner or operator of any facility required to obtain a permit under 326 IAC 2-5.1, 326 IAC 2-6.1, 326 IAC 2-7, or 326 IAC 2-8.

326 IAC 1-2-39 "Malfunction" definition

Sec. 39. Any sudden, unavoidable failure of any air pollution control equipment, process, or combustion or process equipment to operate in a normal and usual manner.

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR QUALITY
COMPLIANCE AND ENFORCEMENT BRANCH
PART 70 OPERATING PERMIT
QUARTERLY DEVIATION AND COMPLIANCE MONITORING REPORT

Source Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station
Source Address: 3711 Darlington Road, Newburgh, Indiana 47630
Part 70 Permit No.: T173-43264-00001

Months: _____ to _____ Year: _____

Page 1 of 2

This report shall be submitted quarterly based on a calendar year. Proper notice submittal under Section C - Malfunctions Report satisfies the reporting requirements of paragraph (a) of Section C-General Reporting. Any deviation from the requirements of this permit, the date(s) of each deviation, the probable cause of the deviation, and the response steps taken must be reported. A deviation required to be reported pursuant to an applicable requirement that exists independent of the permit, shall be reported according to the schedule stated in the applicable requirement and does not need to be included in this report. Additional pages may be attached if necessary. If no deviations occurred, please specify in the box marked "No deviations occurred this reporting period".

□ NO DEVIATIONS OCCURRED THIS REPORTING PERIOD.

□ THE FOLLOWING DEVIATIONS OCCURRED THIS REPORTING PERIOD

Permit Requirement (specify permit condition #)	
Date of Deviation:	**Duration of Deviation:**
Number of Deviations:	
Probable Cause of Deviation:	
Response Steps Taken:	

Permit Requirement (specify permit condition #)	
Date of Deviation:	**Duration of Deviation:**
Number of Deviations:	
Probable Cause of Deviation:	
Response Steps Taken:	

Permit Requirement (specify permit condition #)	
Date of Deviation:	**Duration of Deviation:**
Number of Deviations:	
Probable Cause of Deviation:	
Response Steps Taken:	
Permit Requirement (specify permit condition #)	
Date of Deviation:	**Duration of Deviation:**
Number of Deviations:	
Probable Cause of Deviation:	
Response Steps Taken:	
Permit Requirement (specify permit condition #)	
Date of Deviation:	**Duration of Deviation:**
Number of Deviations:	
Probable Cause of Deviation:	
Response Steps Taken:	

Form Completed by:_____

Title / Position: _____

Date:_____

Phone: _____

Addendum to the Technical Support Document (ATSD) for a Minor Permit Modification

Source Background and Description

Source Name:	**Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station**
Source Location:	**3711 Darlington Road, Newburgh, IN 47630**
County:	**Warrick**
SIC Code:	**4911 and 4922 (Electric Services & Natural Gas Transmission**
Operation Permit No.:	**T 173-43264-00001**
Operation Permit Issuance Date:	**August 17, 2021**
Minor Permit Modification No.:	**173-48980-00001**
Permit Reviewer:	**Hachem Ismaili Alaoui**

IDEM, OAQ has made the following revisions to the permit as described below due to the Emergency Affirmative Defense Removal, with deleted language as ~~strikeouts~~ and new language **bolded**.

Proposed Changes Due to Emergency Affirmative Defense Removal

In the Federal Register Notice 88 FR 47029 dated July 21, 2023, U.S. EPA finalized the removal of the "emergency" affirmative defense provisions from Clean Air Act operating permit program regulations effective August 21, 2023. A rulemaking to amend the Indiana rules at 326 IAC 2-7 (Part 70 Permit Program), 326 IAC 2-8 (Federally Enforceable State Operating Permit Program), and 326 IAC 1-6-1 (Malfunctions) was effective June 21, 2025, making them consistent with federal regulations. IDEM OAQ has determined that changes to the permit are required to be consistent with state and federal law. The permit is revised as shown below with deleted language as ~~strikeouts~~ and new language **bolded**.

(a) The permit is amended to remove Section B - Emergency Provisions and replace the section title with the word "Reserved", to remove the Emergency Occurrence Report form, and to remove any references to the requirements of Section B - Emergency Provisions from permit conditions.

(b) The permit is amended to include a new Section C - Malfunctions Report (and a new associated Malfunctions Report form) that incorporates the record keeping and reporting requirements of 326 IAC 1-6-2 (Records; Notice of Malfunction). All subsequent Section C conditions are renumbered accordingly. Permit Section C - General Reporting Requirements and the Quarterly Deviation And Compliance Monitoring Report form is amended to reference Section C - Malfunctions Report.

(c) Permit citations to definitions within 326 IAC 2-7-1 are amended throughout the permit as necessary, since the definitions under 326 IAC 2-7-1(12) and 326 IAC 2-7-1(20) have been deleted from the rule. Any occurrence of the following 326 IAC 2-7-1 definition citations are amended as shown below, with deleted language as strikeouts and new language **bolded**:

326 IAC 2-7-1~~(21)~~**(19)**
326 IAC 2-7-1~~(22)~~**(20)**
326 IAC 2-7-1~~(33)~~**(31)**
326 IAC 2-7-1~~(35)~~**(33)**
326 IAC 2-7-1~~(37)~~**(35)**
326 IAC 2-7-1~~(42)~~**(39)**

The Permit was revised as follows:

The Permittee must comply with all conditions of this permit. Noncompliance with any provisions of this permit is grounds for enforcement action; permit termination, revocation and reissuance, or modification; or denial of a permit renewal application. Noncompliance with any provision of this permit, except any provision specifically designated as not federally enforceable, constitutes a violation of the Clean Air Act. It shall not be a defense for the Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. ~~An emergency does constitute an affirmative defense in an enforcement action provided the Permittee complies with the applicable requirements set forth in Section B, Emergency Provisions.~~

*****

A.1 General Information [326 IAC 2-7-4(c)][326 IAC 2-7-5(14)][326 IAC 2-7-1(~~22~~**20**)]

*****

A.3 Specifically Regulated Insignificant Activities [326 IAC 2-7-1(~~21~~**19**)][326 IAC 2-7-4(c)][326 IAC 2-7-5(14)]

This stationary source also includes the following insignificant activities which are specifically regulated, as defined in 326 IAC 2-7-1(~~21~~**19**):

*****

A.4 Insignificant Activities [326 IAC 2-7-1(~~21~~**19**)][326 IAC 2-7-4(c)][326 IAC 2-7-5(14)]

This stationary source also includes the following insignificant activities, as defined in 326 IAC 2-7-1(~~21~~**19**):

*****

(aa) A laboratory as defined in 326 IAC 2-7-1(~~21~~**19**)(D).

*****

A.5 Part 70 Permit Applicability [326 IAC 2-7-2]

*****

(a) It is a major source, as defined in 326 IAC 2-7-1(~~22~~**20**);

*****

B.8 Certification [326 IAC 2-7-4(f)][326 IAC 2-7-6(1)][326 IAC 2-7-5(3)(C)]

(a) *****

(1) it contains a certification by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**), and

*****

*****

(c) A "responsible official" is defined at 326 IAC 2-7-1(~~35~~**33**).

*****

B.9 Annual Compliance Certification [326 IAC 2-7-6(5)]

*****

The submittal by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

B.10 Preventive Maintenance Plan [326 IAC 2-7-5(12)][326 IAC 1-6-3]

*****

(b) *****

The PMP extension notification does not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

(c) A copy of the PMPs shall be submitted to IDEM, OAQ upon request and within a reasonable time, and shall be subject to review and approval by IDEM, OAQ. IDEM, OAQ may require the Permittee to revise its PMPs whenever lack of proper maintenance causes or is the primary contributor to an exceedance of any limitation on emissions. The PMPs and their submittal do not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

******

*****

B.11 **Reserved**

~~Emergency Provisions [326 IAC 2-7-16]~~

~~(a) An emergency, as defined in 326 IAC 2-7-1(12), is not an affirmative defense for an action brought for noncompliance with a federal or state health-based emission limitation.~~

~~(b) An emergency, as defined in 326 IAC 2-7-1(12), constitutes an affirmative defense to an action brought for noncompliance with a technology-based emission limitation if the affirmative defense of an emergency is demonstrated through properly signed, contemporaneous operating logs or other relevant evidence that describe the following:~~

~~(1) An emergency occurred and the Permittee can, to the extent possible, identify the causes of the emergency;~~

~~(2) The permitted facility was at the time being properly operated;~~

~~(3) During the period of an emergency, the Permittee took all reasonable steps to minimize levels of emissions that exceeded the emission standards or other requirements in this permit;~~

~~(4) For each emergency lasting one (1) hour or more, the Permittee notified IDEM, OAQ or Southwest Regional Office within four (4) daytime business hours after the beginning of the emergency, or after the emergency was discovered or reasonably should have been discovered;~~

~~Telephone Number: 1-800-451-6027 (ask for Office of Air Quality, Compliance and Enforcement Branch), or~~
~~Telephone Number: 317-233-0178 (ask for Office of Air Quality, Compliance and Enforcement Branch)~~
~~Facsimile Number: 317-233-6865~~
~~Southwest Regional Office phone: (812) 380-2305; fax: (812) 380-2304.~~

~~(5) For each emergency lasting one (1) hour or more, the Permittee submitted the attached Emergency Occurrence Report Form or its equivalent, either by mail or facsimile to:~~

~~Indiana Department of Environmental Management~~
~~Compliance and Enforcement Branch, Office of Air Quality~~
~~Indiana Government Center North~~
~~100 North Senate Avenue, Room 13W~~
~~Indianapolis, Indiana 46204-2251~~

~~within two (2) working days of the time when emission limitations were exceeded due to the emergency.~~

~~The notice fulfills the requirement of 326 IAC 2-7-5(3)(C)(ii) and must contain the following:~~

~~(A) A description of the emergency;~~

~~(B) Any steps taken to mitigate the emissions; and~~

~~(C) Corrective actions taken.~~

~~The notification which shall be submitted by the Permittee does not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(35).~~

~~(6) The Permittee immediately took all reasonable steps to correct the emergency.~~

~~(c) In any enforcement proceeding, the Permittee seeking to establish the occurrence of an emergency has the burden of proof.~~

~~(d) This emergency provision supersedes 326 IAC 1-6 (Malfunctions). This permit condition is in addition to any emergency or upset provision contained in any applicable requirement.~~

~~(e) The Permittee seeking to establish the occurrence of an emergency shall make records available upon request to ensure that failure to implement a PMP did not cause or contribute to an exceedance of any limitations on emissions. However, IDEM, OAQ may require that the Preventive Maintenance Plans required under 326 IAC 2-7-4(c)(8) be revised in response to an emergency.~~

~~(f) Failure to notify IDEM, OAQ by telephone or facsimile of an emergency lasting more than one (1) hour in accordance with (b)(4) and (5) of this condition shall constitute a violation of 326 IAC 2-7 and any other applicable rules.~~

~~(g) If the emergency situation causes a deviation from a technology-based limit, the Permittee may continue to operate the affected emitting facilities during the emergency provided the Permittee immediately takes all reasonable steps to correct the emergency and minimize emissions.~~

*****

B.15 Permit Modification, Reopening, Revocation and Reissuance, or Termination [326 IAC 2-7-5(6)(C)][326 IAC 2-7-8(a)][326 IAC 2-7-9]

(a) This permit may be modified, reopened, revoked and reissued, or terminated for cause. The filing of a request by the Permittee for a Part 70 Operating Permit modification,

revocation and reissuance, or termination, or of a notification of planned changes or anticipated noncompliance does not stay any condition of this permit. [326 IAC 2-7-5(6)(C)] The notification by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

B.16 Permit Renewal [326 IAC 2-7-3][326 IAC 2-7-4][326 IAC 2-7-8(e)]

(a) The application for renewal shall be submitted using the application form or forms prescribed by IDEM, OAQ and shall include the information specified in 326 IAC 2-7-4. Such information shall be included in the application for each emission unit at this source, except those emission units included on the trivial or insignificant activities list contained in 326 IAC 2-7-1(~~21~~**19**) and 326 IAC 2-7-1(~~42~~**39**). The renewal application does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

B.17 Permit Amendment or Modification [326 IAC 2-7-11][326 IAC 2-7-12][40 CFR 72]

*****

(c) *****

Any such application does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

******

*****

B.19 Operational Flexibility [326 IAC 2-7-20][326 IAC 2-7-10.5]

*****

(b) The Permittee may make Section 502(b)(10) of the Clean Air Act changes (this term is defined at 326 IAC 2-7-1(~~37~~**35**)) without a permit revision, subject to the constraint of 326 IAC 2-7-20(a). For each such Section 502(b)(10) of the Clean Air Act change, the required written notification shall include the following:

*****

The notification which shall be submitted is not considered an application form, report or compliance certification. Therefore, the notification by the Permittee does not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

*****

B.22 Transfer of Ownership or Operational Control [326 IAC 2-7-11]

*****

(b) *****

Any such application does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

******

*****

C.8 Asbestos Abatement Projects [326 IAC 14-10][326 IAC 18][40 CFR 61, Subpart M]

*****

(d) *****

The notice shall include a signed certification from the owner or operator that the information provided in this notification is correct and that only Indiana licensed workers and project supervisors will be used to implement the asbestos removal project. The notifications do not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

C.9 Performance Testing [326 IAC 3-6]

(a) *****

no later than thirty-five (35) days prior to the intended test date. The protocol submitted by the Permittee does not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

(b) The Permittee shall notify IDEM, OAQ of the actual test date at least fourteen (14) days prior to the actual test date. The notification submitted by the Permittee does not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

*****

C.11 Compliance Monitoring [326 IAC 2-7-5(3)][326 IAC 2-7-6(1)][40 CFR 64][326 IAC 3-8]

*****

The notification which shall be submitted by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

C.16 Actions Related to Noncompliance Demonstrated by a Stack Test [326 IAC 2-7-5][326 IAC 2-7-6]

*****

(c) *******

The response action documents submitted pursuant to this condition do require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

C.17 Malfunctions Report [326 IAC 1-6-2]

Pursuant to 326 IAC 1-6-2 (Records; Notice of Malfunction):

(a) A record of all malfunctions, startups or shutdowns of any emission unit or emission control equipment, that results in violations of applicable air pollution control regulations or applicable emission limitations must be kept and retained for a period of three (3) years and be made available to the Indiana Department of Environmental Management (IDEM), Office of Air Quality (OAQ) or appointed representative upon request.

(b) When a malfunction of any emission unit or emission control equipment occurs that lasts more than one (1) hour, the condition shall be reported to OAQ, using the Malfunction Report Forms (2 pages). Notification must be made by telephone or

other electronic means, as soon as practicable, but in no event later than four (4) daytime business hours after the beginning of the occurrence.

(c) Failure to report a malfunction of any emission unit or emission control equipment shall constitute a violation of 326 IAC 1-6, and any other applicable rules. Information on the scope and expected duration of the malfunction must be provided, including the items specified in 326 IAC 1-6-2(c)(3)(A) through (E).

(d) Malfunction is defined as any sudden, unavoidable failure of any air pollution control equipment, process, or combustion or process equipment to operate in a normal and usual manner. [326 IAC 1-2-39]

*****

C.18 Emission Statement [326 IAC 2-7-5(3)(C)(iii)][326 IAC 2-7-5(7)][326 IAC 2-7-19(c)][326 IAC 2-6]

*****

(2) Indicate estimated actual emissions of regulated pollutants as defined by 326 IAC 2-7-1(~~33~~**31**) (“Regulated pollutant, which is used only for purposes of Section 19 of this rule”) from the source, for purpose of fee assessment.

*****

The emission statement does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

C.20 General Reporting Requirements [326 IAC 2-7-5(3)(C)][326 IAC 2-1.1-11][326 IAC 2-2][326 IAC 2-3][40 CFR 64][326 IAC 3-8]

(a) The Permittee shall submit the attached Quarterly Deviation and Compliance Monitoring Report or its equivalent. Proper notice submittal under ~~Section B - Emergency Provisions~~ **Section C - Malfunctions Report** satisfies the reporting requirements of this paragraph. Any deviation from permit requirements, the date(s) of each deviation, the cause of the deviation, and the response steps taken must be reported except that a deviation required to be reported pursuant to an applicable requirement that exists independent of this permit, shall be reported according to the schedule stated in the applicable requirement and does not need to be included in this report. This report shall be submitted not later than thirty (30) days after the end of the reporting period. The Quarterly Deviation and Compliance Monitoring Report shall include a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**). A deviation is an exceedance of a permit limitation or a failure to comply with a requirement of the permit.

*****

D.1.12 Reporting Requirements

(a) A quarterly summary of the thirty (30) day rolling weighted average PM emissions rate in pound per million Btu to document the compliance status with Condition D.1.2, as well as a quarterly summary of the information to document compliance with Condition D.1.3 shall be submitted not later than thirty (30) days after the end of the quarter being reported. Section C - General Reporting contains the Permittee's obligation with regard to the reporting required by this condition. The report submitted by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official," as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

*****

D.2.15 Reporting Requirements

(a) A quarterly summary of the information to document the compliance status with Conditions D.2.2 and D.2.3 shall be submitted not later than thirty (30) days after the end of the quarter being reported. Section C - General Reporting contains the Permittee's obligation with regard to the reporting required by this condition. The report submitted by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official," as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

*****

D.3.5 Broken or Failed Bag Detection

(a) For a single compartment baghouse/filter controlling emissions from a process operated continuously, a failed unit and the associated process shall be shut down immediately until the failed unit has been repaired or replaced. ~~Operations may continue only if the event qualifies as an emergency and the Permittee satisfies the requirements of the emergency provisions of this permit (Section B - Emergency Provisions).~~

(b) For a single compartment baghouse controlling emissions from a batch process, the feed to the process shall be shut down immediately until the failed unit has been repaired or replaced. The emissions unit shall be shut down no later than the completion of the processing of the material in the line. ~~Operations may continue only if the event qualifies as an emergency and the Permittee satisfies the requirements of the emergency provisions of this permit (Section B - Emergency Provisions).~~

*****

*****

D.4.5 Broken or Failed Bag Detection [326 IAC 2-7-6(1)][326 IAC 2-7-5(1)][40 CFR 64]

(a) For a single compartment fabric filter controlling emissions from a process operated continuously, a failed unit and the associated process shall be shut down immediately until the failed unit has been repaired or replaced. ~~Operations may continue only if the event qualifies as an emergency and the Permittee satisfies the requirements of the emergency provisions of this permit (Section B - Emergency Provisions).~~

(b) For a single compartment fabric filter controlling emissions from a batch process, the feed to the process shall be shut down immediately until the failed unit has been repaired or replaced. The emissions unit shall be shut down no later than the completion of the processing of the material in the emission units. ~~Operations may continue only if the event qualifies as an emergency and the Permittee satisfies the requirements of the emergency provisions of this permit (Section B - Emergency Provisions).~~

*****

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR QUALITY
COMPLIANCE AND ENFORCEMENT BRANCH
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251
Phone: (317) 233-0178
Fax: (317) 233-6865

PART 70 OPERATING PERMIT
EMERGENCY OCCURRENCE REPORT

Source Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station
Source Address: 3711 Darlington Road, Newburgh, Indiana 47630
Part 70 Permit No.: T173-43264-00001

This form consists of 2 pages Page 1 of 2

□ This is an emergency as defined in 326 IAC 2-7-1(12)
- The Permittee must notify the Office of Air Quality (OAQ), within four (4) daytime business hours (1-800-451-6027 or 317-233-0178, ask for Compliance Section); and
- The Permittee must submit notice in writing or by facsimile within two (2) working days (Facsimile Number: 317-233-6865), and follow the other requirements of 326 IAC 2-7-16.

If any of the following are not applicable, mark N/A

Facility/Equipment/Operation:
Control Equipment:
Permit Condition or Operation Limitation in Permit:
Description of the Emergency:
Describe the cause of the Emergency:

~~If any of the following are not applicable, mark N/A~~ ~~Page 2 of 2~~

~~Date/Time Emergency started:~~
~~Date/Time Emergency was corrected:~~
~~Was the facility being properly operated at the time of the emergency? Y N~~
~~Type of Pollutants Emitted: TSP, PM-10, SO_2, VOC, NO_x, CO, Pb, other:~~
~~Estimated amount of pollutant(s) emitted during emergency:~~
~~Describe the steps taken to mitigate the problem:~~
~~Describe the corrective actions/response steps taken:~~
~~Describe the measures taken to minimize emissions:~~
~~If applicable, describe the reasons why continued operation of the facilities are necessary to prevent imminent injury to persons, severe damage to equipment, substantial loss of capital investment, or loss of product or raw materials of substantial economic value:~~

~~Form Completed by: _____~~

~~Title / Position: _____~~

~~Date: _____~~

~~Phone: _____~~

MALFUNCTION REPORT

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR QUALITY
COMPLIANCE AND ENFORCEMENT BRANCH
FAX NUMBER: (317) 233-6865
EMAIL: AirCompl@idem.in.gov

Source Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station
Source Address: 3711 Darlington Road, Newburgh, Indiana 47630
Permit No.: T173-43264-00001

For any malfunction lasting one (1) hour or longer, the Permittee must submit this form to the Office of Air Quality (OAQ), within four (4) daytime business hours of malfunction start.

If any of the following are not applicable, mark N/A. This form consists of two (2) pages.

This malfunction resulted in a violation of the following Indiana Administrative Code, permit condition, and/or permit limit and meets the definition of "malfunction" as listed on reverse side (e.g., 326 IAC 5-1, Permit Condition D.1.1, 40 CFR 60.62, etc.):

Describe affected facility/equipment/operation (e.g., Coating Line #2, Boiler D, Diesel engine, No. 3 smelter, etc.):
Control equipment (e.g., Baghouse B4, Thermal oxidizer for Paint Line #1, etc.):
Description of the malfunction and cause:

When the malfunction started:	**Date (MM/DD/YYYY):**
	Time (HH:MM):
When the malfunction was corrected or is expected to be corrected:	**Date (MM/DD/YYYY):**
	Time (HH:MM):

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Type of pollutant(s) emitted (e.g., PM, PM10, PM2.5, VOC, etc.):
Estimated amount of pollutant(s) emitted during malfunction (e.g., VOC at 35 lbs/hr, 5 tons of PM, etc.):
Describe the corrective actions and interim control measures taken to minimize emissions (e.g., shut coating line down, isolated failing baghouse compartment, idled furnace operations until repairs completed, etc.):

Form completed by:_____

Title/position: _____

Signature: _____

Date: _____

Phone: _____

Email:_____

326 IAC 1-6-1 Applicability of rule

Sec. 1. This rule applies to the owner or operator of any facility required to obtain a permit under 326 IAC 2-5.1, 326 IAC 2-6.1, 326 IAC 2-7, or 326 IAC 2-8.

326 IAC 1-2-39 "Malfunction" definition

Sec. 39. Any sudden, unavoidable failure of any air pollution control equipment, process, or combustion or process equipment to operate in a normal and usual manner.

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QUARTERLY DEVIATION AND COMPLIANCE MONITORING REPORT

Source Name:	Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station
Source Address:	3711 Darlington Road, Newburgh, Indiana 47630
Part 70 Permit No.:	T173-43264-00001

This report shall be submitted quarterly based on a calendar year. Proper notice submittal under ~~Section B - Emergency Provisions~~ **Section C - Malfunctions Report** satisfies the reporting requirements of paragraph (a) of Section C-General Reporting. Any deviation from the requirements of this permit, the date(s) of each deviation, the probable cause of the deviation, and the response steps taken must be reported. A deviation required to be reported pursuant to an applicable requirement that exists independent of the permit, shall be reported according to the schedule stated in the applicable requirement and does not need to be included in this report. Additional pages may be attached if necessary. If no deviations occurred, please specify in the box marked "No deviations occurred this reporting period".

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IDEM Contact

(a) If you have any questions regarding this permit, please contact Hachem Ismaili Alaoui, Indiana Department Environmental Management, Office of Air Quality, Permits Branch, Indiana Government Center North, 100 North Senate Avenue, Room 13W, Indianapolis, Indiana 46204-2251, or by telephone at (317) 232-2827 or (800) 451-6027, and ask for Hachem Ismaili Alaoui or (317) 232-2827.

(b) A copy of the findings is available on the Internet at: http://www.in.gov/ai/appfiles/idem-caats/

(c) For additional information about air permits and how the public and interested parties can participate, refer to the IDEM Air Permits page on the Internet at: https://www.in.gov/idem/airpermit/public-participation/; and the Citizens' Guide to IDEM on the Internet at: https://www.in.gov/idem/resources/citizens-guide-to-idem/.

Indiana Department of Environmental Management
Office of Air Quality

Technical Support Document (TSD) for a Part 70 Minor Source Modification and Minor Permit Modification

Source Description and Location

Source Name:	**Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station**
Source Location:	**3711 Darlington Road, Newburgh, IN 47630**
County:	**Warrick**
SIC Code:	**4911 and 4922 (Electric Services & Natural Gas Transmission**
Operation Permit No.:	**T 173-43264-00001**
Operation Permit Issuance Date:	**August 17, 2021**
Minor Source Modification No.:	**173-48924-00001**
Minor Permit Modification No.:	**173-48980-00001**
Permit Reviewer:	**Hachem Ismaili Alaoui**

Existing Approvals

The source was issued Part 70 Operating Permit Renewal No. 173-43264-00001 on August 17, 2021. The source has since received the following approvals:

Permit Type	Permit Number	Issuance Date
Significant Source Modification	173-44846-00001	April 7, 2022
Significant Permit Modification	173-44874-00001	April 25, 2022

County Attainment Status

The source is located in Warrick County.

Pursuant to amendments to Indiana Code IC 13-17-3-14, effective July 1, 2023, a federal regulation that classifies or amends a designation of attainment, nonattainment, or unclassifiable for any area in Indiana under the federal Clean Air Act is effective and enforceable in Indiana on the effective date of the federal regulation.

Pollutant	Designation
SO_2	Unclassifiable or attainment effective April 9, 2018, for the 2010 primary 1-hour SO_2 standard. Cannot be classified effective March 3, 1978, for the national secondary standards.
CO	Unclassifiable or attainment effective November 15, 1990.
O_3	Unclassifiable or attainment effective January 16, 2018, for the 2015 8-hour ozone standard.
$PM_{2.5}$	Unclassifiable or attainment effective April 15, 2015, for the 2012 annual $PM_{2.5}$ standard.
$PM_{2.5}$	Unclassifiable or attainment effective December 13, 2009, for the 2006 24-hour $PM_{2.5}$ standard.
PM_{10}	Unclassifiable effective November 15, 1990.
NO_2	Unclassifiable or attainment effective January 29, 2012, for the 2010 NO_2 standard.
Pb	Unclassifiable or attainment effective December 31, 2011, for the 2008 lead standard.

(a) Ozone Standards
Volatile organic compounds (VOC) and Nitrogen Oxides (NO_x) are regulated under the Clean Air Act (CAA) for the purposes of attaining and maintaining the National Ambient Air Quality Standards (NAAQS) for ozone. Therefore, VOC and NO_x emissions are considered when evaluating the rule applicability relating to ozone. Warrick County has been designated as attainment or unclassifiable for ozone. Therefore, VOC and NO_x emissions were reviewed pursuant to the requirements of Prevention of Significant Deterioration (PSD), 326 IAC 2-2.

(b) $PM_{2.5}$
Warrick County has been classified as attainment for $PM_{2.5}$. Therefore, direct $PM_{2.5}$, SO_2, and NOx emissions were reviewed pursuant to the requirements of Prevention of Significant Deterioration (PSD), 326 IAC 2-2.

(c) Other Criteria Pollutants
Warrick County has been classified as attainment or unclassifiable in Indiana for all the other criteria pollutants. Therefore, these emissions were reviewed pursuant to the requirements for Prevention of Significant Deterioration (PSD), 326 IAC 2-2.

Fugitive Emissions

Since this source is classified as a fossil fuel-fired steam electric plants with boilers totaling more than two hundred fifty million (250,000,000) Btu per hour, it is considered one (1) of the twenty-eight (28) listed source categories, as specified in 326 IAC 2-2-1(ff)(1), 326 IAC 2-3-2(g), or 326 IAC 2-7-1(22)(B). Therefore, fugitive emissions are counted toward the determination of PSD, Emission Offset, and Part 70 Permit applicability.

The fugitive emissions of hazardous air pollutants (HAP) are counted toward the determination of Part 70 Permit applicability and source status under Section 112 of the Clean Air Act (CAA).

Greenhouse Gas (GHG) Emissions

On June 23, 2014, in the case of *Utility Air Regulatory Group v. EPA*, cause no. 12-1146, (available at http://www.supremecourt.gov/opinions/13pdf/12-1146_4g18.pdf) the United States Supreme Court ruled that the U.S. EPA does not have the authority to treat greenhouse gases (GHGs) as an air pollutant for the purpose of determining operating permit applicability or PSD Major source status. On July 24, 2014, the U.S. EPA issued a memorandum to the Regional Administrators outlining next steps in permitting decisions in light of the Supreme Court's decision. U.S. EPA's guidance states that U.S. EPA will no longer require PSD or Title V permits for sources "previously classified as 'Major' based solely on greenhouse gas emissions."

The Indiana Environmental Rules Board adopted the GHG regulations required by U.S. EPA at 326 IAC 2-2-1(zz), pursuant to Ind. Code § 13-14-9-8(h) (Section 8 rulemaking). A rule, or part of a rule, adopted under Section 8 is automatically invalidated when the corresponding federal rule, or part of the rule, is invalidated. Due to the United States Supreme Court Ruling, IDEM, OAQ cannot consider GHG emissions to determine operating permit applicability or PSD applicability to a source or modification.

Source Status - Existing Source

The table below summarizes the potential to emit of the entire source, prior to the proposed modification, after consideration of all enforceable limits established in the effective permits. If the control equipment

has been determined to be integral, the table reflects the potential to emit (PTE) after consideration of the integral control device.

	Source-Wide Emissions Prior to Modification (ton/year)								
	PM[1]	**PM_{10}[1]**	**$PM_{2.5}$[1, 2]**	**SO_2**	**NO_X**	**VOC**	**CO**	**Single HAP[3]**	**Total HAPs**
Total PTE of Entire Source Including Fugitives*	>100	>100	>100	>100	>100	90	>100	>10	>25
Title V Major Source Thresholds	NA	100	100	100	100	100	100	10	25
PSD Major Source Thresholds	100	100	100	100	100	100	100	--	--

[1]Under the Part 70 Permit program (40 CFR 70), PM_{10} and $PM_{2.5}$, not particulate matter (PM), are each considered as a "regulated air pollutant."

[2]$PM_{2.5}$ listed is direct $PM_{2.5}$.

[3]Single highest source-wide HAP (HCl)

*Fugitive HAP emissions are always included in the source-wide emissions.

(a) This existing source is a major stationary source, under PSD (326 IAC 2-2), because a PSD regulated pollutant(s), PM, PM10, PM2.5, SO2, NOx, and CO, is emitted at a rate of 100 tons per year or more, and it is one of the twenty-eight (28) listed source categories, as specified in 326 IAC 2-2-1(ff)(1).

(b) This existing source is a major source of HAP, as defined in 40 CFR 63.2, because HAP emissions are equal to or greater than ten (10) tons per year for a single HAP and equal to or greater than twenty-five (25) tons per year for a combination of HAPs.

(c) These emissions are based on the TSD of SSM No. 173-44846-00001, issued on April 7, 2022.

Description of Proposed Modification

The Office of Air Quality (OAQ) has reviewed an application, submitted by SIGECO - F.B. Culley Generating Station on April 3, 2025, relating to construction and operation of one (1) limestone storage pile covering an area of two (2) acres, Two (2) limestone material handling drop points associated with the storage pile, and paved and unpaved roads traffic associated with limestone handling and storage.

The following is a list of the new emission units:

(a) One (1) limestone drop to storage pile, approved in 2025 for construction, with a maximum capacity of 11.42 tons per hour, using no controls, and exhausting outdoors.

(b) One (1) limestone storage pile, approved in 2025 for construction, covering an area of two (2) acres.

(c) One (1) limestone drop to truck, approved in 2025 for construction, with a maximum capacity of 11.42 tons per hour, using no controls, and exhausting outdoors.

(d) Paved and Unpaved Roads.

Enforcement Issues

There are no pending enforcement actions related to this modification.

Emission Calculations

See Appendix A of this Technical Support Document for detailed emission calculations.

Permit Level Determination – Part 70 Modification to an Existing Source

Pursuant to 326 IAC 2-1.1-1(12), Potential to Emit is defined as "the maximum capacity of a stationary source or emission unit to emit any air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or type or amount of material combusted, stored, or processed shall be treated as part of its design if the limitation is enforceable by the U. S. EPA, IDEM, or the appropriate local air pollution control agency."

The following table is used to determine the appropriate permit level under 326 IAC 2-7-10.5. This table reflects the PTE before controls. If the control equipment has been determined to be integral, the table reflects the potential to emit (PTE) after consideration of the integral control device.

	PTE Before Controls of the New Emission Units (ton/year)							
Process / Emission Unit	**PM**	**PM_{10}**	**$PM_{2.5}$[1]**	**SO_2**	**NO_X**	**VOC**	**CO**	**Total HAPs**
Limestone Storage Pile	1.49	0.74	0.30	--	--	--	--	--
Limestone Drop to Storage Pile	0.15	0.06	0.06	--	--	--	--	--
Limestone Drop to Truck	0.15	0.06	0.06	--	--	--	--	--
Paved Roads	3.59	0.72	0.18	--	--	--	--	--
Unpaved Roads	6.80	1.81	0.18	--	--	--	--	--
Total PTE Before Controls of the New Emission Units:	**12.18**	**3.38**	**0.76**	**--**	**--**	**--**	**--**	**--**

[1] $PM_{2.5}$ listed is direct $PM_{2.5}$.

Appendix A of this TSD reflects the detailed potential emissions of the modification.

(a) Approval to Construct

Pursuant to 326 IAC 2-7-10.5(e)(1)(A), a Minor Source Modification is required because this modification has the potential to emit PM that is less than twenty-five (25) tons per year and equal to or greater than five (5) tons per year.

(b) Approval to Operate

Pursuant to 326 IAC 2-7-12(b)(1), this change to the permit is being made through a Minor Permit Modification because:

(A) The modification does not violate any applicable requirement.

(B) The modification does not involve significant changes to existing monitoring, reporting or record keeping requirements in the Part 70 permit.

(C) The modification does not require or change:
  (i) a case-by-case determination of an emission limitation or other standard;
  (ii) source specific determination for temporary sources of ambient impacts; or
  (iii) visibility or increment analysis.

(D) The modification does not seek to establish or change a Part 70 permit term or condition for which there is no corresponding underlying applicable requirement and that the source has assumed to avoid an applicable requirement to which the source would otherwise be subject. This includes the following:
  (i) A federally enforceable emissions cap assumed to avoid classification as a modification under any provision of Title I of the CAA.

(ii) An alternative emissions limit approved under regulations promulgated under Section 112(i)(5) of the CAA.

(E) This change is not a modification under any provision of Title I of the CAA.

(F) This change is not required by the Part 70 program to be processed as a significant modification.

Permit Level Determination – PSD Emissions Increase

(a) Actual to Potential (ATP) Applicability Test

Since this project only involves the construction of new emissions units and/or emissions units considered new for this evaluation, an Actual to Potential (ATP) applicability test, specified in 326 IAC 2-2-2(d)(4), is used to determine if the project results in a Significant Emissions Increase.

The following proposed emissions unit(s) are considered as new emissions units for this evaluation.

(1) One (1) limestone drop to storage pile, approved in 2025 for construction, with a maximum capacity of 11.42 tons per hour, using no controls, and exhausting outdoors.

(2) One (1) limestone storage pile, approved in 2025 for construction, covering an area of two (2) acres.

(3) One (1) limestone drop to truck, approved in 2025 for construction, with a maximum capacity of 11.42 tons per hour, using no controls, and exhausting outdoors.

(4) Paved and Unpaved Roads.

(b) Actual to Potential (ATP) Summary

The Emissions Increase of the project is the sum of the difference between the potential to emit (PTE) from **each new emissions** unit following completion of the project and the baseline actual emissions of these units before the project.

$ATP_{(new\ unit)} = PTE_{(new\ unit)} - Baseline\ Emissions_{(new\ unit)}$

See Appendix A of this Technical Support Document for detailed emission calculations.

Project Emissions Increase (tons/year)								
Process/Emissions Unit	**PM**	**PM_{10}**	**$PM_{2.5}$***	**SO_2**	**NO_X**	**VOC**	**CO**	**GHGs**
Limestone Storage Pile	1.49	0.74	0.30	--	--	--	--	--
Limestone Drop to Storage Pile	0.15	0.06	0.06	--	--	--	--	--
Limestone Drop to Truck	0.15	0.06	0.06	--	--	--	--	--
Paved Roads	3.59	0.72	0.18	--	--	--	--	--
Unpaved Roads	6.80	1.81	0.18	--	--	--	--	--
Project Emissions Increase	**12.18**	**3.38**	**0.76**	**--**	**--**	**--**	**--**	**--**
Significant Levels	25	15	10	40	40	40	100	75,000 CO_2e

*PM2.5 listed is direct PM2.5.
Any values that are highlighted in gray correspond to the limited potential to emit.

See Technical Support Document (TSD) State Rule Applicability - Entire Source section, 326 IAC 2-2 (PSD) and 326 IAC 2-3 (Emission Offset) applicability determination for more information regarding the limits.

(c) Upstream/Downstream Increased Utilization
The proposed new emission units will be an alternative way to deliver limestone to the existing limestone handling process which will not result in an increase or decrease in limestone usage. It is just a different limestone delivery method. Therefore, there will be no potential increase utilization of any upstream or downstream emissions due to the construction and operation of these proposed new units.

(d) Conclusion
This modification to an existing major PSD stationary source is not major because the Emissions Increase of each PSD regulated pollutant is less than the PSD significant level (i.e., the modification does not cause a Significant Emissions Increase). Therefore, pursuant to 326 IAC 2-2, the PSD requirements do not apply.

PTE of the Entire Source After Issuance of the Part 70 Modification

The table below summarizes the after issuance source-wide potential to emit, reflecting all limits, of the emission units. Any control equipment is considered federally enforceable only after issuance of the Part 70 modification, and only to the extent that the effect of the control equipment is made practically enforceable in the permit. If the control equipment has been determined to be integral, the table reflects the potential to emit (PTE) after consideration of the integral control device.

	Source-Wide Emissions After Issuance (ton/year)								
	PM[1]	**PM_{10}[1]**	**$PM_{2.5}$[1, 2]**	**SO_2**	**NO_X**	**VOC**	**CO**	**Single HAP[3]**	**Total HAPs**
Total PTE of Entire Source Including Fugitives*	**329.72**	**596.87**	**474.07**	**4,693.03**	**3,451.79**	**90.50**	**1,382.07**	**32.89**	**85.74**
Title V Major Source Thresholds	NA	100	100	100	100	100	100	10	25
PSD Major Source Thresholds	100	100	100	100	100	100	100	--	--

[1]Under the Part 70 Permit program (40 CFR 70), PM_{10} and $PM_{2.5}$, not particulate matter (PM), are each considered as a "regulated air pollutant."
[2]$PM_{2.5}$ listed is direct $PM_{2.5}$.
[3]Single highest source-wide HAP (HCl)
*Fugitive HAP emissions are always included in the source-wide emissions.

(a) This existing major PSD stationary source will continue to be major under 326 IAC 2-2 because at least one pollutant, PM, PM10, PM2.5, SO2, NOx, and CO, has emissions equal to or greater than the PSD major source threshold.

(b) This existing major source of HAP will continue to be a major source of HAP, as defined in 40 CFR 63.2, because HAP emissions will continue to be equal to or greater than ten (10) tons per year for any single HAP and/or equal to or greater than twenty-five (25) tons per year of a combination of HAPs. Therefore, this source is a major source under Section 112 of the Clean Air Act (CAA).

Federal Rule Applicability Determination

Due to the modification at this source, federal rule applicability has been reviewed as follows:

New Source Performance Standards (NSPS):

(a) The requirements of the New Source Performance Standard for Nonmetallic Mineral Processing Plants, 40 CFR 60, Subpart OOO and 326 IAC 12, are not included in the permit for emission units listed below, because these units are not one (1) of the following affected facilities in fixed or portable nonmetallic mineral processing plants: each crusher, grinding mill, screening operation, bucket elevator, belt conveyor, bagging operation, storage bin, enclosed truck or railcar loading station.

(1) One (1) limestone drop to storage pile, approved in 2025 for construction, with a maximum capacity of 11.42 tons per hour, using no controls, and exhausting outdoors.

(2) One (1) limestone storage pile, approved in 2025 for construction, covering an area of two (2) acres.

(3) One (1) limestone drop to truck, approved in 2025 for construction, with a maximum capacity of 11.42 tons per hour, using no controls, and exhausting outdoors.

(b) There are no other New Source Performance Standards (40 CFR Part 60) and 326 IAC 12 included in the permit for this proposed modification.

National Emission Standards for Hazardous Air Pollutants (NESHAP):

(c) There are no National Emission Standards for Hazardous Air Pollutants (NESHAPs) (40 CFR Part 63, 326 IAC 14, and 326 IAC 20) included in the permit for this proposed modification.

Compliance Assurance Monitoring (CAM):

(a) Pursuant to 40 CFR 64.2, Compliance Assurance Monitoring (CAM) is applicable to each pollutant-specific emission unit that meets the following criteria:

(1) has a potential to emit before controls equal to or greater than the major source threshold for the regulated pollutant involved;

(2) is subject to an emission limitation or standard for that pollutant (or a surrogate thereof); and

(3) uses a control device, as defined in 40 CFR 64.1, to comply with that emission limitation or standard.

(b) Pursuant to 40 CFR 64.2(b)(1)(i), emission limitations or standards proposed after November 15, 1990 pursuant to a NSPS or NESHAP under Section 111 or 112 of the Clean Air Act are exempt from the requirements of CAM. Therefore, an evaluation was not conducted for any emission limitations or standards proposed after November 15, 1990 pursuant to a NSPS or NESHAP under Section 111 or 112 of the Clean Air Act.

(c) Pursuant to 40 CFR 64.2(b)(1)(iii), Acid Rain requirements pursuant to Sections 404, 405, 406, 407(a), 407(b), or 410 of the Clean Air Act are exempt emission limitations or standards. Therefore, CAM was not evaluated for emission limitations or standards for SO_2 and NO_X under the Acid Rain Program.

(d) Pursuant to 40 CFR 64.3(d), if a continuous emission monitoring system (CEMS) is required pursuant to other federal or state authority, the owner or operator shall use the CEMS to satisfy the requirements of CAM according to the criteria contained in 40 CFR 64.3(d).

Based on this evaluation, the requirements of 40 CFR Part 64, CAM, are not applicable to any of the new units as part of this modification.

State Rule Applicability - Entire Source

Due to this modification, state rule applicability has been reviewed as follows:

326 IAC 2-2 (PSD) and 326 IAC 2-3 (Emission Offset)
PSD and Emission Offset applicability is discussed under the Permit Level Determination – PSD and Emission Offset section and the Permit Level Determination - PSD Emissions Increase of this document.

326 IAC 2-4.1 (Major Sources of Hazardous Air Pollutants (HAP))
The provisions of 326 IAC 2-4.1 apply to any owner or operator who constructs or reconstructs a major source of hazardous air pollutants (HAP), as defined in 40 CFR 63.41, after July 27, 1997, unless the major source has been specifically regulated under or exempted from regulation under a NESHAP that was issued pursuant to Section 112(d), 112(h), or 112(j) of the Clean Air Act (CAA) and incorporated under 40 CFR 63. On and after June 29, 1998, 326 IAC 2-4.1 is intended to implement the requirements of Section 112(g)(2)(B) of the Clean Air Act (CAA).

The operation of one (1) limestone drop to storage pile, one (1) limestone storage pile, and one (1) limestone drop to truck will emit less than ten (10) tons per year for a single HAP and less than twenty-five (25) tons per year for a combination of HAPs. Therefore, 326 IAC 2-4.1 does not apply.

326 IAC 2-7-6(5) (Annual Compliance Certification)
The U.S. EPA Federal Register 79 FR 54978 notice does not exempt Title V Permittees from the requirements of 40 CFR 70.6(c)(5)(iv) or 326 IAC 2-7-6(5)(D), but the submittal of the Title V annual compliance certification to IDEM satisfies the requirement to submit the Title V annual compliance certifications to EPA. IDEM does not intend to revise any permits since the requirements of 40 CFR 70.6(c)(5)(iv) or 326 IAC 2-7-6(5)(D) still apply, but Permittees can note on their Title V annual compliance certifications that submission to IDEM has satisfied reporting to EPA per Federal Register 79 FR 54978. This only applies to Title V Permittees and Title V compliance certifications.

326 IAC 5-1 (Opacity Limitations)
This source is subject to the opacity limitations specified in 326 IAC 5-1-2(1)

326 IAC 6-4 (Fugitive Dust Emissions Limitations)
Pursuant to 326 IAC 6-4 (Fugitive Dust Emissions Limitations), the source shall not allow fugitive dust to escape beyond the property line or boundaries of the property, right-of-way, or easement on which the source is located, in a manner that would violate 326 IAC 6-4.

326 IAC 6-5 (Fugitive Particulate Matter Emission Limitations)
This source was constructed after December 13, 1985, and has potential fugitive particulate emissions of twenty-five (25) tons per year or more. Pursuant to 326 IAC 6-5 (Fugitive Particulate Matter Emission Limitations), fugitive particulate matter emissions shall be controlled according to the Fugitive Dust Control Plan that is included as Attachment A to the permit.

326 IAC 6.5 (Particulate Matter Limitations Except Lake County)
Pursuant to 326 IAC 6.5-1-1(a), this source (located in Warrick County) is not subject to the requirements of 326 IAC 6.5 because it is not located in one of the following counties: Clark, Dearborn, Dubois, Howard, Marion, St. Joseph, Vanderburgh, Vigo or Wayne.

326 IAC 6.8 (Particulate Matter Limitations for Lake County)
Pursuant to 326 IAC 6.8-1-1(a), this source (located in Warrick County) is not subject to the requirements of 326 IAC 6.8 because it is not located in Lake County.

326 IAC 6.8 (Lake County: Fugitive Particulate Matter)
Pursuant to 326 IAC 6.8-10-1, this source (located in Warrick County) is not subject to the requirements of 326 IAC 6.8-10 because it is not located in Lake County.

State Rule Applicability – Individual Facilities

Due to this modification, state rule applicability has been reviewed as follows:

Limestone Storage Pile

326 IAC 6-3-2 (Particulate Emission Limitations for Manufacturing Processes)
Pursuant to 326 IAC 6-3-1(b)(14), the limestone storage pile is not subject to the requirements of 326 IAC 6-3, since it is a manufacturing process with potential emissions less than five hundred fifty-one thousandths (0.551) pound per hour.

Limestone Drop to Storage Pile

326 IAC 6-3-2 (Particulate Emission Limitations for Manufacturing Processes)
Pursuant to 326 IAC 6-3-1(b)(14), the limestone drop to storage pile is not subject to the requirements of 326 IAC 6-3, since it is a manufacturing process with potential emissions less than five hundred fifty-one thousandths (0.551) pound per hour.

Limestone Drop to Truck

326 IAC 6-3-2 (Particulate Emission Limitations for Manufacturing Processes)
Pursuant to 326 IAC 6-3-1(b)(14), the limestone drop to truck is not subject to the requirements of 326 IAC 6-3, since it is a manufacturing process with potential emissions less than five hundred fifty-one thousandths (0.551) pound per hour.

Compliance Determination and Monitoring Requirements

Permits issued under 326 IAC 2-7 are required to assure that sources can demonstrate compliance with all applicable state and federal rules on a continuous basis. All state and federal rules contain compliance provisions; however, these provisions do not always fulfill the requirement for a continuous demonstration. When this occurs, IDEM, OAQ, in conjunction with the source, must develop specific conditions to satisfy 326 IAC 2-7-5. As a result, Compliance Determination Requirements are included in the permit. The Compliance Determination Requirements in Section D of the permit are those conditions that are found directly within state and federal rules and the violation of which serves as grounds for enforcement action.

If the Compliance Determination Requirements are not sufficient to demonstrate continuous compliance, they will be supplemented with Compliance Monitoring Requirements, also in Section D of the permit. Unlike Compliance Determination Requirements, failure to meet Compliance Monitoring conditions would serve as a trigger for corrective actions and not grounds for enforcement action. However, a violation in relation to a compliance monitoring condition will arise through a source's failure to take the appropriate corrective actions within a specific time period.

There are no new or modified compliance requirements included with this modification.

Proposed Changes

As part of this permit approval, the permit may contain new or different permit conditions and some conditions from previously issued permits/approvals may have been corrected, changed, or removed. These corrections, changes, and removals may include Title I changes.

The following changes listed below are due to the proposed modification. Deleted language appears as ~~strikethrough~~ text and new language appears as **bold** text (these changes may include Title I changes):

(1) Section A.2(c) of the permit has been modified to include the new emission units description.

A.2 Emission Units and Pollution Control Equipment Summary [326 IAC 2-7-4(c)(3)][326 IAC 2-7-5(14)]

This stationary source consists of the following emission units and pollution control devices:

*****

(e) A limestone handling facility, identified as Unit 7, constructed in 1994, consisting of the following operations:

*****

(16) One (1) limestone drop to storage pile, approved in 2025 for construction, with a maximum capacity of 11.42 tons per hour, using no controls, and exhausting outdoors.

(17) One (1) limestone storage pile, approved in 2025 for construction, covering an area of two (2) acres.

(18) One (1) limestone drop to truck, approved in 2025 for construction, with a maximum capacity of 11.42 tons per hour, using no controls, and exhausting outdoors.

Additional Changes

IDEM, OAQ made additional changes to the permit as described below in order to update the language to match the most current version of the applicable rule, to eliminate redundancy within the permit, and to provide clarification regarding the requirements of these conditions.

IDEM, OAQ has made model updates to standard permit language in the Sections B, C, D, E, and associated reporting forms of the permit to help clarify the intent of these requirements.

B.9 Annual Compliance Certification [326 IAC 2-7-6(5)]

*****

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Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, **Room 13W**
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Indianapolis, Indiana 46204-2251

*****

B.10 Preventive Maintenance Plan [326 IAC 2-7-5(12)][326 IAC 1-6-3]

*****

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*****

B.11 Emergency Provisions [326 IAC 2-7-16]

*****

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Compliance and Enforcement Branch, Office of Air Quality
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100 North Senate Avenue, **Room 13W**
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*****

B.16 Permit Renewal [326 IAC 2-7-3][326 IAC 2-7-4][326 IAC 2-7-8(e)]

*****

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Permit Administration and Support Section, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, **Room 13W**
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Indianapolis, Indiana 46204-2251

*****

B.17 Permit Amendment or Modification [326 IAC 2-7-11][326 IAC 2-7-12][40 CFR 72]

*****

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Permit Administration and Support Section, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, **Room 13W**
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*****

B.19 Operational Flexibility [326 IAC 2-7-20][326 IAC 2-7-10.5]

*****

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Permit Administration and Support Section, Office of Air Quality
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*****

B.22 Transfer of Ownership or Operational Control [326 IAC 2-7-11]

*****

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Permit Administration and Support Section, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, **Room 13W**
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Indianapolis, Indiana 46204-2251

*****

C.8 Asbestos Abatement Projects [326 IAC 14-10][326 IAC 18][40 CFR 61, Subpart M]

*****

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, **Room 13W**
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*****

C.9 Performance Testing [326 IAC 3-6]

*****

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*****

C.11 Compliance Monitoring [326 IAC 2-7-5(3)][326 IAC 2-7-6(1)][40 CFR 64][326 IAC 3-8]

*****

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, **Room 13W**
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Indianapolis, Indiana 46204-2251

*****

C.17 Emission Statement [326 IAC 2-7-5(3)(C)(iii)][326 IAC 2-7-5(7)][326 IAC 2-7-19(c)][326 IAC 2-6]

*****

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
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*****

C.19 General Reporting Requirements [326 IAC 2-7-5(3)(C)][326 IAC 2-1.1-11][326 IAC 2-2][326 IAC 2-3][40 CFR 64][326 IAC 3-8]

*****

(b) The address for report submittal is:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, **Room 13W**
~~MC 61-53 IGCN 1003~~
Indianapolis, Indiana 46204-2251

*****

(f) The report for project at an existing emissions unit shall be submitted no later than sixty (60) days after the end of the year and contain the following:

*****

Reports required in this part shall be submitted to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, **Room 13W**
~~MC 61-53 IGCN 1003~~
Indianapolis, Indiana 46204-2251

*****

E.1.1 General Provisions Relating to New Source Performance Standards [326 IAC 12-1][40 CFR Part 60, Subpart A]

*****

(b) Pursuant to 40 CFR 60.4, the Permittee shall submit all required notifications and reports to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, **Room 13W**
~~MC 61-53 IGCN 1003~~
Indianapolis, Indiana 46204-2251

*****

E.2.1 General Provisions Relating to New Source Performance Standards [326 IAC 12-1][40 CFR Part 60, Subpart A]

*****

(b) Pursuant to 40 CFR 60.4, the Permittee shall submit all required notifications and reports to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, **Room 13W**
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Indianapolis, Indiana 46204-2251

*****

E.3.1 General Provisions Relating to National Emission Standards for Hazardous Air Pollutants under 40 CFR Part 63 [326 IAC 20-1][40 CFR Part 63, Subpart A]

*****

(b) Pursuant to 40 CFR 63.10, the Permittee shall submit all required notifications and reports to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, **Room 13W**
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Indianapolis, Indiana 46204-2251

*****

E.4.1 General Provisions Relating to National Emission Standards for Hazardous Air Pollutants under 40 CFR Part 63 [326 IAC 20-1][40 CFR Part 63, Subpart A]

*****

(b) Pursuant to 40 CFR 63.10, the Permittee shall submit all required notifications and reports to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, **Room 13W**
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Indianapolis, Indiana 46204-2251

*****

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR QUALITY
COMPLIANCE AND ENFORCEMENT BRANCH
Indiana Government Center North
100 North Senate Avenue, **Room 13W**
~~MC 61-53 IGCN 1003~~
Indianapolis, Indiana 46204-2251
Phone: (317) 233-0178
Fax: (317) 233-6865

Conclusion and Recommendation

Unless otherwise stated, information used in this review was derived from the application and additional information submitted by the applicant. An application for the purposes of this review was received on April 3, 2025.

The construction of this proposed modification shall be subject to the conditions of the attached proposed Part 70 Minor Source Modification No. 173-48924-00001. The operation of this proposed modification shall be subject to the conditions of the attached proposed Minor Permit Modification No. 173-48980-00001.

The staff recommends to the Commissioner that the Part 70 Minor Source Modification and Minor Permit Modification be approved.

IDEM Contact

(a) If you have any questions regarding this permit, please contact Hachem Ismaili Alaoui, Indiana Department Environmental Management, Office of Air Quality, Permits Branch, Indiana Government Center North, 100 North Senate Avenue, Room 13W, Indianapolis, Indiana 46204-2251, or by telephone at (317) 232-2827 or (800) 451-6027, and ask for Hachem Ismaili Alaoui or (317) 232-2827.

(b) A copy of the findings is available on the Internet at: http://www.in.gov/ai/appfiles/idem-caats/

(c) For additional information about air permits and how the public and interested parties can participate, refer to the IDEM Air Permits page on the Internet at: https://www.in.gov/idem/airpermit/public-participation/; and the Citizens' Guide to IDEM on the Internet at: https://www.in.gov/idem/resources/citizens-guide-to-idem/.

Appendix A: Emissions Calculations
PTE Summary for Entire Source

Company Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
Address City IN Zip: 3711 Darlington Road, Newburgh, Indiana 47630
Minor Source Modification: 173-48924-00001
Minor Permit Modification: 173-48980-00001
Reviewer: Hachem Ismaili Alaoui

Uncontrolled PTE							
	PM	PM_{10}	$PM_{2.5}$	SO_2	NOx	VOC	CO
Boiler Unit 2 (worst case fuel)	28,737	6,609	1,724	27,300	2,258	25	379
Boiler Unit 3 (worst case fuel)	75,925	17,463	4,556	72,129	5,966	66	1,002
Unit 5F - Coal Handling	21	21	21	-	-	-	-
Unit 6 - Fly Ash	268	268	268	-	-	-	-
Unit 7 - Limestone Handling	293	293	293	-	-	-	-
Unit 7 - Limestone Drop & Storage	1.79	0.85	0.41	-	-	-	-
Unit 8 - Gypsum Handling	257	257	257	-	-	-	-
FGD System	0.0	0.0	0.0	-	-	-	-
Small NG Combustion Units	0.01	0.04	0.04	2.83E-03	0.47	0.03	0.40
Kerosene Combustion Units	0.02	0.01	0.01	0.58	0.16	2.76E-03	0.04
Propane Combustion Units	0.00	0.01	0.01	1.20E-03	0.16	0.01	0.09
Paved Roads	38.49	7.70	1.89	-	-	-	-
Unpaved Roads	7.60	2.03	0.20	-	-	-	-
Total	**105,549**	**24,922**	**7,122**	**99,429**	**8,223**	**90**	**1,382**

Limited and Controlled PTE							
	PM	PM_{10}	$PM_{2.5}$	SO_2	NOx	VOC	CO
Boiler Unit 2 (Notes 1, 3, 5, 6 and 7)	136	181	131	1,086	2,258	25	379
Boiler Unit 3 (Notes 2, 5, 8 and 9)	179	406	334	3,606	1,193	66	1,002
Unit 5F - Coal Handling	0.17	0.17	0.17	-	-	-	-
Unit 6 - Fly Ash	2.66	2.66	2.66	-	-	-	-
Unit 7 - Limestone Handling	2.93	2.93	2.93	-	-	-	-
Unit 7 - Limestone Drop & Storage	1.79	0.85	0.41	-	-	-	-
Unit 8 - Gypsum Handling	2.57	2.57	2.57	-	-	-	-
FGD System	0.0	0.0	0.0	-	-	-	-
Small NG Combustion Units	0.01	0.04	0.04	2.83E-03	0.47	0.03	0.40
Kerosene Combustion Units	0.02	0.01	0.01	0.58	0.16	2.76E-03	0.04
Propane Combustion Units	0.00	0.01	0.01	1.20E-03	0.16	0.01	0.09
Paved Roads (Note 4)	3.85	0.77	0.19	-	-	-	-
Unpaved Roads (Note 4)	0.76	0.20	0.020	-	-	-	-
Total	**329.72**	**596.87**	**474.07**	**4,693.03**	**3,451.79**	**90.50**	**1,382.07**

Note 1: For Unit 2: SO2 is limited by Consent Decree IP99-1692-C-M/F.

Note 2: For Unit 3: PM, SO2 and NOx are limited by Consent Decree IP99-1692-C-M/F. For PM: emission rate = 0.015 lb/MMBtu per Consent Decree.

Note 3: For Unit 2: Pursuant to NESHAP UUUUU, limited PM = 0.03 lb/MMBtu. (0.03 lb/MMBtu) x (1,031 MMBtu/hr) x (1 ton/2,000 lb) x (8,760 hrs/yr) = 136 tons/yr

Note 4: Controlled PM, PM10, and PM2.5 according to fugitive dust plan.

Note 5: For Unit 2 and Unit 3; limited HCl: Pursuant to NESHAP UUUUU: HCl E.F. = (0.002 lb/MMBtu)

Note 6: 10 micron fraction for filterable PM10 is 67% for ESP exit per Table 1.1-6, AP-42 (0.67 x 0.03 = 0.02 lb/MMBtu). The condensable fraction is 0.02 lb/MMBtu per Table 1.1-5, AP-42. Total PM10 is 0.04 lb/MMBtu. (0.04 lb/MMBtu) x (1031 MMBtu/hr) x (1 ton/2000 lb) x (8760 hrs/yr) = 180.6 tons/yr.

Note 7: 2.5 micron fraction for filterable PM2.5 is 29% for ESP exit per Table 1.1-6, AP-42 (0.29 x 0.03 = 0.009 lb/MMBtu). The condensable fraction is 0.02 lb/MMBtu per Table 1.1-5, AP-42. Total PM2.5 is 0.029 lb/MMBtu. (0.029 lb/MMBtu) x (1031 MMBtu/hr) x (1 ton/2000 lb) x (8760 hrs/yr) = 130.9 tons/yr.

Note 8: 10 micron fraction for filterable PM10 is 92% for Fabric Filter exit per Table 1.1-6, AP-42 (0.92 x 0.015 = 0.014 lb/MMBtu). The condensable fraction is 0.02 lb/MMBtu per Table 1.1-5, AP-42. Total PM10 is 0.034 lb/MMBtu. (0.034 lb/MMBtu) x (2724 MMBtu/hr) x (1 ton/2000 lb) x (8760 hrs/yr) = 405.65 tons/yr.

Note 9: 2.5 micron fraction for filterable PM2.5 is 53% for Fabric Filter exit per AP-42 (0.53 x 0.015 = 0.008 lb/MMBtu). The condensable fraction is 0.02 lb/MMBtu per Table 1.1-5, AP-42. Total PM2.5 is 0.028 lb/MMBtu. (0.028 lb/MMBtu) x (2724 MMBtu/hr) x (1 ton/2000 lb) x (8760 hrs/yr) = 334.07 tons/yr.

Appendix A: Emissions Calculations
HAP Emissions Summary

Company Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
Address City IN Zip: 3711 Darlington Road, Newburgh, Indiana 47630
Minor Source Modification: 173-48924-00001
Minor Permit Modification: 173-48980-00001
Reviewer: Hachem Ismaili Alaoui

HAP Emissions -Uncontrolled

Equipment Description	HAPs															
	HCl	HF	Benzene	Cyanide	PCDD/ PCDF	Selenium	Cadmium	Chromium	Manganese	Nickel	Beryllium	Arsenic	Lead	Hexane	Other HAPs	Total HAPs
Boiler 2	246.32	30.79	0.27	0.51	5.01E-05	2.67E-01	1.05E-02	5.34E-02	1.01E-01	5.75E-02	4.31E-03	8.42E-02	8.62E-02	7.95	1.99	288.48
Boiler 3	650.79	81.35	0.71	1.36	1.32E-04	7.05E-01	2.77E-02	1.41E-01	2.66E-01	1.52E-01	1.14E-02	2.22E-01	2.28E-01	21.00	5.25	762.19
Small NG combustion units	-	-	9.92E-06	-	-		5.20E-06	6.61E-06	1.79E-06	9.92E-06	-	-	2.36E-06	-	8.88E-03	0.01
Kerosene combustion heaters	-	-	-	-	-	1.64E-05	3.29E-06	3.29E-06	6.57E-06	3.29E-06	3.29E-06	4.38E-06	9.86E-06	-	3.29E-06	5.37E-05
Single HAP Totals	**897.10**	112.14	0.97	1.87	1.82E-04	0.97	3.81E-02	0.19	0.37	0.21	1.57E-02	0.31	0.31	28.95	7.24	**1050.69**
														Single Highest HAP		**897.10**	**HCl**

HAP Emissions - Limited/Controlled

Equipment Description	HAPs															
	HCl	HF	Benzene	Cyanide	PCDD/ PCDF	Selenium	Cadmium	Chromium	Manganese	Nickel	Beryllium	Arsenic	Lead	Hexane	Other HAPs	**Total HAPs**
Boiler 2	9.03	3.69	0.27	5.15E-01	4.97E-05	2.26E-02	1.35E-02	1.26E-02	2.21E-02	1.58E-02	9.03E-04	4.97E-03	5.42E-03	7.95	1.99	23.54
Boiler 3	23.86	9.76	0.71	1.36	1.31E-04	5.97E-02	3.58E-02	3.34E-02	5.85E-02	4.18E-02	2.39E-03	1.31E-02	1.43E-02	21.00	5.25	62.19
Small NG combustion units	-	-	9.92E-06	-	-	-	5.20E-06	6.61E-06	1.79E-06	9.92E-06	-	-	2.36E-06	-	8.88E-03	0.01
Kerosene combustion heaters	-	-	-	-	-	1.64E-05	3.29E-06	3.29E-06	6.57E-06	3.29E-06	-	-	9.86E-06	-	3.29E-06	4.60E-05
Single HAP Totals	**32.89**	13.45	0.97	1.87	1.81E-04	0.08	4.93E-02	0.05	0.08	0.06	3.29E-03	0.02	0.02	28.95	7.24	**85.74**	**Total HAPs**
														Single Highest HAP		**32.89**	**HCl**

Appendix A: Emissions Calculations
Modification Summary

Company Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
Address City IN Zip: 3711 Darlington Road, Newburgh, Indiana 47630
Minor Source Modification: 173-48924-00001
Minor Permit Modification: 173-48980-00001
Reviewer: Hachem Ismaili Alaoui

PTE (tons/yr)									
Emission Unit	**PM**	**PM10**	**PM2.5**	**SO2**	**NOx**	**VOC**	**CO**	**Total HAP**	**Single HAP**
Limestone Storage Pile	1.49	0.74	0.30	--	--	--	--	--	--
Limestone Drop to Storage Pile	0.15	0.06	0.06	--	--	--	--	--	--
Limestone Drop to Truck	0.15	0.06	0.06	--	--	--	--	--	--
Paved Roads	3.59	0.72	0.18	--	--	--	--	--	--
Unpaved Roads	6.80	1.81	0.18	--	--	--	--	--	--
Total	12.18	3.38	0.76	0.00	0.00	0.00	0.00	0.00	0.00

Appendix A: Emissions Calculations
ATP Test

Company Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
Address City IN Zip: 3711 Darlington Road, Newburgh, Indiana 47630
Minor Source Modification: 173-48924-00001
Minor Permit Modification: 173-48980-00001
Reviewer: Hachem Ismaili Alaoui

New Emissions Units (ton/yr)							
Process/Emission Unit	**PM**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**NO_X**	**VOC**	**CO**
Limestone Storage Pile	1.49	0.74	0.30	--	--	--	--
Limestone Drop to Storage Pile	0.15	0.06	0.06	--	--	--	--
Limestone Drop to Truck	0.15	0.06	0.06	--	--	--	--
Paved Roads	3.59	0.72	0.18	--	--	--	--
Unpaved Roads	6.80	1.81	0.18	--	--	--	--
Project Emissions Increase	**12.18**	**3.38**	**0.76**	**0.00**	**0.00**	**0.00**	**0.00**
Significant Levels	25	15	10	40	40	40	100

Appendix A: Emissions Calculations
Coal / Natural Gas-Fired Boiler, Identified as Unit 2, Constructed in 1963;
With Maximum Heat Input Capacity of 1,031 MMBtu/hr
Uncontrolled/Controlled PTE

Company Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
Address City IN Zip: 3711 Darlington Road, Newburgh, Indiana 47630
Minor Source Modification: 173-48924-00001
Minor Permit Modification: 173-48980-00001
Reviewer: Hachem Ismaili Alaoui

Heat Input Capacity	Coal Heating Value	Potential Coal Throughput	Potential Throughput Gas (HIC*8.76)	Control Efficiency ESP	Control Efficiency Scrubber	Sulfur Content %	Ash Content %
MMBtu/hr	Btu/lb	ton/yr	MMCF/yr			3.5	14
1,031	11,000	410,525	9031.6	99.2%	95%		

Uncontrolled/Controlled PTE							
For Coal Combustion	**PM**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**NOx**	**VOC**	**CO**
Emission Factor in lb/ton	140.00 *(10A)*	32.20 *(2.3A)*	8.40 *(0.6A)*	133.0 *(38S)*	11.0	0.06	0.5
Uncontrolled Potential to Emit (ton/yr)	28,737	6,609	1,724	27,300	2,258	12	103
Controlled Potential to Emit (ton/yr)	230	154	122	1,365	2,258	12	103
For Natural Gas Combustion	PM	PM_{10}	$PM_{2.5}$	SO_2	NOx*	VOC	CO
Emission Factor in lb/MMCF	1.9	7.6	7.6	0.6	100.0	5.5	84.0
Uncontrolled Potential to Emit (ton/yr)	8.6	34.3	34.3	2.7	451.6	24.8	379.3
Controlled Potential to Emit (ton/yr)	0.07	0.27	0.27	0.14	451.6	24.8	379.3

Methodology

*NG Fired Emission Factors for NOx: Uncontrolled = 100, Low NOx Burner = 50, Low NOx Burners/Flue gas recirculation = 32
Coal Emission Factors are from AP 42, Chapter 1.1, Tables 1.1-3, 1.1-4.
Potential Throughput (ton/yr) = Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 10^6 Btu/MMBtu / Heating Value (Btu/lb) / 2000 lb/ton
Potential Throughput (MMCF/yr) = Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 1 MMCF/1,000 MMBtu
Emission (ton/yr) = Throughput x Emission Factor / 2,000 lb/ton

Hazardous Air Pollutants (HAPs)

Uncontrolled/Unlimited HAPs					
	HCl	HF	Benzene	Cyanide	PCDD/ PCDF
Emission Factor in lb/ton of coal	1.2	0.15	0.0013	0.0025	2.44E-07
Potential to Emit in tons/yr	246	31	0.27	0.51	5.01E-05

Uncontrolled/Unlimited HAPs - Metals								
	Selenium	Cadmium	Chromium	Manganese	Nickel	Beryllium	Arsenic	Lead
Emission Factor in lb/ton of coal	1.3E-03	5.1E-05	2.6E-04	4.9E-04	2.8E-04	2.10E-05	4.10E-04	4.20E-04
Potential Emission in tons/yr	2.7E-01	1.0E-02	5.3E-02	1.0E-01	5.7E-02	4.3E-03	8.4E-02	8.6E-02

Note that HAP emissions from natural gas combustion are negligible.

Total HAPs (ton/yr) : 279

Limited HAPs (Pursuant to NESHAP, Subpart UUUUU, Table 2)					
	HCl (Note 1)	HF **	Benzene **	Cyanide **	PCDD/ PCDF **
Emission Factor in lb/MMBtu of coal	0.002	8.18E-04	5.91E-05	1.14E-04	1.10E-08
Potential to Emit in tons/yr	9.03	3.69E+00	2.67E-01	5.15E-01	4.97E-05

Limited HAPs - Metals (Pursuant to NESHAP, Subpart UUUUU, Table 2)								
	Selenium ***	Cadmium ***	Chromium ***	Manganese ***	Nickel ***	Beryllium ***	Arsenic ***	Lead ***
Emission Factor in lb/MMBtu of coal	5.0E-06	3.0E-06	2.8E-06	4.9E-06	3.5E-06	2.00E-07	1.10E-06	1.20E-06
Potential Emission in tons/yr	0.02	0.014	0.013	0.022	0.016	0.001	0.005	0.005

Total HAPs (Including Additional HAPs (page 3); (ton/yr) : 24

** The original EFs from AP-42 for Benzene, Cyanide, and PCDD/PCDF were converted from lb/ton of coal to lb/MMBtu of coal which is the unit used for EFs in Table 2 of NESHAP, Subpart UUUUU. (e.g.: (0.0013 lb/ton) * ((heat input capacity (hr/1031 MMBtu)) * (yr/8760 hr) * (410525 tons/yr) = 5.91E-05 lb/MMBtu) = Benzene EF.

*** The original EFs from AP-42 were replaced with the EFs from Table 2 of NESHAP, Subpart UUUUU when the Table 2 EFs were more stringent than the AP-42 EFs. The EFs from Table 2 were converted from lb/Tbtu to lb/MMBtu. (e.g.: (5 lb/Tbtu) * (1 Tbtu/1,000,000,000,000 Btu) * (1,000,000 Btu/ 1 MMBtu) = 5.0E-06 lb/MMBtu)

Note 1: Limited HCl EF: Pursuant to NESHAP UUUUU, Table 2: E.F = 0.002 lb/MMBtu; (e.g.: (0.002 lb/MMBtu) x (1,031 MMBtu/hr) x (1 ton/2,000 lb) x (8,760 hrs/yr) = 9.03 tons/yr)

Appendix A: Emissions Calculations
Coal Burning - Additional HAP Emissions from Boiler Unit 2

Company Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
Address City IN Zip: 3711 Darlington Road, Newburgh, Indiana 47630
Minor Source Modification: 173-48924-00001
Minor Permit Modification: 173-48980-00001
Reviewer: Hachem Ismaili Alaoui

Boiler Emission Unit 2

Total Maximum Heat Input Capacity	**1,031**
Coal Heating Value (Btu/lb)	**11,000**
Potential Coal Throughput (tons/yr)	**410,525**

Pollutant	Emission Factor (lbs/MMBtu of Coal)	PTE of HAP (tons/year)
Antimony	8.18E-07	0.004
Cobalt	4.55E-06	0.021
Mercury	1.2E-06	0.005
Acetaldehyde	2.59E-05	0.117
Acetophenone	6.82E-07	0.003
Acrolein	1.32E-05	0.060
Benzyl Chloride	3.18E-05	0.144
DEHP	3.32E-06	0.015
Bromoform	1.77E-06	0.008
Carbon Disulfide	5.91E-06	0.027
2-Chloroacetophenone	3.18E-07	0.001
Chlorobenzene	1.00E-06	0.005
Chloroform	2.68E-06	0.012
Cumene	2.41E-07	0.001
Dichlorobenzene	1.18E-06	0.005
2,4-Dinitrotoluene	1.14E-04	0.515
Dimethyl Sulfate	2.18E-06	0.010
Ethyl Benzene	4.27E-06	0.019
Ethyl Chloride	1.91E-06	0.009
Ethylene Dichloride	1.82E-06	0.008
Ethylene Dibromide	5.45E-08	0.0002
Formaldehyde	1.09E-05	0.049
Hexane	1.76E-03	7.95
Isophorone	2.64E-05	0.119
MEK	1.77E-05	0.080
Methyl Bromide	7.27E-06	0.033
Methyl Chloride	2.41E-05	0.109
Methyl Hydrazine	7.73E-06	0.035
Methyl Methacrylate	9.09E-07	0.004
Methyl Tert Butyl Ether	1.59E-06	0.007
Methylene Chloride	1.32E-05	0.060
Naphthalene	5.98E-07	0.003
POM	7.55E-05	0.341
Phenol	7.27E-07	0.003
Propionaldehyde	1.73E-05	0.078
Tetrachloroethylene	1.95E-06	0.009
Toluene	1.09E-05	0.049
1,1,1-Trichloroethane	9.09E-07	0.004
Styrene	1.14E-06	0.005
Xylenes	1.68E-06	0.008
Vinyl Acetate	3.45E-07	0.002
Total		**9.933**

Note: Emission factors from, AP-42, Tables 1.1-13, 1.1-14, 1.1-15, and 1.1-18 for Coal Combustion (09/98).
The EFs from AP-42 were converted from lb/ton of coal to lb/MMBtu of coal.

Methodology
PTE of HAP (tons/year) = Total Maximum Heat Input (MMBtu/hr) * Emission Factor (lb/MMBtu) * 8,760 hrs/yr * 1 ton/2,000 lb

Appendix A: Emissions Calculations
Coal / Natural Gas-Fired Boiler, Identified as Unit 3, Constructed in 1970;
With Maximum Heat Input Capacity of 2,689 MMBtu/hr
Uncontrolled/Controlled PTE

Company Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
Address City IN Zip: 3711 Darlington Road, Newburgh, Indiana 47630
Minor Source Modification: 173-48924-00001
Minor Permit Modification: 173-48980-00001
Reviewer: Hachem Ismaili Alaoui

Heat Input Capacity	Coal Heating Value	Potential Coal Throughput	Potential Throughput Gas (HCl@ 7%)	Control Efficiency FF	Control Efficiency Scrubber	Control Efficiency SCR	Sulfur Content %	Ash Content %
MMBtu/hr	Btu/lb	ton/yr	MMCF/yr					
2,724	11,000	1,084,647	23862.2	99.81%	95%	80%	3.5	14

Uncontrolled/Controlled PTE							
For Coal Combustion	**PM**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**NOx**	**VOC**	**CO**
Emission Factor in lb/ton	140.00 *(10A)*	32.20 *(2.3A)*	8.40 *(0.6A)*	133.0 *(38S)*	11.0	0.06	0.5
Uncontrolled Potential to Emit (ton/yr)	75,925	17,463	4,556	72,129	5,966	33	271
Controlled Potential to Emit (ton/yr)	144	133	76	3,606	1,193	33	271

For Natural Gas Combustion	**PM**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**NOx***	**VOC**	**CO**
Emission Factor in lb/MMCF	1.9	7.6	7.6	0.6	100.0	5.5	84.0
Uncontrolled Potential to Emit (ton/yr)	22.7	90.7	90.7	7.2	1193.1	65.6	1002.2
Controlled Potential to Emit (ton/yr)	22.7	90.7	90.7	7.2	1,193.1	65.6	1,002.2

Methodology
*NG Fired Emission Factors for NOx: Uncontrolled = 100, Low NOx Burner = 50, Low NOx Burners/Flue gas recirculation = 32
Coal Emission Factors are from AP 42, Chapter 1.1, Tables 1.1-3, 1.1-4.
Potential Throughput (ton/yr) = Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 10^6 Btu/MMBtu / Heating Value (Btu/lb) / 2000 lb/ton
Potential Throughput (MMCF/yr) = Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 1 MMCF/1,000 MMBtu
Emission (ton/yr) = Throughput x Emission Factor / 2,000 lb/ton

Hazardous Air Pollutants (HAPs)

Uncontrolled/Unlimited HAPs					
	HCl	HF	Benzene	Cyanide	PCDD/ PCDF
Emission Factor in lb/ton of coal	1.2	0.15	0.0013	0.0025	2.44E-07
Potential to Emit in tons/yr	651	81	0.71	1.36	1.32E-04

Uncontrolled/Unlimited HAPs - Metals								
	Selenium	Cadmium	Chromium	Manganese	Nickel	Beryllium	Arsenic	Lead
Emission Factor in lb/ton of coal	1.3E-03	5.1E-05	2.6E-04	4.9E-04	2.8E-04	2.10E-05	4.10E-04	4.20E-04
Potential Emission in tons/yr	7.1E-01	2.8E-02	1.4E-01	2.7E-01	1.5E-01	1.1E-02	2.2E-01	2.3E-01

Note that HAP emissions from natural gas combustion are negligible.

Total HAPs (ton/yr) :	**736**

Limited HAPs (Pursuant to NESHAP, Subpart UUUUU, Table 2)					
	HCl (Note 1)	HF **	Benzene **	Cyanide **	PCDD/ PCDF **
Emission Factor in lb/MMBtu of coal	0.002	8.18E-04	5.91E-05	1.14E-04	1.10E-08
Potential to Emit in tons/yr	23.86	9.76E+00	7.05E-01	1.36E+00	1.31E-04

Limited HAPs - Metals (Pursuant to NESHAP, Subpart UUUUU, Table 2)								
	Selenium ***	Cadmium ***	Chromium ***	Manganese ***	Nickel ***	Beryllium ***	Arsenic ***	Lead ***
Emission Factor in lb/MMBtu of coal	5.0E-06	3.0E-06	2.8E-06	4.9E-06	3.5E-06	2.00E-07	1.10E-06	1.20E-06
Potential Emission in tons/yr	0.06	0.04	0.03	0.06	0.04	2.39E-03	1.31E-02	1.43E-02

Total HAPs (ton/yr) :	**62**

** The original EFs from AP-42 for Benzene, Cyanide, and PCDD/PCDF were converted from lb/ton of coal to lb/MMBtu of coal which is the unit used for EFs in Table 2 of NESHAP, Subpart UUUUU. (e.g.: (0.0013 lb/ton) * ((heat input capacity (hr/11031 MMBtu)) * (yr/8760 hr) * (410525 tons/yr) = 5.91E-05 lb/MMBtu) = Benzene EF.

*** The original EFs from AP-42 were replaced with the EFs from Table 2 of NESHAP, Subpart UUUUU when the Table 2 EFs were more stringent than the AP-42 EFs. The EFs from Table 2 were converted from lb/Tbtu to lb/MMBtu. (e.g.: (5 lb/Tbtu) * (1 Tbtu/1,000,000,000,000 Btu) * (1,000,000 Btu/ 1 MMBtu) = 5.0E-06 lb/MMBtu)

Note 1: Limited HCl EF: Pursuant to NESHAP UUUUU, Table 2: E.F = 0.002 lb/MMBtu; (e.g.: (0.002 lb/MMBtu) x (2,689 MMBtu/hr) x (1 ton/2,000 lb) x (8,760 hrs/yr) = 23.56 tons/yr)

Appendix A: Emissions Calculations
Coal Burning - Additional HAP Emissions from Boiler Unit 3

Company Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
Address City IN Zip: 3711 Darlington Road, Newburgh, Indiana 47630
Minor Source Modification: 173-48924-00001
Minor Permit Modification: 173-48980-00001
Reviewer: Hachem Ismaili Alaoui

Boiler Emission Unit 3

Total Maximum Heat Input Capacity	**2,724**
Coal Heating Value (Btu/lb)	**11,000**
Potential Coal Throughput (tons/yr)	**1,084,647**

Pollutant	Emission Factor (lbs/MMBtu of Coal)	PTE of HAP (tons/year)
Antimony	8.18E-07	0.010
Cobalt	4.55E-06	0.054
Mercury	1.2E-06	0.014
Acetaldehyde	2.59E-05	0.309
Acetophenone	6.82E-07	0.008
Acrolein	1.32E-05	0.157
Benzyl Chloride	3.18E-05	0.379
DEHP	3.32E-06	0.040
Bromoform	1.77E-06	0.021
Carbon Disulfide	5.91E-06	0.071
2-Chloroacetophenone	3.18E-07	0.004
Chlorobenzene	1.00E-06	0.012
Chloroform	2.68E-06	0.032
Cumene	2.41E-07	0.003
Dichlorobenzene	1.18E-06	0.014
2,4-Dinitrotoluene	1.14E-04	1.360
Dimethyl Sulfate	2.18E-06	0.026
Ethyl Benzene	4.27E-06	0.051
Ethyl Chloride	1.91E-06	0.023
Ethylene Dichloride	1.82E-06	0.022
Ethylene Dibromide	5.45E-08	0.0007
Formaldehyde	1.09E-05	0.130
Hexane	1.76E-03	21.00
Isophorone	2.64E-05	0.315
MEK	1.77E-05	0.211
Methyl Bromide	7.27E-06	0.087
Methyl Chloride	2.41E-05	0.288
Methyl Hydrazine	7.73E-06	0.092
Methyl Methacrylate	9.09E-07	0.011
Methyl Tert Butyl Ether	1.59E-06	0.019
Methylene Chloride	1.32E-05	0.157
Naphthalene	5.98E-07	0.007
POM	7.55E-05	0.901
Phenol	7.27E-07	0.009
Propionaldehyde	1.73E-05	0.206
Tetrachloroethylene	1.95E-06	0.023
Toluene	1.09E-05	0.130
1,1,1-Trichloroethane	9.09E-07	0.011
Styrene	1.14E-06	0.014
Xylenes	1.68E-06	0.020
Vinyl Acetate	3.45E-07	0.004
Total		**26.244**

Note: Emission factors from, AP-42, Tables 1.1-13, 1.1-14, 1.1-15, and 1.1-18 for Coal Combustion (09/98).
The EFs from AP-42 were converted from lb/ton of coal to lb/MMBtu of coal.

Methodology

PTE of HAP (tons/year) = Total Maximum Heat Input (MMBtu/hr) * Emission Factor (lb/MMBtu) * 8,760 hrs/yr * 1 ton/2,000 lb

Appendix A: Emissions Calculations
On-Site Material Handling PTE for Coal and Fly Ash

Company Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. CulleyStation
Address City IN Zip: 3711 Darlington Road, Newburgh, Indiana 47630
Minor Source Modification: 173-48924-00001
Minor Permit Modification: 173-48980-00001
Reviewer: Hachem Ismaili Alaoui

Permit Reference	Coal	Controlled PM/PM10/PM2.5 (tons/yr)	Uncontrolled PM/PM10/PM2.5 (tons/year)	Uncontrolled PM/PM10/PM2.5 (lb/hr)
1	Floating dock unloading clamshell serving both coal and limestone unloading operations (served by S/V 6).	-	1.953	0.446
2	Truck load-out station serving both coal and limestone unloading operations (served by S/V 9).	-	0.578	0.132
3	Unit 2 coal pile hopper with a maximum coal feed belt capacity of 600 tons per hour.	-	0.158	0.036
4	Unit 2 coal hopper conveyor (C1) with a maximum coal feed belt capacity of 600 tons per hour.	-	0.158	0.036
5	Unit 2 coal transfer house conveyor drop with enclosed transfer drop.	-	-	-
6	Unit 2 coal transfer house conveyor (#4) with a maximum coal feed belt capacity of 1240 tons per hour.	-	0.326	0.074
7	Unit 2 coal transfer-crusher house conveyor drop with enclosed transfer house and internal fabric filter.	-	-	-
8	Unit 2 coal transfer house conveyor with a maximum coal feed belt capacity of 1240 tons per hour.	-	0.326	0.074
9	Unit 2 powerhouse coal tripper conveyor with an enclosed powerhouse and sealed transfer points.	-	-	-
10	Unit 2 powerhouse coal tripper conveyor bunker drop with an enclosed powerhouse and sealed transfer points.	-	-	-
11	Unit 2 powerhouse coal bunkers with an enclosed powerhouse and sealed transfer points.	-	-	-
12	Units 2 and 3 coal pile of 645,000 tons.	-	0.030	0.007
13	Unit 2 coal pile hopper with a maximum coal feed belt capacity of 640 tons per hour.	-	0.168	0.038
14	Unit 2 coal pile hopper conveyor with a maximum coal feed belt capacity of 640 tons per hour.	-	0.168	0.038
15	Unit 3 coal pile hopper with a maximum coal feed belt capacity of 640 tons per hour.	-	0.168	0.038
16	Unit 3 coal pile hopper conveyor with a maximum coal feed belt capacity of 640 tons per hour.	-	0.168	0.038
17	Unit 3 coal transfer house conveyor drop with an enclosed transfer house and internal fabric filter (served by S/V 8).	-	0.168	0.038
18	Unit 3 coal transfer house conveyor with a maximum coal feed belt capacity of 640 tons per hour.	0.168	16.820	3.840
19	Unit 3 powerhouse coal tripper conveyor with an enclosed powerhouse and sealed transfer points.	-	-	-
20	Unit 3 powerhouse coal tripper conveyor bunker drop with an enclosed powerhouse and sealed transfer points.	-	-	-
21	Unit 3 powerhouse coal bunker with an enclosed powerhouse and sealed transfer points.	-	-	-
22	Miscellaneous enclosed coal bunker and weigh-scales with vents.	-	-	-
	Total	0.17	21.19	-

Fly Ash	Controlled PM/PM10/PM2.5 (tons/yr)	Uncontrolled PM/PM10/PM2.5 (tons/year)	Uncontrolled PM/PM10/PM2.5 (lb/hr)
One (1) fly ash storage silo receiving fly ash via a close-pipe vacuum handling system from the electrostatic precipitator hoppers of Units 2 and 3, with a maximum capacity of 1000 tons, and a maximum throughput of 179.9 tons per hour, with a fabric filter separator exhausting to S/V 16 and a bin filter exhausting to S/V 17.	2.661	266.1	60.753
One (1) fly ash silo truck loadout station, with a maximum capacity of 25 tons per hour (the coal trucks have a maximum capacity of 25 tons and haul ash at the rate of one truck per hour), with an enclosed telescoping discharged chute and emissions reduced by fly ash wetting and partial loading of the trucks.	-	1.6305	0.372
Total	2.7	267.7	

Appendix A: Emissions Calculations
On-Site Material Handling PTE for Coal and Fly Ash

Company Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. CulleyStation
Address City IN Zip: 3711 Darlington Road, Newburgh, Indiana 47630
Minor Source Modification: 173-48924-00001
Minor Permit Modification: 173-48980-00001
Reviewer: Hachem Ismaili Alaoui

The Limestone Handling Process (Unit 7) and the Gypsum Handling Process (Unit 8) are not subject to the requirements of 326 IAC 6-3-2, because pursuant to 326 IAC 6-3-2(c)(5), facilities subject to a more stringent 326 IAC 12 Rule are exempt from 326 IAC 6-3-2. The Limestone Handling Process (Unit 7) and the Gypsum Handling Process (Unit 8) are subject to the requirements of 40 CFR Part 60, Subpart OOO, which are more stringent than the requirements of 326 IAC 6-3-2.

Limestone	Controlled PM/PM10/PM2.5 (tons/yr)	Uncontrolled PM/PM10/PM2.5 (tons/year)	Uncontrolled PM/PM10/PM2.5 (lb/hr)
One (1) limestone unloading floating clamshell dock with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to S/V 6. (This operation serves both coal and limestone unloading operations.)	1.953	195.3	44.589
One (1) covered conveyor, identified as Conveyor 1 (CL-1), with a maximum throughput of 550 tons per hour.	-	0.001	2.28E-04
One (1) limestone truck loadout to conveyor with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to S/V 9. (This operation serves both coal and limestone unloading operations.)	0.578	57.8	13.196
One (1) covered conveyor, identified as Conveyor 2 (L-1), with a maximum throughput of 800 tons per hour.	-	0.001	2.28E-04
One (1) limestone storage building with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to S/V 10.	0.153	15.3	3.493
One (1) limestone reclaim system located inside a totally-enclosed building adjacent to the limestone storage building.	-	-	-
One (1) limestone storage building loadout with a maximum capacity of 750 tons/hr, an enclosed building for dust control, and exhausting indoors.	-	-	-
One (1) covered conveyor, identified as Conveyor 3 (L-2), with a maximum throughput of 300 tons per hour.	-	0.001	2.28E-04
One (1) limestone transfer house (No. 1) with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to S/V 12.	-	0.264	0.060
One (1) covered conveyor, identified as Conveyor 4 (L-3), with a maximum throughput of 300 tons per hour.	-	0.001	2.28E-04
One (1) coal and limestone transfer house (serving Unit No. 3) with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to S/V 8. (This operation serves both coal and limestone transferring operations.)	0.161	16.1	3.676
One (1) covered conveyor, identified as Conveyor 5 (L-4), with a maximum throughput of 300 tons per hour.	-	0.001	2.28E-04
One (1) limestone transfer house (No. 2) with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to S/V 14.	-	0.184	0.042
One (1) covered conveyor, identified as Conveyor 6 (L-5), with a maximum throughput of 300 tons per hour.	-	0.001	2.28E-04
One (1) limestone day silo with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to S/V 15.	0.083	8.3	1.895
Total	2.93	293.25	66.95

Gypsum	Controlled PM/PM10/PM2.5 (tons/yr)	Uncontrolled PM/PM10/PM2.5 (tons/year)	Uncontrolled PM/PM10/PM2.5 (lb/hr)
One (1) gypsum filter cake conveyor drop, with a maximum capacity of 35 tons per hour, with a fabric filter for dust control, exhausting to S/V 11.	0.396	39.55	9.030
One (1) gypsum filter cake conveyor drop, with a maximum capacity of 35 tons per hour, with a fabric filter for dust control, exhausting to S/V 13.	0.064	6.35	1.450
One (1) covered conveyor, identified as G1A, (operates only when G1B is offline) with a maximum capacity of 50 tons per hour.	-	-	-
One (1) covered conveyor, identified as G1B (operates only when G1A is offline), with a maximum capacity of 50 tons per hour.	-	-	-
One (1) gypsum filter cake transfer house conveyor drop with a maximum capacity of 35 tons/hr, a fabric filter for dust control, exhausting to S/V 4.	1.530	152.99	34.929
One (1) covered conveyor, identified as G2A, (operates only when G2B is offline) with a maximum capacity of 50 tons per hour.	-	-	-
One (1) covered conveyor, identified as G2B (operates only when G2A is offline), with a maximum capacity of 50 tons per hour.	-	-	-
One (1) gypsum storage building consisting of two (2) 1000-ton gypsum storage silos and one (1) storage pile designated for truck haul-away exhausting indoors.	-	-	-
One (1) covered silo to barge loadout primary filter cake transfer conveyor, identified as Conveyor 4, with a maximum capacity of 400 tons per hour, with a fabric filter for dust control, exhausting to S/V 7.	-	-	-
One (1) covered silo to truck secondary transfer conveyor, identified as Conveyor 3, with a maximum capacity of 400 tons/hour and exhausting indoors.	-	-	-
One (1) gypsum barge loadout conveyor drop, with a maximum capacity of 35 tons/hr, with a fabric filter for dust control and exhausting to S/V 5.	0.291	29.13	6.651
One (1) gypsum barge loadout with two (2) telescoping transfer chutes delivering filter cake gypsum to river barges with a maximum capacity of 400 tons per hour.	0.291	29.13	6.651
Total	2.57	257.15	

Two (2) wet ball mills (one operational and one full capacity spare), each receiving limestone through a separate weigh-belft feeder from the day silo of the limestone handling facility (Unit 8). Each ball mill is a closed-device (hard-piped, enclosed design), wet mill capable of handling 20.5 tons per hour of dry limestone feed.	-	-	-
Two (2) limestone slurry storage tanks, receiving the ball mill product (fresh limestone slurry), which is then discharged into the scrubber system. The scrubbed gas stream exits the absorber tower through the scrubber stack.	-	-	-
Total	0	0	

Appendix A: Emissions Calculations
Limestone Handling and Storage Pile

Company Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
Address City IN Zip: 3711 Darlington Road, Newburgh, Indiana 47630
Minor Source Modification: 173-48924-00001
Minor Permit Modification: 173-48980-00001
Reviewer: Hachem Ismaili Alaoui

Particulate matter emissions result from wind erosion of storage piles when gusts of wind cause loose dust on the surface of pile to become airborne. The annual quantity of emissions is dependent on the silt content of the material stored in the pile, the moisture of the pile (predicted by the number of days per year with measurable precipitation), and the percentage of hours per year that the wind speed exceeds the threshold speed of 12 miles per hour. Emissions are calculated on a pounds per day per acre basis using the method from the EPA Document "*Control of Open Fugitive Dust Source (page 4-17)"*. Emission rates are then converted to a pounds per hour and tons per year basis for each pile based for each pile based on the estimated typical outer surface area of each pile.

Emission Factors

Storage Pile	Silt Content of Aggregate (s)[1] (%)	Annual Days of Rain (p)[2] (days)	% of time the unobstructed wind speed > 12 mph (f)[3] (%)	Uncontrolled PM Emission Factor (E) (lb/day/acre)	Uncontrolled PM Emission Factor (lb/hr/ft^2)	Control Efficiency (%)	Controlled PM Emission Factor (lb/day/acre)	Controlled PM Emission Factor (lb/hr/ft^2)
Limestone Storage Pile	1.6	125	33.0	4.07	3.90E-06	0.00%	4.07	3.90E-06

[1] Average Silt Content from AP-42, Table 13.2.4-1
[2] Annual day of rain from AP-42, Figure 13.2.1-2
[3] Based on 2023 daily wind speed data collected at Evansville, Indiana wind section
s: Silt content of aggregate (%)
p: Number of days with greater than 0.01 inch of precipitation per year
f: % of time the unobstructed wind speed exceeds 12 mph at the mean pile height
E: PM Emission factor

$$E = 1.7\left(\frac{s}{1.5}\right)\left(\frac{365-p}{235}\right)\left(\frac{f}{15}\right)(lb/day/acre)$$

Control of Open Fugitive Dust Sources
EPA-450/3-88-008. September 1988, Page 4-17.

Uncontrolled PM Emission Factor (lb/hr/ft^2) = [Uncontrolled PM Emission Fcator (lb/day/acre) / 24 (hrs/day)] / 43559.66 (ft^2/acre)
Controlled PM Emission Factor (lb/day/acre) = Uncontrolled PM Emission Factor (lb/day/acre) * (1 - Control Efficieny (%))
Controlled PM Emission Factor (lb/hr/ft^2) = Uncontrolled PM Emission Factor (lb/hr/ft2) * (1 - Control Efficieny (%))

Limestone Storage Pile Emissions

Storage Pile	Outer Surface Area of Storage Pile (acre)	Outer Surface Area of Storage Pile (ft^2)	Uncontrolled PM Emissions (lb/hr)	Uncontrolled PM10 Emissions (lb/hr)	Uncontrolled PM2.5 Emissions (lb/hr)	Uncontrolled PM Emissions (tons/yr)	Uncontrolled PM10 Emissions (tons/yr)	Uncontrolled PM2.5 Emissions (tons/yr)
Limestone Storage Pile	2.00	87120.0	0.34	0.17	0.07	1.49	0.74	0.30

PM10 is assumed to be 50% of PM and PM2.5 is assumed to be 20% of PM. These assumptions are based on particle size multipliers for Industrial Wind Erosion from AP-42 Page 13.2.5-3. PM10 being 50% of PM (multipliers of 0.5 and 1.0) and PM2.5 being 7.5% of PM (multipliers of 0.075 and 1.0). These assumptions were approved by IDEM in permit # 40198 for Heidelberg Materials US Cement LLC

Methodology
Outer Surface Area of Storage Pile (ft^2) = Outer Surface Area of Storage Pile (acre) * (43560 ft^2/ 1 acre)
Uncontrolled PM Emissions (lb/hr) = Outer Surface Area of Storage Pile (ft^2) * Emission Factor (lb/hr/ft^2)
Uncontrolled PM Emissions (tons/yr) = Uncontrolled PM Emissions (lb/hr) * 8760 (hrs/yr) * (1 ton / 2000 lb)
Uncontrolled PM10 Emissions (lb/hr) = Uncontrolled PM Emissions (lb/hr) * 50%
Uncontrolled PM10 Emissions (tons/yr) = Uncontrolled PM10 Emissions (lb/hr) * 8760 (hrs/yr) * (1 ton / 2000 lb)
Uncontrolled PM2.5 Emissions (lb/hr) = Uncontrolled PM Emissions (lb/hr) * 20%
Uncontrolled PM2.5 Emissions (tons/yr) = Uncontrolled PM2.5 Emissions (lb/hr) * 8760 (hrs/yr) * (1 ton / 2000 lb)

Limestone Handling Emissions

Storage Pile	Maximum Throughput (tons/hr)	PM Emission Factor (lb/ton)	PM10/PM2.5 Emission Factor (lb/ton)	Uncontrolled PM Emissions (lb/hr)	Uncontrolled PM10/PM2.5 Emissions (lb/hr)	Uncontrolled PM Emissions (tons/yr)	Uncontrolled PM10/PM2.5 Emissions (tons/yr)
Limestone Drop to Storage Pile	11.42	0.003	0.0011	0.03	0.01	0.15	0.06
Limestone Drop to Truck	11.42	0.003	0.0011	0.03	0.01	0.15	0.06
			Total	0.07	0.03	0.30	0.11

PM, PM10, and PM2.5 emission factors are from AP-42, Chapter 11.19.2, Table 11.19.2-2 for Crushed stone processing operations (SCC 3-05-020-06).

Methodology
Uncontrolled Emissions (lb/hr) = Maximum Throughput (tons/hr) * Emission Factor (lb/ton)
Uncontrolled Emissions (tons/yr) = Uncontrolled Emissions (lb/hr) * 8760 (hrs/yr) * (1 ton / 2000 lb)

Appendix A: Emissions Calculations
Small NG Combustion Units
Natural Gas Combustion Only
MM BTU/HR <100

Company Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
Address City IN Zip: 3711 Darlington Road, Newburgh, Indiana 47630
Minor Source Modification: 173-48924-00001
Minor Permit Modification: 173-48980-00001
Reviewer: Hachem Ismaili Alaoui

Unit	Quantity	Max. Heat Input Capacity Each, (MMBtu/hr)	Total Heat Input Capacity (MMBtu/hr)
Forced Air Unit Htrs	3	0.06	0.18
Planning Office Furnaces	4	0.09	0.36
Maintenance Shop Water Htrs	2	0.04	0.08
Maintenance Shop Radiant Htrs	3	0.16	0.48
		TOTAL:	**1.10**

Heat Input Capacity MMBtu/hr	HHV mmBtu / mmscf	Potential Throughput MMCF/yr
1.10	1020	9.4

	Pollutant						
	PM*	PM10*	direct PM2.5*	SO2	NOx	VOC	CO
Emission Factor in lb/MMCF	1.9	7.6	7.6	0.6	100 **see below	5.5	84
Potential Emission in tons/yr	0.01	0.04	0.04	0.00	0.47	0.03	0.40

*PM emission factor is filterable PM only. PM10 emission factor is filterable and condensable PM10 combined.
PM2.5 emission factor is filterable and condensable PM2.5 combined.
**Emission Factors for NOx: Uncontrolled = 100, Low NOx Burner = 50, Low NOx Burners/Flue gas recirculation = 32

Methodology
All emission factors are based on normal firing.
MMBtu = 1,000,000 Btu
MMCF = 1,000,000 Cubic Feet of Gas
Emission Factors are from AP 42, Chapter 1.4, Tables 1.4-1, 1.4-2, 1.4-3, SCC #1-02-006-02, 1-01-006-02, 1-03-006-02, and 1-03-006-03
Potential Throughput (MMCF) = Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 1 MMCF/1,020 MMBtu
Emission (tons/yr) = Throughput (MMCF/yr) x Emission Factor (lb/MMCF)/2,000 lb/ton

Hazardous Air Pollutants (HAPs)

	HAPs - Organics					
	Benzene	Dichlorobenze	Formaldehyde	Hexane	Toluene	**Total - Organics**
Emission Factor in lb/MMcf	2.1E-03	1.2E-03	7.5E-02	1.8E+00	3.4E-03	
Potential Emission in tons/yr	9.9E-06	5.7E-06	3.5E-04	0.01	1.6E-05	**0.01**

	HAPs - Metals					
	Lead	Cadmium	Chromium	Manganese	Nickel	**Total - Metals**
Emission Factor in lb/MMcf	5.0E-04	1.1E-03	1.4E-03	3.8E-04	2.1E-03	
Potential Emission in tons/yr	2.4E-06	5.2E-06	6.6E-06	1.8E-06	9.9E-06	**2.6E-05**
					Total HAPs	**0.01**
					Worst HAP	**0.01**

Methodology is the same as above.
The five highest organic and metal HAPs emission factors are provided above.
Additional HAPs emission factors are available in AP-42, Chapter 1.4.

Appendix A: Emissions Calculations
Ten (10) Kerosene-Fired Portable Heaters (Direct-Fired) Each with Heat Input Capacity of 0.05 MMBtu/hr (Assumed)
MMBTU/HR <100

Company Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
Address City IN Zip: 3711 Darlington Road, Newburgh, Indiana 47630
Minor Source Modification: 173-48924-00001
Minor Permit Modification: 173-48980-00001
Reviewer: Hachem Ismaili Alaoui

Unit Name/ID	Quantity	MMBtu/hr (Each)	Total MMBtu/hr
Portable Kerosene Heaters	5	0.05	0.25
Total Heat Input Capacity (MMBtu/hr)			0.25

Heating Value	0.135	MMBtu/gal
S = Weight % Sulfur	0.5	% (default value)
Total Capacity	0.002	kgal/hr

	Pollutant						
	PM*	PM10*	direct PM2.5*	SO2	NOx	VOC	CO
Emission Factor in lb/kgal	2.0	1.3	1.3	71.0 (142.0S)	20	0.34	5.0
Potential Emission in tons/yr	0.02	0.01	0.01	0.58	0.16	0.00	0.04

*PM emission factor is filterable PM only (AP 42, Table 1.3-1). PM10 emission factor is filterable and condensable PM10 combined (AP 42, Table 13.-2). Assume PM10 = PM2.5.

Methodology
All emission factors are based on normal firing.
MMBtu = 1,000,000 Btu
Total Capacity (kgal /hr) = Total Capacity (MMBtu / hr) / Heating Value (MMBtu /gal) / (1000 gal / kgal)
Emission Factors are from AP 42, Chapter 1.3, Tables 1.3-1, 1.3-2, 1.3-3, 1.3-8, 1.3-9, 1.3-11, and 1.3-12 for distillate oil-fired boilers < 100 MMBtu/hr.
Emissions (tons / yr) = Throughput (kgal / hr) x Emission Factor (lb / kgal) x (8760 hrs / yr) / (2000 lb / ton)
Emission (tons / yr) = Throughput (MMBtu / hr) x Emission Factor (lb / MMBtu) x (8760 hrs / yr) / (2000 lb / ton)
Assume heating value of Kerosene = 135,000 Btu/gallon.

HAPS Calculations

	HAPs - Metals					
	Arsenic	Beryllium	Mercury	Selenium		TOTAL
Emission Factor in lb/MMBtu	4.0E-06	3.0E-06	3.0E-06	1.5E-05		
Potential Emission in tons/yr	4.38E-06	3.29E-06	3.29E-06	1.64E-05		**2.74E-05**

	HAPs - Metals (continued)					
	Lead	Cadmium	Chromium	Manganese	Nickel	TOTAL
Emission Factor in lb/MMBtu	9.0E-06	3.0E-06	3.0E-06	6.0E-06	3.0E-06	
Potential Emission in tons/yr	9.86E-06	3.29E-06	3.29E-06	6.57E-06	3.29E-06	**2.63E-05**
					Total HAPs	**5.37E-05**
					Worst HAP	**1.64E-05**

Methodology is the same as above.
HAPs emission factors are available in AP-42, Chapter 1.3-9 and 1.3-10.

Appendix A: Emissions Calculations
Five (5) Propane Gas-Fired Portable Heaters Each With Heat Input Capacity of 0.05 MMBtu/hr (Assumed)
(LPG - Propane Combustion PTE)

Company Name: **Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station**
Address City IN Zip: **3711 Darlington Road, Newburgh, Indiana 47630**
Minor Source Modification: **173-48924-00001**
Minor Permit Modification: **173-48980-00001**
Reviewer: **Hachem Ismaili Alaoui**

Heat Input Capacity MMBtu/hr	Potential Throughput kgals/year
0.25	23.9

SO2 Emission factor = 0.10 x S
S = Sulfur Content = 1.00 grains/100ft^3

	Pollutant						
	PM*	PM10*	direct PM2.5**	SO2	NOx	VOC	CO
Emission Factor in lb/kgal	0.2	0.7	0.7	0.1 *(0.10S)*	13.0	1.0 **TOC value	7.5
Potential Emission in tons/yr	0.00	0.01	0.01	0.00	0.16	0.01	0.09

*PM emission factor is filterable PM only. PM emissions are stated to be all less than 10 microns in aerodynamic equivalent diameter, footnote in Table 1.5-1, therefore PM10 is based on the filterable and condensable PM emission factors.
** No direct PM2.5 emission factor was given. Direct PM2.5 is a subset of PM10. If one assumes all PM10 to be all direct PM2.5, then a worst case assumption of direct PM2.5 can be made.
**The VOC value given is TOC. The methane emission factor is 0.2 lb/kgal.
Assume the Sulfur content of the Propane Gas = 1.0 grains per 100 cubic feet of gas.

Methodology
1 gallon of LPG has a heating value of 94,000 Btu
1 gallon of propane has a heating value of 91,500 Btu (use this to convert emission factors to an energy basis for propane)
(Source - AP-42 (Supplement B 10/96) page 1.5-1)
Potential Throughput (kgals/year) = Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 1kgal per 1000 gallon x 1 gal per 0.0915 MMBtu
Emission Factors are from AP42 (7/08), Table 1.5-1 (SCC #1-02-010-02)
Propane Emission Factors shown. Please see AP-42 for butane.
Emission (tons/yr) = Throughput (kgals/yr) x Emission Factor (lb/kgal) / 2,000 lb/ton
No Emission Factors listed for Hazardous Air Pollutants.

Appendix A: Emission Calculations
Fugitive Dust Emissions - Paved Roads

Company Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
Address City IN Zip: 3711 Darlington Road, Newburgh, Indiana 47630
Minor Source Modification: 173-48924-00001
Minor Permit Modification: 173-48980-00001
Reviewer: Hachem Ismaili Alaoui

Paved Roads at Industrial Site
The following calculations determine the amount of emissions created by paved roads, based on 8,760 hours of use and AP-42, Ch 13.2.1 (1/2011).

Vehicle Informtation (provided by source)

Type	Maximum number of vehicles per day	Number of one-way trips per day per vehicle	Maximum trips per day (trip/day)	Maximum Weight Loaded (tons/trip)	Total Weight driven per day (ton/day)	Maximum one-way distance (feet/trip)	Maximum one-way distance (mi/trip)	Maximum one-way miles (miles/day)	Maximum one-way miles (miles/yr)
Coal semi truck	100.0	1.0	100.0	25.0	2500.0	2640	0.500	50.0	18250.0
Coal semi truck	100.0	1.0	100.0	5.0	500.0	2640	0.500	50.0	18250.0
Ash semi truck	25.0	1.0	25.0	25.0	625.0	2640	0.500	12.5	4562.5
Ash semi truck	25.0	1.0	25.0	5.0	125.0	2640	0.500	12.5	4562.5
Small vehicles	30.0	1.0	30.0	2.0	60.0	2640	0.500	15.0	5475.0
Small vehicles	30.0	1.0	30.0	2.0	60.0	2640	0.500	15.0	5475.0
Limestone Delivery Truck (Full)	1.0	11.0	11.0	39.0	429.0	682	0.129	1.4	518.6
Limestone Delivery Truck (Empty)	1.0	11.0	11.0	14.0	154.0	682	0.129	1.4	518.6
Internal Limestone Truck (Full)	1.0	14.0	14.0	40.0	560.0	2469	0.468	6.5	2389.5
Internal Limestone Truck (Empty)	1.0	14.0	14.0	20.0	280.0	2469	0.468	6.5	2389.5
		Totals	**360.0**	**177.0**	**5293.0**	**22142.0**	**4.2**	**170.9**	**62391.2**

Average Vehicle Weight Per Trip = 14.7 tons/trip
Average Miles Per Trip = 0.47 miles/trip

Unmitigated Emission Factor, Ef = [k * (sL)^0.91 * (W)^1.02] (Equation 1 from AP-42 13.2.1)

	PM	PM10	PM2.5	
where k =	0.011	0.0022	0.00054	lb/VMT = particle size multiplier (AP-42 Table 13.2.1-1)
W =	14.7	14.7	14.7	tons = average vehicle weight (provided by source)
sL =	9.7	9.7	9.7	

Taking natural mitigation due to precipitation into consideration, Mitigated Emission Factor, Eext = E * [1 - (p/4N)] (Equation 2 from AP-42 13.2.1)
Mitigated Emission Factor, Eext = Ef * [1 - (p/4N)]
where p = 125 days of rain greater than or equal to 0.01 inches (see Fig. 13.2.1-2)
N = 365 days per year

	PM	PM10	PM2.5	
Unmitigated Emission Factor, Ef =	1.349	0.270	0.0662	lb/mile
Mitigated Emission Factor, Eext =	1.234	0.247	0.0606	lb/mile
Dust Control Efficiency =	90%	90%	90%	

Process	Mitigated PTE of PM (tons/yr)	Mitigated PTE of PM10 (tons/yr)	Mitigated PTE of PM2.5 (tons/yr)	Controlled PTE of PM (tons/yr)	Controlled PTE of PM10 (tons/yr)	Controlled PTE of PM2.5 (tons/yr)
Coal semi truck	11.26	2.25	0.55	1.13	0.23	0.06
Coal semi truck	11.26	2.25	0.55	1.13	0.23	0.06
Ash semi truck	2.81	0.56	0.14	0.28	0.06	0.01
Ash semi truck	2.81	0.56	0.14	0.28	0.06	0.01
Small vehicles	3.38	0.68	0.17	0.34	0.07	0.02
Small vehicles	3.38	0.68	0.17	0.34	0.07	0.02
Limestone Delivery Truck (Full)	0.32	0.06	0.02	0.03	0.01	0.00
Limestone Delivery Truck (Empty)	0.32	0.06	0.02	0.03	0.01	0.00
Internal Limestone Truck (Full)	1.47	0.29	0.07	0.15	0.03	0.01
Internal Limestone Truck (Empty)	1.47	0.29	0.07	0.15	0.03	0.01
Totals	**38.49**	**7.70**	**1.89**	**3.85**	**0.77**	**0.19**

Methodology
Total Weight driven per day (ton/day) = [Maximum Weight Loaded (tons/trip)] * [Maximum trips per day (trip/day)]
Maximum one-way distance (mi/trip) = [Maximum one-way distance (feet/trip) / [5280 ft/mile]
Maximum one-way miles (miles/day) = [Maximum trips per year (trip/day)] * [Maximum one-way distance (mi/trip)]
Average Vehicle Weight Per Trip (ton/trip) = SUM[Total Weight driven per day (ton/day)] / SUM[Maximum trips per day (trip/day)]
Average Miles Per Trip (miles/trip) = SUM[Maximum one-way miles (miles/day)] / SUM[Maximum trips per year (trip/day)]
Unmitigated PTE (tons/yr) = [Maximum one-way miles (miles/yr)] * [Unmitigated Emission Factor (lb/mile)] * (ton/2000 lbs)
Mitigated PTE (tons/yr) = [Maximum one-way miles (miles/yr)] * [Mitigated Emission Factor (lb/mile)] * (ton/2000 lbs)
Controlled PTE (tons/yr) = [Mitigated PTE (tons/yr)] * [1 - Dust Control Efficiency]

Abbreviations
PM = Particulate Matter
PM10 = Particulate Matter (<10 um)
PM2.5 = Particle Matter (<2.5 um)
PTE = Potential to Emit

Appendix A: Emission Calculations
Fugitive Dust Emissions - Unpaved Roads

Company Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
Address City IN Zip: 3711 Darlington Road, Newburgh, Indiana 47630
Minor Source Modification: 173-48924-00001
Minor Permit Modification: 173-48980-00001
Reviewer: Hachem Ismaili Alaoui

Unpaved Roads at Industrial Site
The following calculations determine the amount of emissions created by unpaved roads, based on 8,760 hours of use and AP-42, Ch 13.2.2 (11/2006).

Vehicle Information (provided by source)

Type	Maximum number of vehicles	Number of one-way trips per day per vehicle	Maximum trips per day (trip/day)	Maximum Weight of Loaded Vehicle (tons/trip)	Total Weight driven per day (ton/day)	Maximum one-way distance (feet/trip)	Maximum one-way distance (mi/trip)	Maximum one-way miles (miles/day)	Maximum one-way miles (miles/yr)
Ash Pond Transfer - Empty Truck	1.0	1.1	1.1	15.0	16.0	1994	0.378	0.4	147.3
Ash Pond Transfer - Loaded Truck	1.0	1.1	1.1	40.0	42.7	1994	0.378	0.4	147.3
Limestone Delivery Truck (Full)	1.0	11.0	11.0	39.0	429.0	664	0.126	1.4	504.9
Limestone Delivery Truck (Empty)	1.0	11.0	11.0	14.0	154.0	464	0.088	1.0	352.8
Internal Limestone Truck (Full)	1.0	14.0	14.0	40.0	560.0	845	0.160	2.2	817.8
Internal Limestone Truck (Empty)	1.0	14.0	14.0	20.0	280.0	845	0.160	2.2	817.8
		Totals	**52.1**	**168.0**	**1481.8**	**6806.0**	**1.3**	**7.6**	**2787.9**

Average Vehicle Weight Per Trip = 28.4 tons/trip
Average Miles Per Trip = 0.15 miles/trip

Unmitigated Emission Factor, Ef = k*[(s/12)^a]*[(W/3)^b] (Equation 1a from AP-42 13.2.2)

	PM	PM10	PM2.5	
where k =	4.9	1.5	0.15	lb/mi = particle size multiplier (AP-42 Table 13.2.2-2 for Industrial Roads)
s =	6.0	6.0	6.0	% = mean % silt content of unpaved roads (AP-42 Table 13.2.2-1 Iron and Steel Production)
a =	0.7	0.9	0.9	= constant (AP-42 Table 13.2.2-2 for Industrial Roads)
W =	28.4	28.4	28.4	tons = average vehicle weight
b =	0.45	0.45	0.45	= constant (AP-42 Table 13.2.2-2 for Industrial Roads)

Taking natural mitigation due to precipitation into consideration, Mitigated Emission Factor, Eext = E * [(365 - P)/365] (Equation 2 from AP-42 13.2.2)
Mitigated Emission Factor, Eext = E * [(365 - P)/365]
where P = 125 days of rain greater than or equal to 0.01 inches (see Fig. 13.2.2-1)

	PM	PM10	PM2.5	
Unmitigated Emission Factor, Ef =	8.30	2.21	0.22	lb/mile
Mitigated Emission Factor, Eext =	5.46	1.45	0.15	lb/mile
Dust Control Efficiency =	90%	90%	90%	(pursuant to control measures outlined in fugitive dust control plan)

Process	Mitigated PTE of PM (Before Control) (tons/yr)	Mitigated PTE of PM10 (Before Control) (tons/yr)	Mitigated PTE of PM2.5 (Before Control) (tons/yr)	Mitigated PTE of PM (After Control) (tons/yr)	Mitigated PTE of PM10 (After Control) (tons/yr)	Mitigated PTE of PM2.5 (After Control) (tons/yr)
Vehicle (entering plant) (one-way trip)	0.40	0.11	0.01	0.04	0.01	0.00
Vehicle (leaving plant) (one-way trip)	0.40	0.11	0.01	0.04	0.01	0.00
Limestone Delivery Truck (Full)	1.38	0.37	0.04	0.14	0.04	0.00
Limestone Delivery Truck (Empty)	0.96	0.26	0.03	0.10	0.03	0.00
Internal Limestone Truck (Full)	2.23	0.59	0.06	0.22	0.06	0.01
Internal Limestone Truck (Empty)	2.23	0.59	0.06	0.22	0.06	0.01
Totals	**7.60**	**2.03**	**0.20**	**0.76**	**0.20**	**0.02**

Methodology
Total Weight driven per day (ton/day) = [Maximum Weight of Loaded Vehicle (tons/trip)] * [Maximum trips per day (trip/day)]
Maximum one-way distance (mi/trip) = [Maximum one-way distance (feet/trip) / [5280 ft/mile]
Maximum one-way miles (miles/day) = [Maximum trips per year (trip/day)] * [Maximum one-way distance (mi/trip)]
Average Vehicle Weight Per Trip (ton/tr = SUM[Total Weight driven per day (ton/day)] / SUM[Maximum trips per day (trip/day)]
Average Miles Per Trip (miles/trip) = SUM[Maximum one-way miles (miles/day)] / SUM[Maximum trips per year (trip/day)]
Mitigated PTE (Before Control) (tons/yr) = (Maximum one-way miles (miles/yr)) * (Mitigated Emission Factor (lb/mile)) * (ton/2000 lbs)
Mitigated PTE (After Control) (tons/yr) = (Mitigated PTE (Before Control) (tons/yr)) * (1 - Dust Control Efficiency)

Abbreviations
PM = Particulate Matter
PM10 = Particulate Matter (<10 um)
PM2.5 = Particulate Matter (<2.5 um)
PTE = Potential to Emit

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

100 N. Senate Avenue • Indianapolis, IN 46204
(800) 451-6027 • (317) 232-8603 • Fax (317) 233-6647 • www.idem.IN.gov

Mike Braun
Governor

Clint Woods
Commissioner

SENT VIA U.S. MAIL: CONFIRMED DELIVERY AND SIGNATURE REQUESTED

TO: Greg Dick
Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station
PO Box 209
Evansville, IN 47702

DATE: July 7, 2025

FROM: Jenny Acker, Branch Chief
Permits Branch
Office of Air Quality

SUBJECT: Final Decision
TV Minor Permit Modification
173-48980-00001

This notice is to inform you that a final decision has been issued for the air permit application referenced above.

Our records indicate that you are the contact person for this application. However, if you are not the appropriate person within your company to receive this document, please forward it to the correct person. In addition, the Notice of Decision has been sent to the OAQ Permits Branch Interested Parties List and, if applicable, the Consultant/Agent and/or Responsible Official/Authorized Individual.

The final decision and supporting materials are available electronically; the original signature page is enclosed for your convenience. The final decision and supporting materials available electronically at:

IDEM's online searchable database: https://www.in.gov/apps/idem/caats/ . Choose Search Option **by Permit Number**, then enter permit 48980

and

IDEM's Virtual File Cabinet (VFC): https://www.in.gov/idem. Enter VFC in the search box, then search for permit documents using a variety of criteria, such as Program area, date range, permit #, Agency Interest Number, or Source ID.

If you have technical questions regarding the enclosed documents, please contact the Office of Air Quality, Permits Branch at (317) 233-0178, or toll-free at 1-800-451-6027 (ext. 3-0178), and ask to speak to the permit reviewer who prepared the permit. If you think you have received this document in error, or have difficulty accessing the documents online, please contact Joanne Smiddie-Brush of my staff at 1-800-451-6027 (ext 3-0185), or via e-mail at jbrush@idem.IN.gov.

Visit on.IN.gov/survey or scan the QR code to provide feedback.
We appreciate your input!

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

100 N. Senate Avenue • Indianapolis, IN 46204
(800) 451-6027 • (317) 232-8603 • Fax (317) 233-6647 • www.idem.IN.gov

Mike Braun
Governor

Clint Woods
Commissioner

July 7, 2025

TO: Newburgh Chandler Public Library Bell Road Library

From: Jenny Acker, Branch Chief
Permits Branch
Office of Air Quality

Subject: **Important Information for Display Regarding a Final Determination**

Applicant Name: **Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station**
Permit Number: **173-48980-00001**

You previously received information to make available to the public during the public comment period of a draft permit. Enclosed is a copy of the final decision and supporting materials for the same project. Please place the enclosed information along with the information you previously received. To ensure that your patrons have ample opportunity to review the enclosed permit, **we ask that you retain this document for at least 60 days.**

The applicant is responsible for placing a copy of the application in your library. If the permit application is not on file, or if you have any questions concerning this public review process, please contact Joanne Smiddie-Brush, OAQ Permits Administration Section at 1-800-451-6027, extension 3-0185.

Enclosures
Final Library 1/13/2025

Visit on.IN.gov/survey or scan the QR code to provide feedback.
We appreciate your input!

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

100 N. Senate Avenue • Indianapolis, IN 46204
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Mike Braun
Governor

Clint Woods
Commissioner

July 7, 2025
Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station
173-48980-00001

To: Interested Parties

This notice is to inform you that a final decision has been issued for the air permit application referenced above. This notice is for informational purposes only. You are not required to take any action.

You are receiving this notice because you asked to be on IDEM's notification list for this company and/or county; or because your property is nearby the company being permitted; or because you represent a local/regional government entity.

The enclosed Notice of Decision Letter provides additional information about the final permit decision.

The final decision and supporting materials are available electronically at:

IDEM's online searchable database: https://www.in.gov/apps/idem/caats/. Choose Search Option by Permit Number, then enter permit 48980

and

IDEM's Virtual File Cabinet (VFC): https://www.in.gov/idem. Enter VFC in the search box, then search for permit documents using a variety of criteria, such as Program area, date range, permit #, Agency Interest Number, or Source ID.

If you have technical questions regarding the enclosed documents, please contact the Office of Air Quality, Permits Branch at (317) 233-0178, or toll-free at 1-800-451-6027 (ext. 3-0178), and ask to speak to the permit reviewer who prepared the permit.

Please Note: *If you would like to be removed from the Air Permits mailing list, please contact Joanne Smiddie-Brush with the Air Permits Administration Section at 1-800-451-6027, ext. 3-0185 or via e-mail at JBRUSH@IDEM.IN.GOV. If you have recently moved and this Notice has been forwarded to you, please notify us of your new address and if you wish to remain on the mailing list. Mail that is returned to IDEM by the Post Office with a forwarding address in a different county will be removed from our list unless otherwise requested.*

Enclosure

Final Interested Parties Cover Letter 1/13/2025

Mail Code 61-53

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1		Greg Dick SIGECO - FB Culley Generating Station PO Box 209 Evansville IN 47702 (Source CAATS) via EMS									
2		F Shane Bradford Vice President SIGECO - FB Culley Generating Station PO Box 209 Evansville IN 47702 *(RO CAATS)*									
3		Warrick County Board of Commissioners 107 W Locust St, Ste 301 Boonville IN 47601-0585 *(Local Official)*									
4		Warrick County Health Department 107 W Locust St, Ste 204 Boonville IN 47601-1701 *(Health Department)*									
5		Newburgh Town Council and Town Manager PO Box 6 Newburgh IN 47630 *(Local Official)*									
6		Mr. Mark Wilson Evansville Courier & Press PO Box 268 Evansville IN 47702-0268 *(Affected Party)*									
7		Newburgh Chandler Public Library - Bell Road 4111 Lakeshore Dr, PO Box 850 Newburgh IN 47630 *(Library)*									
8		David Boggs 216 Western Hills Dr Mount Vernon IN 47620 *(Affected Party)*									
9		Tony Schroeder Trinity Consultants 29425 Chagrin Blvd Ste 360 Pepper Pike OH 44124 *(Consultant)*									
10		Tony Mendoza Sierra Club Environmental Law Program 2101 Webster St, Ste 1300 Oakland CA 94612 *(Affected Party)*									
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BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-25-12
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	))))	Order No. 202-25-13

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 27
CenterPoint Fuel Cost Order

ORIGINAL

Commissioner	Yes	No	Not Participating
Huston			√
Bennett	√		
Freeman	√		
Veleta	√		
Ziegner	√		

STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

PETITION OF SOUTHERN INDIANA GAS AND ELECTRIC COMPANY D/B/A CENTERPOINT ENERGY INDIANA SOUTH ("CEI SOUTH") FOR APPROVAL OF A CHANGE IN ITS FUEL COST ADJUSTMENT FOR ELECTRIC SERVICE IN ACCORDANCE WITH THE ORDER OF THE COMMISSION IN CAUSE NO. 37712 EFFECTIVE JUNE 18, 1986, AND SENATE BILL NO. 529 EFFECTIVE APRIL 11, 1979, AND FOR RECOVERY OF NATURAL GAS POWER PLANT PIPELINE SERVICE RATES IN ACCORDANCE WITH THE ORDER OF THE COMMISSION IN CAUSE NO. 45564 S1 EFFECTIVE AUGUST 7, 2024.

CAUSE NO. 38708 FAC 146

APPROVED: APR 30 2025

ORDER OF THE COMMISSION

Presiding Officer:
Ann S. Pagonis, Administrative Law Judge

On February 18, 2025, in accordance with Ind. Code § 8-1-2-42, Southern Indiana Gas and Electric Company d/b/a CenterPoint Energy Indiana South ("CEI South") filed its Verified Petition ("Petition") with the Indiana Utility Regulatory Commission ("Commission") in this Cause for approval of a change in its fuel adjustment charge ("FAC"). In support of its Petition, CEI South contemporaneously filed testimony.

On March 25, 2025, the OUCC filed the testimony of Gregory Guerrettaz, a Certified Public Accountant and President of Financial Solutions Group, Inc., and Michael D. Eckert, Chief Technical Advisor in the OUCC's Electric Division. The OUCC filed revisions on April 1, 2025.

The Commission held an evidentiary hearing at 9:30 a.m. on April 8, 2025, in Room 224 of the PNC Center, 101 West Washington Street, Indianapolis, Indiana. CEI South and the OUCC appeared by counsel at the hearing, during which each party's evidence was admitted into the record without objection.

Based on the applicable law and the evidence presented, the Commission finds:

1. **Statutory Notice and Jurisdiction.** Notice of the hearing in this Cause was given and published as required by law. CEI South is a public utility as defined in Ind. Code § 8-1-2-1. Under Ind. Code § 8-1-2-42, the Commission has jurisdiction over changes to CEI South's rates and charges related to adjustments in fuel costs. Therefore, the Commission has jurisdiction over CEI South and the subject matter of this proceeding.

2. CEI South's Characteristics. CEI South is a corporation organized and existing under the laws of the State of Indiana with its principal office located at 211 NW Riverside Drive in Evansville, Indiana. CEI South renders electric utility service to the public and owns and operates electric generating, transmission, and distribution plant, property, and equipment and related facilities for the production, storage, transmission, delivery, and furnishing of this service.

3. Efforts to Acquire Fuel and Generate or Purchase Power to Provide Electricity at the Lowest Reasonable Cost. As a condition of receiving its requested fuel adjustment cost, Petitioner must demonstrate it complied with the statutory requirements of Ind. Code § 8-1-2-42(d)(1) by making every reasonable effort to acquire fuel and generate or purchase power, or both, so as to provide electricity to its retail customers at the lowest fuel cost reasonably possible.

A. Efforts to Acquire Fuel. F. Shane Bradford, Petitioner's Vice President, Indiana Electric, testified that CEI South utilizes coal and natural gas for its electric generation and incurs the costs of purchasing those fuels, including fuel related transportation and storage costs. He said CEI South's generating units are offered into the Midcontinent Independent System Operator's ("MISO") Day Ahead and Real Time markets and are dispatched by MISO on an economic basis. He noted CEI South has contracted through competitive processes to purchase its coal requirements from nearby mines, which helps minimize transportation costs. Mr. Bradford added that CEI South utilizes Indiana coal as its primary fuel source for electric generation. He further testified that CEI South has one coal supply contract currently in place that supports re-pricing opportunities for CEI South's supply, which, given the volume flexibility provided under this contract, leaves opportunities for spot purchases as needed. CEI South has made specific data concerning its coal purchases available to the auditors for the OUCC.

Mr. Bradford described CEI South's coal inventory position and the on-going steps it has taken to manage its coal inventory. Mr. Bradford testified that CEI South has a coal inventory reserve target to ensure reliability. He then testified regarding CEI South's 2024 and 2025 coal plans, including an update on its projected coal burn, coal purchases, and coal inventory. Mr. Bradford also provided a detailed calculation of CEI South's expected coal inventory.

Mr. Bradford additionally described the details of the four new Texas Gas Transmission ("TGT") capacity contracts starting December 1, 2024, and April 1, 2025, respectively. Mr. Bradford testified that these four capacity contracts are consistent with the Commission's June 28, 2022 Order in Cause No. 45564, in which the Commission was satisfied with CEI South's decision to secure transportation capacity pursuant to a Precedent Agreement with TGT rather than pursuing alternatives.[1] Mr. Bradford explained that the Precedent Agreement comprises four executed firm service agreements and their associated negotiated rate letter agreements. He stated once construction of the TGT pipeline is completed and in service, firm service will commence and continue for a term of 20 years.

Mr. Bradford testified that, as detailed in Petitioner's Exhibit No. 1, Confidential Attachment FSB-3, of the four total new contracts with TGT, two provide firm capacity for winter

[1] *Southern Indiana Gas & Electric Co.*, Cause No. 45564 (IURC June 28, 2022), p. 28.

and two provide firm capacity for summer. Mr. Bradford stated the daily capacity for each season will be split, with one-half of the volume originating from the southern supply region (Zone SL), and the other half originating from a northern supply point (Zone 3). He explained that this receipt point split was included for supply diversification to both maximize reliability and mitigate the impact of elevated natural gas prices in specific geographical locations. Mr. Bradford noted information regarding the reservation cost derived rates for these new interstate capacity agreements can be found in Petitioner's Exhibit No. 2, Attachment BKA-3.

Brian K. Ankenbrand, Manager of Regulatory and Rates for CEI South, testified that CEI South received approval to recover the TGT-related costs through the FAC mechanism in the Commission's August 7, 2024 Order in Cause No. 45564 S1, which approved CEI South's request to recover the TGT costs using the then in effect 4CP allocation through its FAC mechanism. Specifically, Mr. Ankenbrand stated the Commission authorized CEI South to recover TGT fixed costs through the Natural Gas Power Plant Pipeline Service Rate. He noted CEI South will recover the variable commodity costs as part of its fuel charges through the FAC mechanism. The Natural Gas Power Plant Pipeline Service Rates requested for recovery in this FAC can be found in Petitioner's Exhibit No. 2, Attachment BKA-1.

Michael D. Eckert, Chief Technical Advisor in the OUCC's Electric Division, testified that as of January 31, 2025, CEI South's coal inventory was 226,197 tons, which is approximately 76,410 tons lower than what was reported in Cause No. 38708 FAC 145. He added that CEI South has taken actions to increase its coal inventory. Mr. Eckert recommended CEI South continue to provide inputs to its calculation of the coal inventory, as well as update the Commission on its 2025 projected coal burn, coal purchases, and coal inventory.

Mr. Eckert testified that CEI South is not currently using coal decrement pricing. He stated that the OUCC recommends CEI South file testimony, schedules, and workpapers to justify any coal decrement pricing (or any other type of pricing) in future FAC filings. Mr. Eckert noted CEI South is requesting recovery of firm TGT interstate pipeline capacity costs in this proceeding. Mr. Eckert determined CEI South's proposed treatment of the TGT interstate pipeline capacity costs complies with the Commission's August 7, 2024 Order in Cause No. 45564 S1. He added that CEI South's steam generation costs and monthly fuel costs are comparable or lower than its Indiana peer utilities.

Mr. Eckert testified that during its review, the OUCC was made aware of an outage at Culley Unit 3. He stated that Culley Unit 3's transformer failed on February 15, 2025, possibly due to a lightning strike. He further testified that CEI South anticipates the unit to be back online by April 4, 2025. Additionally, he noted that due to the environmental parameters associated with the Culley Unit 3 outage, Culley Unit 2's availability will be limited until Unit 3 comes back online. Mr. Eckert stated that CEI South may need to purchase power from the MISO market to replace lost power as a result of the outage, subjecting CEI South's fuel cost to market volatility, possibly impacting CEI South's FAC 147 and FAC 148. The OUCC recommended CEI South provide an update to the Commission on the Culley Unit 3 forced outage in FAC 147.

Based on the evidence presented, the Commission finds that CEI South has made every reasonable effort to acquire fuel so as to provide electricity to its retail customers at the lowest fuel

cost reasonably possible. We also find Mr. Eckert's recommendations regarding CEI South's coal inventory reasonable and appropriate. As such, we direct CEI South to continue providing inputs to its coal inventory calculation and to update the Commission on its 2025 projected coal burn, coal purchases, and coal inventory. Additionally, CEI South is directed to file testimony, schedules, and workpapers to justify any coal decrement pricing or other type of pricing in future FAC filings. Finally, CEI South is directed to provide an update to the Commission on the Culley Unit 3 forced outage in its FAC 147 filing.

B. Purchased Power Costs for September, October, and November 2024 ("Reconciliation Period"). In Cause No. 43414, the Commission established daily benchmarks to assess the reasonableness of purchased power costs. Mr. Bradford explained that the benchmark consists of using a generic gas-fired turbine heat rate of 12,500 BTU/kWh and the NYMEX Henry Hub Gas day-ahead price plus $0.60/MMBTU gas transport charge. Petitioner's Exhibit No. 1, Attachment FSB-1, Schedule 2 illustrates the calculation of the daily benchmarks. Applying the daily benchmarks to individual power purchase transactions in this proceeding, CEI South requests the recovery of certain purchased power costs in excess of the Daily Benchmarks for the Reconciliation Period. As the Commission previously noted, the standard to evaluate a utility's purchase that exceeds the benchmark is the "reasonableness of the decisions under the circumstances which were known (or which reasonably should have been known) at the time the purchases were made, not an after the fact focus using hindsight judgment . . . ." *Treatment of Purchased Power Costs*, Cause No. 41363 (IURC Aug. 18, 1999).

Mr. Bradford stated that CEI South incurred purchased power costs in excess of the daily benchmarks totaling $1,672,025.14 ($992,912.57 in September 2024, $357,711.82 in October 2024, and $321,400.75 in November 2024). He stated that $50,883.04 of this total is not recoverable because it did not meet the criteria established by a benchmark settlement, but the remaining over-benchmark purchases in the amount of $1,621,142.10 are recoverable. He stated the $1,621,142.10 in benchmark purchases were incurred pursuant to MISO's security constrained economic dispatch across its footprint because MISO elected to utilize other generation when CEI South needed additional power. Petitioner's Exhibit No. 1, Attachment FSB-1, Schedule 3 provided evidence regarding CEI South's purchased power that included purchased power volumes, costs, the reasons for the purchases, and the sum of hourly purchased power costs in excess of the applicable benchmarks for the Reconciliation Period. CEI South also provided support for its position that over-benchmark costs of $1,621,142.10 included in this proceeding are recoverable. The schedule indicates these power purchases were made due to generation facilities being on outage or reserve shutdown. Mr. Bradford testified that without the purchased power, Petitioner could not have met its retail customers' demand while complying with MISO dispatch instructions. OUCC witness Eckert agreed with CEI South's determination that the utility should be allowed to recover $1,621,142.10 of purchased power costs that exceeded the benchmark.

Based on this evidence, we find CEI South's identified purchased power costs were reasonable under the circumstances at the time of the purchases. As such, these purchased power costs are properly included in the fuel cost reconciliation.

4. Fuel Cost and Other Operating Expenses. To recover its requested fuel adjustment cost, Ind. Code § 8-1-2-42(d)(2) requires Petitioner to establish that "the actual increases in fuel cost through the latest month for which actual fuel costs are available since the last order of the commission approving basic rates and charges of the electric utility have not been offset by actual decreases in other operating expenses." Actual increases in Petitioner's fuel cost in the current case for the Reconciliation Period have not been offset by actual decreases in other operating expenses.

At the time of filing this Petition, the latest month for which CEI South's actual fuel costs were available was November 2024, and the latest three months for which such figures were available were September, October, and November 2024.

The Order in CEI South's most recent electric base rate case, Cause No. 43839, was issued on April 27, 2011, and approved the cost of fuel per kWh sold to be determined for the various voltage-level sales groups based on the line loss characteristics of each voltage group. These changes were effective May 3, 2011. The average cost of fuel per kWh supplied for the Reconciliation Period was $0.030945 as reflected in Petitioner's Exhibit No. 2, Attachment BKA-2, Schedule 5, Page 4, Line 32. The fuel cost at approved rates in Cause No. 43839 totaled $222,189,000 and the actual fuel costs were $197,501,000, a difference of $24,688,000, as shown on Petitioner's Exhibit No. 3, Attachment CMB-1, Page 1, Line 17.

As shown in Petitioner's Exhibit No. 3, Attachment CMB-1, Page 1, Line 16, the authorized operation and maintenance expense, excluding fuel cost, for the 12 months ended November 30, 2024, was $271,038,000, while the actual operating and maintenance expense, excluding fuel, amounted to $305,879,000, a difference of $34,841,000.

Based on the evidence, the Commission finds CEI South has met the requirement of Ind. Code § 8-1-2-42(d)(2) that increases in fuel costs have not been offset by decreases in other operating expenses.

5. Return Earned. Ind. Code § 8-1-2-42(d)(3), subject to the provisions of Ind. Code § 8-1-2-42.3, generally prohibits an FAC that would result in CEI South earning a return in excess of the applicable authorized return. Should the FAC result in CEI South earning a return in excess of the applicable authorized return, CEI South must, in accordance with the provisions of Ind. Code § 8-1-2-42.3, determine if the sum of the differentials between the actual earned return and the authorized return for each of the 12-month periods considered during the relevant period is greater than zero. If the sum is greater than zero, the Commission shall reduce the FAC. Ind. Code § 8-1-2-42.3(b).

The authorized return from Cause No. 43839 applicable in this Cause is $94,450,297. The Commission's Orders in Cause Nos. 44910, 45052, and 44909, including sub-dockets, authorized a total of $40,357,805. The proration for purposes of this FAC is determined on a daily basis as shown in Petitioner's Exhibit No. 3, Attachment CMB-3 (Cause No. 44910 TDSIC 13 of $11,129,213, Cause No. 44910 TDSIC 14 of $15,178,497, Cause No. 44910 TDSIC 1 of $251,133, Cause No. 45052 ECA 3 of $1,871,652, Cause No. 45052 ECA 4 of $7,053,254, Cause No. 45052 ECA 5 of $4,113,313, Cause No. 44909 CECA 5 of $382,997, and Cause No. 44909 CECA 6 of

$377,747). Therefore, CEI South's authorized return for this FAC proceeding is $134,808,102. Petitioner's Exhibit No. 3, Attachment CMB-1, Page 1, Line 15 shows net electric operating income applicable to retail customers for the 12 months ended November 30, 2024, of $99,099,000. CEI South based its net operating income on its actual financial statements for this period.

CEI South did not exceed its authorized return in the current period as reflected in Petitioner's Exhibit No. 3, Attachment CMB-2, Line 1. The sum of the differentials (both positive and negative) between the determined return and the authorized return during the relevant period is negative $727,200,862. As such, no refund is appropriate.

6. Estimation of Fuel Cost. Ind. Code § 8-1-2-42(d)(4) sets forth an additional requirement that must be found for an electric utility to recover its requested FAC. Specifically, it requires a finding that a utility's estimate of its prospective average fuel costs for each month of the estimated three calendar months is reasonable after taking into consideration the actual fuel costs experienced and the estimated fuel costs for the three calendar months for which actual fuel costs are available.

Petitioner's Exhibit No. 2, Attachment BKA-2, Schedule 1, Line 26, Column E indicates CEI South's prospective average monthly fuel cost for May, June and July 2025 ("Estimation Period") is $17,131,374. Mr. Ankenbrand explained that this prospective average fuel cost estimate was calculated by determining the amount of generation that would be required from each generating unit, the amount of fuel required for the generation, and the price of fuel for each generating unit, assuming a normal weather supply plan. The price used for each coal-fired generation unit is the estimated average price of all coal in inventory for each unit. CEI South has included projections for solar generation within this FAC proceeding.

Mr. Ankenbrand sponsored Petitioner's Exhibit No. 2, Attachment BKA-2, Schedule 5, Page 4, which indicates CEI South estimated its weighted average fuel cost for the Reconciliation Period would be $0.032014 per kWh supply. This exhibit further shows the actual weighted average fuel cost experienced for this three-month period was $0.030945 per kWh supply, resulting in a difference between estimated and actual weighted average cost in the amount of $0.001069 per kWh or 3.45% as reflected in Petitioner's Exhibit No. 2, Attachment BKA-2, Schedule 5, Page 4, Line 33. He said the estimating deviation was 5.69% in September 2024, 3.40% in October 2024, and 0.94% in November 2024.

Based on the evidence presented, the Commission finds CEI South's estimating techniques are reasonable, and its estimates for the Estimation Period should be accepted.

7. Actual Incremental Fuel Cost/Actual Incremental Fuel Clause Revenue. During the Reconciliation Period, CEI South's actual incremental cost of fuel incurred was negative $6,304,465, but its actual incremental fuel adjustment clause revenues to be reconciled with this amount equaled negative $1,698,901, resulting in an over-recovery for the Reconciliation Period in the amount of $4,605,564 as reflected on Petitioner's Exhibit No. 2, Attachment BKA-

2, Schedule 4, Pages 1-3, Line 6.[2] CEI South's reconciliation of the actual incremental fuel cost and the collected fuel costs for the Reconciliation Period is proper and when combined with the Estimation Period, assures CEI South is reconciling actual fuel costs applicable to kWh sales.

8. Resulting Fuel Cost Adjustment. The estimated cost of fuel supplied for the Estimation Period in this filing, $0.037597 per kWh as reflected on Petitioner's Exhibit No. 2, Attachment BKA-2, Schedule 1, Line 27, plus the variance of negative $0.003566 per kWh (*Id.* at Line 31), results in the cost of fuel supplied of $0.034031 per kWh (*Id.* at Line 32). Adjustments for system losses are applied to the rate schedules based on voltage-level losses, as approved in Cause No. 43839. Mr. Ankenbrand stated that CEI South updated its base cost of fuel included in rates in its FAC rate derivation calculation, as approved in Cause No. 45990 (*Id.* at Line 37). The following table illustrates the calculation of the FACs for the voltage-level groups based on their estimated loss percentages.

	RS, B, SGS, OSS, SL, OL	DGS	LP	HLF	Special Contracts
Cost of Fuel Supplied	34.031	34.031	34.031	34.031	37.690
Estimated Loss %	6.964451%	6.932541%	4.510571%	1.779189%	1.179325%
Fuel Cost Adjusted for Losses	36.578	36.566	35.638	34.647	38.140
Estimated Cost of Company Use	0.099	0.099	0.099	0.099	0.099
Total Estimated Cost of Fuel (mills/kWh Sold)	36.677	36.665	35.737	34.746	38.239
Less Base Cost of Fuel Included in Rates (mills/kWh Sold)[3]	44.338	44.326	43.299	42.133	
Fuel Cost Charge per kWh sold (mills/kWh Sold)	(7.661)	(7.661)	(7.562)	(7.387)	38.239

The OUCC recommended the Commission approve the factors set forth above. The FACs shown above, if approved, will be applied to the usage billed by CEI South during the Estimation Period.

[2] These figures are not inclusive of the special contract variance included on Petitioner's Exhibit No. 2, Attachment BKA-2, Schedule 4, Pages 1-3, Line 7, as the special contract variance does not contribute to the rate derivation for the other rate classes.

[3] Pursuant to the February 3, 2025, Final Order in Cause No. 45990

CEI South additionally requested approval of Natural Gas Power Plant Pipeline Service Rates for the recovery of costs incurred during the FAC period, including the reconciliation of prior period variances and the offset of costs with any used capacity sales from the TGT pipeline, as approved in Cause No. 45564 S1. As noted above, in Cause No. 45564 S1 we authorized CEI South to recover its TGT costs using the then in effect 4CP allocation factors approved in Cause No. 43354 MCRA 21 S1. As explained by Mr. Ankenbrand, CEI South updated its allocation percentages used in its natural gas power plant pipeline service ("NGPPPS") rate derivation calculation, as approved in Cause No. 45990. This table illustrates the Natural Gas Power Plant Pipeline Service Rates to be charged by rate schedule.

	Allocation Percentage[4]	**Charge Adjusted**	**Rate ($ per kW or kVa)**	**Rate ($ per kWh)**
RS	38.3107%	Energy	-	$0.006905
B	0.1295%	Energy	-	$0.004437
SGS	1.4210%	Energy	-	$0.005757
DGS/MLA	23.7110%	Energy	-	$0.005850
OSS	1.4935%	Energy	-	$0.004642
LP	32.6662%	Demand	$1.733	-
BAMP – Base	1.4112%	Demand	$0.893	-
HLF	0.8569%	Demand	$2.221	-

The Natural Gas Power Plant Pipeline Service Rates shown above will be applied to the usage billed by CEI South during the Estimation Period.

9. Effect on Customers. Based on CEI South's filing, a residential customer using 1,000 kWh per month will experience an increase of $1.33 per month on his or her electric bill for the Estimation Period compared to the factors presently approved (excluding various tracking mechanisms and sales tax).

10. Confidential Information. On February 18, 2025, Petitioner filed its Motion for Protection of Confidential and Proprietary Information with a supporting affidavit asserting that certain information to be submitted to the Commission was trade secret information as defined in Ind. Code § 24-2-3-2 and should be treated as confidential in accordance with Ind. Code §§ 5-14-3-4 and 8-1-2-29. A Docket Entry was issued on March 4, 2025, in which the Presiding Officers determined the information should be held confidential on a preliminary basis, after which the information was submitted under seal. After reviewing the information and consideration of the affidavit, we find the information is trade secret information as defined in Ind. Code § 24-2-3-2, is exempt from public access and disclosure under Ind. Code §§ 5-14-3-4 and 8-1-2-29, and shall be held confidential and protected from public access and disclosure by the Commission.

[4] Pursuant to the February 3, 2025 Final Order in Cause No. 45990

IT IS THEREFORE ORDERED BY THE INDIANA UTILITY REGULATORY COMMISSION that:

1. CEI South's fuel cost factors set forth above in Finding 8 are approved.

2. Prior to implementing the authorized rates, CEI South shall file the tariff and applicable rate schedules under this Cause for approval by the Commission's Energy Division. Such rates shall be effective on or after the date of approval, subject to Division review and agreement with the amounts reflected.

3. Consistent with the OUCC's recommendations, CEI South shall continue to provide inputs to its coal inventory calculation; update the Commission regarding Petitioner's 2025 projected coal burn, coal purchases, and coal inventory; update the OUCC with detailed information on any potential coal or transport contract amendments or price changes; and provide testimony describing the impact Petitioner's fuel inventory strategy may have on its customers. CEI South shall continue to provide testimony regarding its natural gas hedges for the forecast period and how the strategy evolves. CEI South shall also file testimony, schedules, and workpapers to justify any actual or anticipated need for coal decrement pricing in future FAC filings. CEI South shall provide testimony in FAC 147 regarding the February 15, 2025, Culley Unit 3 forced outage.

4. The information submitted under seal in this Cause pursuant to Petitioner's request for confidential treatment is determined to be confidential trade secret information as defined in Ind. Code § 24-2-3-2 and shall continue to be held as confidential and exempt from public access and disclosure pursuant to Ind. Code §§ 5-14-3-4 and 8-1-2-29.

5. This Order shall be effective on and after the date of its approval.

BENNETT, FREEMAN, VELETA, AND ZIEGNER CONCUR; HUSTON ABSENT:

APPROVED: APR 30 2025

I hereby certify that the above is a true and correct copy of the Order as approved.

Dana Kosco

Digitally signed by Dana Kosco
Date: 2025.04.30 10:20:12 -04'00'

Dana Kosco
Secretary of the Commission

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-25-12
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	))))	Order No. 202-25-13

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 28
Culley 2024 NPDES Permit

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
We Protect Hoosiers and Our Environment.
100 N. Senate Avenue • Indianapolis, IN 46204
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Eric J. Holcomb
Governor
Brian C. Rockensuess
Commissioner

May 3, 2024

VIA ELECTRONIC MAIL - shane.bradford@centerpointenergy.com

Mr. Shane Bradford, Vice-President, Power Generation Operations
CenterPoint Energy
P.O. Box 209
Evansville, IN 47702

Dear Mr. Bradford:

Re: NPDES Permit No. IN0002259
Permit Modification
SIGECO F.B. Culley Generating Station
Newburgh, IN – Warrick County

Your request for modification of the above-referenced discharge permit has been processed in accordance with Section 402 and 405 of the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251, et seq.), and IDEM's permitting authority under IC 13-15.

The enclosed Pages 1 through 21 of 79 are intended to replace the corresponding pages of your existing NPDES Permit No. IN0002259. An accompanying Fact Sheet itemizes and explains the rationale for the revisions. All discharges from the referenced facility shall be consistent with the terms and conditions of this permit, as modified.

The draft NPDES permit for the SIGECO F.B. Culley Generating Station was made available for public comment from March 19, 2024, through April 19, 2024, as part of Public Notice No. 20240319 – IN0002259– D on IDEM's website at https://www.in.gov/idem/public-notices/public-notices-all-regions/. During this comment period, no comment letters were received.

Pursuant to IC 4-21.5-3-5(f), the determination of modification in this letter becomes effective fifteen (15) days after it has been served; however, pursuant to IC 4-21.5-3-2(e), if it is served by mail it becomes effective eighteen (18) days after issued. It should also be noted that any appeal must be filed under procedures outlined in IC 13-15-6, IC 4-21.5, and the enclosed Public Notice.

The appeal must be initiated by filing a petition for administrative review with the Office of Environmental Adjudication (OEA) within fifteen (15) days of the emailing of an electronic copy of this letter or within eighteen (18) days of the mailing of this letter by filing at the following addresses:

Director
Office of Environmental Adjudication
Indiana Government Center North
Room N103
100 North Senate Avenue
Indianapolis, Indiana 46204

Commissioner
Indiana Department of Environmental Management
Indiana Government Center North
Room 1301
100 North Senate Avenue
Indianapolis, Indiana 46204

Any appeal request must be filed in accordance with IC 4-21.5-3-7, IC 13-15-7, and the enclosed Public Notice. The appeal request must include facts demonstrating that the party requesting appeal is the applicant, a person aggrieved or adversely affected by this modification or otherwise entitled to review by law. Pursuant to IC 13-15-7-3, the permit shall remain in force pending a decision on any appeal that has been timely requested under the provisions of IC 4-21.5 and IC 13-15-7.

One condition of your permit requires periodic reporting of several effluent parameters. You are required to submit both federal discharge monitoring reports (DMRs) and state Monthly Monitoring Reports (MMRs) on a routine basis. The MMR form is available on the internet at the following web site: https://www.in.gov/idem/cleanwater/wastewater-compliance/wastewater-reporting-forms-notices-and-instructions/.

Once you are on this page, select the “IDEM Forms” page and locate the “Monthly Monitoring Report (MMR) for Industrial Discharge Permits-30530” under the Wastewater Facilities heading. We recommend selecting the “XLS” version because it will complete all of the calculations when you enter the data.

All NPDES permit holders are required to submit their monitoring data to IDEM using NetDMR. Information on NetDMR is available on the IDEM website at https://www.in.gov/idem/cleanwater/resources/netdmr/.

If you have questions concerning this modification, please contact Nikki Gardner at 317/232-8707 or ngardner@idem.in.gov. More information on the appeal review process is available at the website for the Office of Environmental Adjudication at http://www.in.gov/oea.

Sincerely,



Jerry Dittmer, Chief
Permits Branch
Office of Water Quality

Enclosure

cc: Chief, Permits Section, U.S. EPA, Region 5
Warrick County Health Department
Angela Casbon-Scheller, CenterPoint Energy
Jeremy Ferguson, IDEM
Helen Demmings, IDEM
Stacey Cochran, ORSANCO
Shyamala Raman, IDEM OLQ
Troy Weaver, IDEM OLQ

STATE OF INDIANA

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

AMENDED AUTHORIZATION TO DISCHARGE UNDER THE

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act, as amended, (33 U.S.C. 1251 et seq., the "Clean Water Act" or “CWA”), and IDEM’s permitting authority under IC 13-15,

SOUTHERN INDIANA GAS AND ELECTRIC COMPANY (SIGECO)

is authorized to discharge from the F.B. Culley Generating Station, a coal-fired steam electric generating plant, that is located at 3711 Darlington Road, Newburgh, Indiana, to receiving waters identified as the Ohio River and Little Pigeon Creek near its confluence with the Ohio River in accordance with effluent limitations, monitoring requirements, and other conditions set forth in Parts I, II, and III hereof.

The permit, as issued on February 1, 2023, and subsequently modified on July 6, 2023, and August 30, 2023, is hereby amended, as contained herein. The amended provisions shall become effective May 1, 2024. All terms and conditions of the permit not modified at this time remain in effect. Further, any existing condition or term affected by the amendments will remain in effect until the amended provisions become effective. This permit may be revoked for the nonpayment of applicable fees in accordance with IC 13-18-20.

This permit and the authorization to discharge, as amended, shall expire at midnight February 29, 2028. In order to receive authorization to discharge beyond the date of expiration, the permittee shall submit such information and forms as are required by the Indiana Department of Environmental Management no later than 180 days prior to the date of expiration.

Issued on May 3, 2024 for the Indiana Department of Environmental Management.



Jerry Dittmer, Chief
Permits Branch
Office of Water Quality

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. The permittee is authorized to discharge from the outfall listed below in accordance with the terms and conditions of this permit. The permittee is authorized to discharge from Outfall 001[21], located at Latitude 37° 54' 35.39", Longitude -87° 19' 37.99". The discharge is limited to condenser cooling unit wastewater, contact stormwater pond discharge (internal Outfall 101 - low volume wastewater, coal pile run-off, treated metal cleaning wastewater from internal outfall 401, bottom ash transport water filtrate, East Ash Pond water (filtrate), and stormwater), and East Ash Pond perimeter gradient control wells (internal Outfall 201). Samples taken in compliance with the monitoring requirements below shall be taken at a point representative of the discharge but prior to entry into the Ohio River. Such discharge shall be limited and monitored by the permittee as specified below:

DISCHARGE LIMITATIONS [1][2][12][13][16][17]
Outfall 001

Table 1

	Quantity or Loading			Quality or Concentration			Monitoring Requirements	
	Monthly	Daily		Monthly	Daily		Measurement	Sample
Parameter	Average	Maximum	Units	Average	Maximum	Units	Frequency	Type
Flow[18]	Report	Report	MGD	----	----	----	1 X Daily	24-Hour Total
Plant Capacity Factor	----	----	----	Report	----	%daily average	1 X Daily	Report
Temperature								
Intake	----	----	----	Report	Report	°F	1 X Hourly[11]	Grab
Effluent[22]	----	----	----	Report	Report	°F	1 X Hourly[11]	Grab
Mixed River[9][10][22]	----	----	----	Report	Report	°F	1 X Daily[23]	Grab
ORSANCO[25]								
Interim	----	----	----	----	Report	°F	1 X Daily	Report
Final	----	----	----	----	110	°F	1 X Daily	Report
Total Residual Oxidants (Bromine)[5][6]			----	0.75	2	µg/l	1 X Daily	Grab
TRC-Continuous [5][6][14]	----	----	----	0.02	0.04	mg/l	1 X Daily	Grab
Duration/Day	----	----	----	----	120	minutes/day	1 X Daily	Report
TRC - Intermittent[15][19]		----	----	Report	0.2	mg/l	1 X Daily	Grab
Frequency	----	----	----	----	4	times/day	1 X Daily	Report
Dose Duration	----	----	----	----	40	minutes/dose	1 X Daily	Report
Duration/Day	----	----	----	----	120	minutes/day	1 X Daily	Report
Cadmium[4]	----	----	----	2.1	3.9	µg/l	2 X Monthly	24 Hr. Comp.
Mercury[4][6]	----	----	----	12	20	ng/l	6 X Annually[7]	Grab
Copper[4]	----	----	----	31	63	µg/l	2 X Monthly	24 Hr. Comp.
Iron[4]	----	----	----	Report	Report	µg/l	2 X Monthly	24 Hr. Comp.
Silver[4][6][24]								
Interim	----	----	----	Report	Report	µg/l	2 X Monthly	24 Hr. Comp.
Final	----	----	----	3.8	6.6	µg/l	2 X Monthly	24 Hr. Comp.
Nickel[4]	----	----	----	Report	Report	µg/l	1 X Monthly	24 Hr. Comp.
Aluminum[4]	----	----	----	Report	Report	mg/l	1 X Monthly	24 Hr. Comp.
Arsenic[4][6]	----	----	----	Report	Report	mg/l	1 X Monthly	24 Hr. Comp.
Selenium[4][6]	----	----	----	Report	Report	mg/l	1 X Monthly	24 Hr. Comp.
Zinc[4]	----	----	----	Report	Report	mg/l	1 X Monthly	24 Hr. Comp.
Free Cyanide[6]	----	----	----	Report	Report	mg/l	1 X Monthly	Grab

Sulfate	----	----	----	Report	Report	mg/l	1 X Quarterly[8] 24 Hr. Comp.
Boron	----	----	----	Report	Report	mg/l	1 X Quarterly[8] 24 Hr. Comp.
Chloride	----	----	----	Report	Report	mg/l	1 X Quarterly[8] 24 Hr. Comp.
Fluoride	----	----	----	Report	Report	mg/l	1 X Quarterly[8] 24 Hr. Comp.
Bromide	----	----	----	Report	Report	mg/l	1 X Quarterly[8] 24 Hr. Comp.
Whole Effluent Toxicity Testing[20]							

Table 2

	Quality or Concentration			Monitoring Requirements	
	Daily	Daily		Measurement	Sample
Parameter	Minimum	Maximum	Units	Frequency	Type
pH[3]	6.0	9.0	s.u.	1 X Monthly	Grab

[1] See Part I.B. of the permit for the minimum narrative limitations.

[2] In the event that a new water treatment additive is to be used that will contribute to this Outfall, or changes are to be made in the use of water treatment additives, including dosage, the permittee must apply for and receive approval from IDEM prior to such discharge. Discharges of any such additives must meet Indiana water quality standards. The permittee must apply for permission to use water treatment additives by completing and submitting State Form 50000 (Application for Approval to Use Water Treatment Additives) currently available at: https://www.in.gov/idem/forms/idem-agency-forms/.

[3] If the permittee collects more than one grab sample on a given day for pH, the values shall not be averaged for reporting daily maximums or daily minimums. The permittee must report the individual minimum and the individual maximum pH value of any sample during the month on the Monthly Monitoring Report form.

[4] The permittee shall measure and report the identified metal as total recoverable metal.

[5] The water quality-based effluent limits (WQBEL) for bromine and TRC are less than the limit of quantitation (LOQ) as specified in footnote [6]. Compliance with this permit will be demonstrated if the effluent concentrations measured are less than the respective LOQ. If the measured concentration of bromine or TRC is greater than the water quality-based effluent limitations and above the respective LOD specified in footnote [6] in any three (3) consecutive analyses, or any five (5) out of nine (9) analyses, then the discharger shall:

(1) Determine the source of the parameter through an evaluation of sampling techniques, analytical/laboratory procedures, and waste streams (including internal waste streams). Re-examine the chlorination /dechlorination procedures or re-examine the bromination /de-bromination procedures, as applicable.

(2) The sampling and analysis for bromine or TRC shall be increased to 2 X Daily and remain at this increased sampling frequency until:

(a) The increased sampling frequency for bromine or TRC has been in place for at least five (5) days;
(b) At least nine (9) samples have been taken under this increased sampling frequency; and
(c) The measured concentration of bromine or TRC is less than the LOD specified in footnote [6] in at least seven (7) out of the nine (9) most recent analyses.

[6] The following EPA approved test methods and associated LODs and LOQs are to be used in the analysis of the effluent samples. Alternative methods may be used if first approved by IDEM and EPA, if applicable.

Parameter	Test Method	LOD	LOQ
Mercury	1631E	0.2 ng/l	0.5 ng/l
Arsenic	3113 B-2004	1 µg/l	3.2 µg/l
Arsenic	200.9, Rev. 2.2 (1994)	0.5 µg/l	1.6 µg/l
Arsenic	200.8, Rev. 5.4 (1994)	0.4 µg/l	1.3 µg/l
Selenium	3113 B-2004 or 3114 B-2009	2 µg/l	6.4 µg/l
Selenium	200.8, Rev. 5.4 (1994)	2.1 µg/l	6.7 µg/l
Selenium	200.9, Rev. 2.2 (1994)	0.6 µg/l	1.9 µg/l
Silver	200.8, Rev 5.4 (1994) Selection Ion Monitoring	0.005 µg/l	0.016 µg/l
Chlorine, Total residual	4500-Cl D-2000, E-2000 or G-2000	0.02 mg/l	0.06 mg/l
Cyanide, Available**	4500-CN-G-1999	5 µg/l	16 µg/l
Cyanide, Available**	OIA-1677-09 (available)	0.5 µg/l	1.6 µg/l
Cyanide, Available**	Kelada-01 (available)	0.5 µg/l	1.6 µg/l
Oxidants, Total Residual (Bromine)	4500-Cl D-2000, E-2000 or G-2000	0.02 mg/l	0.06 mg/l
**Free cyanide shall be reported as free cyanide but measured using one of the EPA approved test methods above for available cyanide.			

Case-Specific LOD/LOQ

The permittee may determine and use a case-specific LOD or LOQ using the analytical method specified above, or any other analytical method which is approved by the Commissioner, and EPA if applicable, prior to use. The LOD shall be derived by the procedure specified for method detection limits contained in 40 CFR Part 136, Appendix B, and the LOQ shall be set equal to 3.18 times the LOD. Other methods may be used if first approved by the Commissioner.

[7] Mercury monitoring shall be conducted 6 X annually in the months of February, April, June, August, October, and December of each year for the term of the permit using EPA Test Method 1631, Revision E.

[8] Samples shall be taken once at any time during each of the four annual quarters:

(A) January-February-March;
(B) April-May-June;
(C) July-August-September; and
(D) October-November-December.

For quarterly monitoring, in the first quarter for example, the permittee may conduct sampling within the month of January, February or March. The result from this reporting timeframe shall be reported on the March DMR, regardless of which of the months within the quarter the sample was taken.

[9] At no time shall the water temperature of the discharge from Outfall 001, as determined at the edge of the mixing zone described in 327 IAC 2-1-4, exceed the maximum limits in the following table during more than one percent (1%) of the hours in the twelve (12) month period ending with any month and by more than three degrees Fahrenheit (3ºF) (one and seven-tenths degrees Celsius (1.7ºC)). Water temperatures shall not exceed the following average temperature limitations (these are averages of the daily maximums for each day in the period).

Month	Average °F(°C)	Maximum °F(°C)
January	49.3 (9.6)	50 (10.0)
February	48.6 (9.2)	50 (10.0)
March	55.0 (12.8)	60 (15.6)
April	63.2 (17.3)	70 (21.1)
May	71.4 (21.9)	80 (26.7)
June 1-15	77.6 (25.3)	87 (30.6)
June 16-30	87.0 (30.6)	
July	89.0 (31.7)	89 (31.7)
August	89.0 (31.7)	89 (31.7)
September 1-15	87.0 (30.6)	87 (30.7)
September 16-30	82.6 (28.1)	
October	75.5 (24.2)	78 (25.6)
November	66.1 (19.0)	70 (21.1)
December	56.7 (13.7)	57 (14.0)

[10] The permittee will have the option of either meeting the above limits at the end of pipe, or by meeting the limits with a mixed river temperature that takes into account the mixing zone allowed by 327 IAC 2-1-6(b). The mixed river temperature is to be determined by employing the following mathematical model:

$$TMR = TU + \frac{QE * (TE - TU)}{0.5 * (Q7{,}10 - QI) + QE}$$

where:
TMR = mixed river temperature (ºF)
TU = upstream river temperature (ºF)
TE = effluent temperature (ºF)
QE = effluent flow (MGD)
QI = intake flow (MGD)
Q7,10 = 5,920 MGD

[11] Temperature shall be monitored and measurements recorded every hour. The highest single recorded measurement for each day shall be reported on the state monthly monitoring report for each day. The highest single recorded daily measurement shall be reported on the federal discharge monitoring report as the maximum daily temperature for that month. The monthly average shall be reported on the state monthly monitoring and the federal discharge monitoring report as the average of all measured values for the calendar month.

[12] The permittee shall post a permanent marker on the stream bank at each outfall discharging directly to the Ohio River. The marker shall consist at a minimum of the name of the establishment to which the permit was issued, the permit number, and the outfall number. The information shall be printed in letters not less than two inches in height. The marker shall be a minimum of 2 feet by 2 feet and shall be a minimum of 3 feet above the ground.

[13] The Stormwater Monitoring and Non-Numeric Effluent Limits and the Stormwater Pollution Prevention Plan (SWPPP) requirements can be found in Part I.D. and I.E. of this permit.

[14] Continuous chlorination is considered as all occurrences that do not meet the definition of intermittent chlorination, as described in 327 IAC 2-1-6 Table 1, Footnote [a]. These water quality based effluent limits (WQBELs) are applicable any time that the discharge of chlorine does not meet this intermittent definition.

[15] This daily maximum limit for total residual chlorine is only applicable if the discharge of chlorine is intermittent. As required by 327 IAC 2-1-6 Table 1, Footnote [a], to be considered an intermittent discharge, total residual chlorine shall not be detected in the discharge for a period of more than forty (40) minutes in duration, and such periods shall be separated by at least five (5) hours. Simultaneous multi-unit chlorination is permitted.

[16] Beginning December 31, 2025, there shall be no discharge of bottom ash transport water from Unit 2. The discharge of bottom ash transport water from Unit 3 was prohibited as of December 31, 2020.

[17] There shall be no discharge of polychlorinated biphenyl (PCB) compounds attributable to facility operations such as those historically used in transformer fluids. In order to determine compliance with the PCB discharge prohibition, the permittee shall provide the following PCB data with the next NPDES permit renewal application for at least one sample taken from Outfall 001. The corresponding facility water intake(s) shall be monitored at the same time as the final outfall.

Parameter	Test Method	LOD	LOQ
*Total PCBs	608	0.1 µg/l	0.3 µg/l
*Total PCBs is the sum of the following aroclors: PCB-1016, PCB-1221, PCB-1232, PCB-1242, PCB-1248, PCB-1254, and PCB-1260.			

[18] Flow is to be measured continuously using a flow measuring device. The permittee may use engineering calculations to measure flow as approved by the commissioner.

[19] Chlorination reporting requirements for frequency and dose duration apply only when the facility is chlorinating intermittently.

[20] See Part I.F. of the permit for Whole Effluent Toxicity Testing requirements.

[21] The facility must submit a new comprehensive facility-wide water balance diagram with the next permit modification application or permit renewal application, whichever occurs first.

[22] The following conditions apply for Temperature outside the mixing zone:

(1) There shall be no abnormal temperature changes that may adversely affect aquatic life unless caused by natural conditions.
(2) The normal daily and seasonal temperature fluctuations that existed before the addition of heat due to other than natural causes shall be maintained.
(3) The maximum temperature rise at any time or place above natural shall not exceed five (5) degrees Fahrenheit (two and eight-tenths (2.8) degrees Celsius) in streams.

[23] The mixed river temperature shall be calculated each hour (or more frequently if temperature is recorded more frequently than hourly). The highest single calculated result for each day shall be reported on the state monthly monitoring report for each day. The highest single calculated daily result for a month shall be reported on the federal discharge monitoring report as the mixed river temperature maximum daily temperature for that month. The monthly average shall be reported on the state monthly monitoring and the federal discharge monitoring report as the average of all calculated daily maximums for the calendar month.

[24] This limit will become effective nine months after the effective date of the permit. Prior to the limit becoming effective, silver data shall be reported at a minimum of 2 X Monthly.

[25] The limit will become effective nine (9) months after the effective date of the permit. The limit is applicable at a location where public access is possible. The permittee must submit a report within six (6) months of the permit effective date that delineates in-river where public contact is possible and provides accompanying modeling and calculations that will be used to support reporting of temperatures at that location.

2. The permittee is authorized to discharge from the outfall listed below in accordance with the terms and conditions of this permit. The permittee is authorized to discharge from Outfall 101, located at Latitude 37° 54' 44.36", Longitude -87° 19' 50.81". The discharge is limited to contact stormwater pond discharge (low volume wastewater, coal pile run-off, treated metal cleaning wastewater from new internal outfall 401, bottom ash transport water filtrate[3], East Ash Pond water (filtrate), and stormwater). Samples taken in compliance with the monitoring requirements below shall be taken at a point representative of the discharge but prior to mixing with any other wastestreams. Such discharge shall be limited and monitored by the permittee as specified below:

DISCHARGE LIMITATIONS [1][3][4]
Outfall 101

Table 1

	Quantity or Loading			Quality or Concentration			Monitoring Requirements	
Parameter	Monthly Average	Daily Maximum	Units	Monthly Average	Daily Maximum	Units	Measurement Frequency	Sample Type
Flow	Report	Report	MGD	----	----	----	1 X Daily	24-Hour Total
TSS[6]	----	----	----	23	74	mg/l	1 X Weekly	24 Hr. Comp.
O&G[6]	----	----	----	8[5]	11[5]	mg/l	1 X Weekly	Grab
COD	----	----	----	----	Report	mg/l	Semi-Annually	Grab
$CBOD_5$	----	----	----	----	Report	mg/l	Semi-Annually	Grab
Total Kjeldahl Nitrogen		----	----	----	Report	mg/l	Semi-Annually	Grab
Nitrate + Nitrite Nitrogen		----	----	----	Report	mg/l	Semi-Annually	Grab
Total Phosphorus		----	----	----	Report	mg/l	Semi-Annually	Grab

Table 2

	Quality or Concentration			Monitoring Requirements	
Parameter	Daily Minimum	Daily Maximum	Units	Measurement Frequency	Sample Type
pH[2]	6.0	9.0	s.u.	1 X Daily	Grab

[1] In the event that a new water treatment additive is to be used that will contribute to this Outfall, or changes are to be made in the use of water treatment additives, including dosage, the permittee must apply for and receive approval from IDEM prior to such discharge. Discharges of any such additives must meet Indiana water quality standards. The permittee must apply for permission to use water treatment additives by completing and submitting State Form 50000 (Application for Approval to Use Water Treatment Additives) currently available at: https://www.in.gov/idem/forms/idem-agency-forms/.

[2] If the permittee collects more than one grab sample on a given day for pH, the values shall not be averaged for reporting daily maximums or daily minimums. The permittee must report the individual minimum and the individual maximum pH value of any sample during the month on the Monthly Monitoring Report form.

[3] Fly ash and FGD wastewater are prohibited from being discharged.

Bottom ash transport water from Unit 3 is prohibited from being discharged.

Beginning December 31, 2025, bottom ash transport water from Unit 2 will be prohibited from being discharged.

[4] Monitoring at Internal Outfall 101 is only required when the outfall is discharging to the discharge tunnel which leads to Outfall 001.

[5] Footnote removed (July 2023 permit modification).

[6] The TSS and O&G limits must be reevaluated during the next permit renewal. If the permittee wants TSS and/or O&G allocations for unregulated wastestreams, the following must be submitted with the next permit renewal application:

(a) Average flow rates for each regulated, unregulated and dilution wastestream before combining with a wastestream of a different category (regulated, unregulated and dilution),

(b) Beginning at least 24 months prior to the next permit renewal application due date, collect analytical data at least 1 x Month for the parameter contributed by each unregulated wastestream prior to combining with a wastestream of a different category for which the permittee wants an allocation, and

(c) Analytical data for the parameter for each wastestream which discharges directly to the Contact Stormwater Pond shall be collected prior to entering the Contact Stormwater Pond.

The permittee should submit a sampling plan to IDEM for review and approval prior to initiating the monitoring described above.

3. The permittee is authorized to discharge from the outfall listed below in accordance with the terms and conditions of this permit. The permittee is authorized to discharge from Outfall 201, located at Latitude 37° 54' 34.49", Longitude -87° 19' 27.59". The discharge is limited to East Ash Pond perimeter gradient control well discharge. Samples taken in compliance with the monitoring requirements below shall be taken at a point representative of the discharge but prior to mixing with any other wastestreams. Such discharge shall be limited and monitored by the permittee as specified below:

DISCHARGE LIMITATIONS [1][3][4]
Outfall 201

Table 1

	Quantity or Loading			Quality or Concentration			Monitoring Requirements	
Parameter	Monthly Average	Daily Maximum	Units	Monthly Average	Daily Maximum	Units	Measurement Frequency	Sample Type
Flow	Report	Report	MGD	----	----	----	1 X Daily	24-Hour Total
O&G	----	----	----	15	20	mg/l	1 X Weekly	Grab
TSS	----	----	----	30	70	mg/l	1 X Weekly	24 Hr. Comp.

Table 2

	Quality or Concentration			Monitoring Requirements	
Parameter	Daily Minimum	Daily Maximum	Units	Measurement Frequency	Sample Type
pH[2]	6.0	9.0	s.u.	1 X Daily	Grab

[1] In the event that a new water treatment additive is to be used that will contribute to this Outfall, or changes are to be made in the use of water treatment additives, including dosage, the permittee must apply for and receive approval from IDEM prior to such discharge. Discharges of any such additives must meet Indiana water quality standards. The permittee must apply for permission to use water treatment additives by completing and submitting State Form 50000 (Application for Approval to Use Water Treatment Additives) currently available at: https://www.in.gov/idem/forms/idem-agency-forms/.

[2] If the permittee collects more than one grab sample on a given day for pH, the values shall not be averaged for reporting daily maximums or daily minimums. The permittee must report the individual minimum and the individual maximum pH value of any sample during the month on the Monthly Monitoring Report form.

[3] Monitoring at Internal Outfall 201 is only required when the outfall is discharging to the discharge tunnel which leads to Outfall 001.

[4] Bottom ash, fly ash, and FGD wastewater are prohibited from being discharged.

4. The permittee is authorized to discharge from the outfall listed below in accordance with the terms and conditions of this permit. The permittee is authorized to discharge from Outfall 401, located at Latitude 37° 54' 34.78", Longitude -87° 19' 28.98". The discharge is limited to metal cleaning wastewater. Samples taken in compliance with the monitoring requirements below shall be taken at a point representative of the discharge but prior to mixing with any other wastestreams. Such discharge shall be limited and monitored by the permittee as specified below:

DISCHARGE LIMITATIONS [1][3]
Outfall 401

Table 1

	Quantity or Loading			Quality or Concentration			Monitoring Requirements	
Parameter	Monthly Average	Daily Maximum	Units	Monthly Average	Daily Maximum	Units	Measurement Frequency	Sample Type
Flow	Report	Report	MGD	----	----	----	1 X Daily	24-Hour Total
O&G	----	----	----	15	20	mg/l	1 X Weekly	Grab
TSS	----	----	----	30	100	mg/l	1 X Weekly	24 Hr. Comp.
Copper[4]	----	----	----	1.0	1.0	mg/l	1 X Daily	24 Hr. Comp.
Iron[4]	----	----	----	1.0	1.0	mg/l	1 X Daily	24 Hr. Comp.

Table 2

	Quality or Concentration			Monitoring Requirements	
Parameter	Daily Minimum	Daily Maximum	Units	Measurement Frequency	Sample Type
pH[2]	6.0	9.0	s.u.	1 X Daily	Grab

[1] In the event that a new water treatment additive is to be used that will contribute to this Outfall, or changes are to be made in the use of water treatment additives, including dosage, the permittee must apply for and receive approval from IDEM prior to such discharge. Discharges of any such additives must meet Indiana water quality standards. The permittee must apply for permission to use water treatment additives by completing and submitting State Form 50000 (Application for Approval to Use Water Treatment Additives) currently available at: https://www.in.gov/idem/forms/idem-agency-forms/.

[2] If the permittee collects more than one grab sample on a given day for pH, the values shall not be averaged for reporting daily maximums or daily minimums. The permittee must report the individual minimum and the individual maximum pH value of any sample during the month on the Monthly Monitoring Report form.

[3] Monitoring at Internal Outfall 401 is only required when metal cleaning wastewater is being discharged to a yard drain or other conveyance that eventually discharges to the Ohio River. Samples should be collected after treatment, if any, and prior to entering a yard drain or other conveyance.

[4] The permittee shall measure and report the identified metal as total recoverable metal.

5. The permittee is authorized to discharge from the outfall listed below in accordance with the terms and conditions of this permit. The permittee is authorized to discharge from Outfall 004, located at Latitude 37° 54' 38.36", Longitude -87° 19' 35.09". The discharge is limited to sanitary wastewater package plant discharge. Samples taken in compliance with the monitoring requirements below shall be taken at a point representative of the discharge but prior to entry into the Ohio River. Such discharge shall be limited and monitored by the permittee as specified below:

DISCHARGE LIMITATIONS [1][2][4]
Outfall 004

Table 1

	Quantity or Loading			Quality or Concentration			Monitoring Requirements	
Parameter	Monthly Average	Daily Maximum	Units	Monthly Average	Daily Maximum	Units	Measurement Frequency	Sample Type
Flow	Report	Report	MGD	----	----	----	2 X Monthly	24-Hour Total
TSS	----	----	----	30	45	mg/l	2 X Monthly	24 Hr. Comp.
$TBOD_5$	----	----	----	30	45	mg/l	2 X Monthly	24 Hr. Comp.
E. coli[5]	----	----	----	125[6]	235[7]	count/100 ml	2 X Monthly	Grab
Fecal Coliform[8][9]								
Interim	----	----	----	Report	----	count/100 ml	2 X Monthly	Grab
Final	----	----	----	2000	----	count/100 ml	2 X Monthly	Grab

Table 2

	Quality or Concentration			Monitoring Requirements	
Parameter	Daily Minimum	Daily Maximum	Units	Measurement Frequency	Sample Type
pH[3]	6.0	9.0	s.u.	2 X Monthly	Grab

[1] See Part I.B. of the permit for the minimum narrative limitations.

[2] In the event that a new water treatment additive is to be used that will contribute to this Outfall, or changes are to be made in the use of water treatment additives, including dosage, the permittee must apply for and receive approval from IDEM prior to such discharge. Discharges of any such additives must meet Indiana water quality standards. The permittee must apply for permission to use water treatment additives by completing and submitting State Form 50000 (Application for Approval to Use Water Treatment Additives) currently available at: https://www.in.gov/idem/forms/idem-agency-forms/.

[3] If the permittee collects more than one grab sample on a given day for pH, the values shall not be averaged for reporting daily maximums or daily minimums. The permittee must report the individual minimum and the individual maximum pH value of any sample during the month on the Monthly Monitoring Report form.

[4] The permittee shall post a permanent marker on the stream bank at each outfall discharging directly to the Ohio River. The marker shall consist at a minimum of the name of the establishment to which the permit was issued, the permit number, and the outfall number. The information shall be printed in letters not less than two inches in height. The marker shall be a minimum of 2 feet by 2 feet and shall be a minimum of 3 feet above the ground.

[5] The limits and monitoring requirements for *E. coli* apply from April 1 through October 31. The effluent shall be disinfected on a continuous basis such that violations of the applicable bacteriological limitations do not occur from April 1 through October 31 annually.

[6] The monthly average *E. coli* value shall be calculated as a geometric mean. Per 327 IAC 5-10-6, the concentration of *E. coli* shall not exceed one hundred twenty-five (125) cfu or mpn per 100 milliliters as a geometric mean of the effluent samples taken in a calendar month. No samples may be excluded when calculating the monthly geometric mean.

[7] If less than ten samples are taken and analyzed for *E. coli* in a calendar month, no samples may exceed two hundred thirty-five (235) cfu or mpn as a daily maximum. However, when ten (10) or more samples are taken and analyzed for *E. coli* in a calendar month, not more than ten percent (10%) of those samples may exceed two hundred thirty-five (235) cfu or mpn as a daily maximum. When calculating ten percent, the result must not be rounded up. In reporting for compliance purposes on the Discharge Monitoring Report (DMR) form, the permittee shall record the highest non-excluded value for the daily maximum.

[8] In order to comply with ORSANCO requirements, in accordance with 327 IAC 5-10-6(b), fecal coliform is limited to a monthly average of 2,000 count per 100 ml from November 1 through March 31. The monthly average for fecal coliform shall be calculated using a geometric mean.

[9] This limit will become effective nine months after the effective date of the permit. Prior to the limit becoming effective, Fecal coliform results shall be reported as a geometric mean from November 1 through March 31.

6. The permittee is authorized to discharge stormwater from the outfall listed below in accordance with the terms and conditions of this permit. The permittee is authorized to discharge from Outfall 005, located at Latitude 37° 54' 42.40", Longitude -87° 19' 51.49". Samples taken in compliance with the monitoring requirements below shall be taken at a point representative of the discharge but prior to entry into the Ohio River. Such discharge shall be limited and monitored by the permittee as specified below:

DISCHARGE LIMITATIONS [1][2][4][5]

Outfall 005

			Monitoring Requirements	
Parameter	Daily Maximum	Units	Measurement Frequency[3]	Sample Type
Flow	Report	MGD	Semi-Annually	Estimate Total
Total Suspended Solids	Report	mg/l	Semi-Annually	Grab
pH	Report	s.u.	Semi-Annually	Grab
O&G	Report	mg/l	Semi-Annually	Grab
COD	Report	mg/l	Semi-Annually	Grab
$CBOD_5$	Report	mg/l	Semi-Annually	Grab
Total Kjeldahl Nitrogen	Report	mg/l	Semi-Annually	Grab
Nitrate plus Nitrite Nitrogen	Report	mg/l	Semi-Annually	Grab
Total Phosphorus	Report	mg/l	Semi-Annually	Grab

[1] The Stormwater Monitoring and Non-Numeric Effluent Limits and the Stormwater Pollution Prevention Plan (SWPPP) requirements can be found in Part I.D. and I.E. of this permit.

[2] All samples shall be collected from the discharge resulting from a storm event that is greater than 0.1 inches and at least 72 hours from the previously measurable (greater than 0.1 inch rainfall) storm event. There shall be a minimum of three (3) months between reported sampling events.

For each sample taken, the permittee shall record the duration and total rainfall of the storm event, the number of hours between beginning of the storm measured and the end of the previous measurable rain event, and the outside temperature at the time of sampling. A grab sample shall be taken during the first thirty (30) minutes of the discharge (or as soon thereafter as practicable).

[3] The first sampling event is to occur between January and June and the associated DMR / MMR submitted no later than July 28th. The second sampling event is to occur between July and December and the associated DMR / MMR submitted no later than January 28th.

[4] See Part I.B. of the permit for the minimum narrative limitations.

[5] The permittee shall post a permanent marker on the stream bank at each outfall discharging directly to the Ohio River. The marker shall consist at a minimum of the name of the establishment to which the permit was issued, the permit number, and the outfall number. The information shall be printed in letters not less than two inches in height. The marker shall be a minimum of 2 feet by 2 feet and shall be a minimum of 3 feet above the ground.

7. The permittee is authorized to discharge from the outfall listed below in accordance with the terms and conditions of this permit. The permittee is authorized to discharge from Outfall 006 [10], located at Latitude 37° 54' 29.01", Longitude -87° 19' 20.66". The discharge is limited to East Ash Pond perimeter gradient control wells and noncontact stormwater. Samples taken in compliance with the monitoring requirements below shall be taken at a point representative of the discharge but prior to entry into the Little Pigeon Creek near its confluence with the Ohio River. Such discharge shall be limited and monitored by the permittee as specified below:

DISCHARGE LIMITATIONS [1][2][3][4]
Outfall 006

Table 1

	Quantity or Loading			Quality or Concentration			Monitoring Requirements	
	Monthly	Daily		Monthly	Daily		Measurement	Sample
Parameter	Average	Maximum	Units	Average	Maximum	Units	Frequency	Type
Flow	Report	Report	MGD	----	----	----	1 X Daily	24-Hour Total
Total Dissolved Solids (TDS)	----	----		Report	Report	mg/l	2 X Monthly	24 Hr. Comp.
Total Suspended Solids (TSS)	----	----		Report	Report	mg/l	2 X Monthly	24 Hr. Comp.
Antimony [5][9]	----	----	----	Report	Report	mg/l	2 X Monthly	24 Hr. Comp.
Arsenic [5][9]	----	----	----	Report	Report	mg/l	2 X Monthly	24 Hr. Comp.
Barium [5][9]	----	----	----	Report	Report	mg/l	2 X Monthly	24 Hr. Comp.
Boron	----	----	----	Report	Report	mg/l	2 X Monthly	24 Hr. Comp.
Cadmium [5]	----	----	----	Report	Report	µg/l	2 X Monthly	24 Hr. Comp.
Chloride	----	----	----	Report	Report	mg/l	2 X Monthly	24 Hr. Comp.
Chromium, Hexavalent [7][9]		----	----	Report	Report	mg/l	2 X Monthly	24 Hr. Comp.
Chromium, Total [5]----		----	----	Report	Report	mg/l	2 X Monthly	24 Hr. Comp.
Cobalt [5][9]	----	----	----	Report	Report	mg/l	2 X Monthly	24 Hr. Comp.
Fluoride [9]	----	----	----	Report	Report	mg/l	2 X Monthly	24 Hr. Comp.
Lithium [5][9]	----	----	----	Report	Report	mg/l	2 X Monthly	24 Hr. Comp.
Lead [5]	----	----	----	Report	Report	mg/l	2 X Monthly	24 Hr. Comp.
Mercury [5][6][9]----		----	----	Report	Report	ng/l	6 X Annually	Grab
Molybdenum [5][9]----		----	----	Report	Report	mg/l	2 X Monthly	24 Hr. Comp.
Selenium [5][9]	----	----	----	Report	Report	mg/l	2 X Monthly	24 Hr. Comp.
Sulfate	----	----	----	Report	Report	mg/l	2 X Monthly	24 Hr. Comp.
Thallium [5][9]	----	----	----	Report	Report	mg/l	2 X Monthly	24 Hr. Comp.
Zinc [5]	----	----	----	Report	Report	mg/l	2 X Monthly	24 Hr. Comp.

Table 2

	Quality or Concentration			Monitoring Requirements	
	Daily	Daily		Measurement	Sample
Parameter	Minimum	Maximum	Units	Frequency	Type
pH[8]	6.0	9.0	s.u.	2 X Monthly	Grab

[1] See Part I.B. of the permit for the minimum narrative limitations.

[2] In the event that a new water treatment additive is to be used that will contribute to this Outfall, or changes are to be made in the use of water treatment additives, including dosage, the permittee must apply for and receive approval from IDEM prior to such discharge. Discharges of any such additives must meet Indiana water quality standards. The permittee must apply for permission to use water treatment additives by completing and submitting State Form 50000 (Application for Approval to Use Water Treatment Additives) currently available at: https://www.in.gov/idem/forms/idem-agency-forms/.

[3] The permittee shall post a permanent marker on the stream bank at each outfall discharging directly to the Ohio River. The marker shall consist at a minimum of the name of the establishment to which the permit was issued, the permit number, and the outfall number. The information shall be printed in letters not less than two inches in height. The marker shall be a minimum of 2 feet by 2 feet and shall be a minimum of 3 feet above the ground.

[4] The Stormwater Monitoring and Non-Numeric Effluent Limits and the Stormwater Pollution Prevention Plan (SWPPP) requirements can be found in Parts I.D. and I.E. of this permit.

[5] The permittee shall measure and report the identified metal as total recoverable metal.

[6] Mercury monitoring shall be conducted 6 X annually in the months of February, April, June, August, October, and December of each year for the term of the permit using EPA Test Method 1631, Revision E.

[7] Hexavalent chromium shall be measured and reported as dissolved metal. The hexavalent chromium sample type shall be by grab method. The maximum holding time for a hexavalent chromium sample is 28 days under 40 CFR 136.3(e), Table II. However, as noted in footnote 20 of Table II, to achieve the 28-day holding time, the ammonium sulfate buffer solution specified in EPA Method 218.6 must be used. This holding time allowance of 28-days supersedes the preservation and holding time requirements in the approved hexavalent chromium methods, unless this supersession would compromise the measurement, in which case the preservation and holding time requirements [the sample must be analyzed within 24 hours of collection] in the method must be followed.

[8] If the permittee collects more than one grab sample on a given day for pH, the values shall not be averaged for reporting daily maximums or daily minimums. The permittee must report the individual minimum and the individual maximum pH value of any sample during the month on the Monthly Monitoring Report form.

[9] The following EPA approved test methods and associated LODs and LOQs are to be used in the analysis of the effluent samples. Alternative methods may be used if first approved by IDEM and EPA, if applicable.

Parameter	Test Method	LOD	LOQ
Antimony	200.8	0.13 µg/l	1.0 µg/l
Antimony	200.7	3 µg/l	6 µg/l
Arsenic	3113 B-2004	1 µg/l	3.2 µg/l
Arsenic	200.9, Rev. 2.2 (1994)	0.5 µg/l	1.6 µg/l
Arsenic	200.8, Rev. 5.4 (1994)	0.4 µg/l	1.3 µg/l
Barium	200.8	4.9 µg/l	15.6 µg/l
Barium	200.7	25 µg/l	50 µg/l
Cobalt	200.8	0.086 µg/l	1.0 µg/l
Cobalt	200.7	5 µg/l	10 µg/l
Fluoride	SM 4500F/C	0.021 mg/l	0.10 mg/l
Fluoride	300.0	0.05 mg/l	0.1 mg/l
Hexavalent Chromium	218.6	0.04 µg/l	0.1 µg/l
Lithium	200.7	4.1 µg/l	20.0 µg/l
Mercury	1631E	0.2 ng/l	0.5 ng/l
Molybdenum	200.8	0.48 µg/l	5.0 µg/l
Molybdenum	200.7	25 µg/l	50 µg/l
Selenium	3113 B-2004 or 3114 B-2009	2 µg/l	6.4 µg/l
Selenium	200.8, Rev. 5.4 (1994)	0.35 µg/l	1.0 µg/l
Selenium	200.9, Rev. 2.2 (1994)	0.6 µg/l	1.9 µg/l
Thallium	200.8	0.073 µg/l	1.0 µg/l
Thallium	200.7	5 µg/l	10 µg/l

Case-Specific LOD/LOQ

The permittee may determine and use a case-specific LOD or LOQ using the analytical method specified above, or any other analytical method which is approved by the Commissioner, and EPA if applicable, prior to use. The LOD shall be derived by the procedure specified for method detection limits contained in 40 CFR Part 136, Appendix B, and the LOQ shall be set equal to 3.18 times the LOD. Other methods may be used if first approved by the Commissioner.

[10] This outfall will discharge from the perimeter gradient control system located outside the perimeter of the East Ash Pond. Following the cessation of pumping from the perimeter gradient control wells, Outfall 006 will discharge noncontact stormwater from the former East Ash Pond and adjacent green areas surrounding the pond.

8. The permittee is required to collect intake water samples in conjunction with certain discharge samples. The intake structure is designated as 000 on the Discharge Monitoring Report (DMR) forms. Samples taken in compliance with the monitoring requirements below shall be taken at a point representative of the intake water characteristics. Such samples shall be monitored by the permittee as specified below:

DISCHARGE LIMITATIONS

Intake Structures 000

Table 1

	Quantity or Loading			Quality or Concentration			Monitoring Requirements	
Parameter	Monthly Average	Daily Maximum	Units	Monthly Average	Daily Maximum	Units	Measurement Frequency	Sample Type
Flow Intake 1[3]	Report	Report	MGD	----	----	----	1 X Daily	24-Hour Total
Flow Intake 2[3]	Report	Report	MGD	----	----	----	1 X Daily	24-Hour Total
Flow Intake 3[3]	Report	Report	MGD	----	----	----	1 X Daily	24-Hour Total
Mercury[1][2]	----	----	----	Report	Report	ng/l	1 X Monthly	Grab
Arsenic[2]	----	----	----	Report	Report	mg/l	1 X Monthly	24 Hr. Comp.
Cadmium[1]	----	----	----	Report	Report	ug/l	1 X Monthly	24 Hr. Comp.
Selenium[1][2]	----	----	----	Report	Report	mg/l	1 X Monthly	24 Hr. Comp.
Nickel[1]	----	----	----	Report	Report	mg/l	1 X Monthly	24 Hr. Comp.
Aluminum[1]	----	----	----	Report	Report	mg/l	1 X Monthly	24 Hr. Comp.
Silver[1][2]	----	----	----	Report	Report	ug/l	1 X Monthly	24 Hr. Comp.
Zinc[1]	----	----	----	Report	Report	mg/l	1 X Monthly	24 Hr. Comp.
Copper[1]	----	----	----	Report	Report	ug/l	1 X Monthly	24 Hr. Comp.
Iron[1]	----	----	----	Report	Report	mg/l	1 X Monthly	24 Hr. Comp.

[1] The permittee shall measure and report the identified metal as total recoverable metal.

[2] The following EPA approved test methods and associated LODs and LOQs are to be used in the analysis of the effluent samples. Alternative methods may be used if first approved by IDEM and EPA, if applicable.

Parameter	Test Method	LOD	LOQ
Mercury	1631E	0.2 ng/l	0.5 ng/l
Arsenic	3113 B-2004	1 µg/l	3.2 µg/l
Arsenic	200.9, Rev. 2.2 (1994)	0.5 µg/l	1.6 µg/l
Arsenic	200.8, Rev. 5.4 (1994)	0.4 µg/l	1.3 µg/l
Selenium	3113 B-2004 or 3114 B-2009	2 µg/l	6.4 µg/l
Selenium	200.8, Rev. 5.4 (1994)	0.35 µg/l	1.0 µg/l
Selenium	200.9, Rev. 2.2 (1994)	0.6 µg/l	1.9 µg/l
Silver	200.8, Rev 5.4 (1994) Selection Ion Monitoring	0.005 µg/l	0.016 µg/l

Case-Specific LOD/LOQ

The permittee may determine and use a case-specific LOD or LOQ using the analytical method specified above, or any other analytical method which is approved by the Commissioner, and EPA if applicable, prior to use. The LOD shall be derived by the procedure specified for method detection limits contained in 40 CFR Part 136, Appendix B, and the LOQ shall be set equal to 3.18 times the LOD. Other methods may be used if first approved by the Commissioner.

[3] The permittee shall report 24-hour total intake flow as an estimated flow using pump hours of operation. Within 24 months of the effective date of the permit, the permittee shall report the 24-hour total intake flow as measured from a flow meter or other IDEM approved methodology.

B. MINIMUM NARRATIVE LIMITATIONS

At all times the discharge from any and all point sources specified within this permit shall not cause receiving waters:

1. including waters within the mixing zone, to contain substances, materials, floating debris, oil, scum attributable to municipal, industrial, agricultural, and other land use practices, or other discharges that do any of the following:

   a. will settle to form putrescent or otherwise objectionable deposits;

   b. are in amounts sufficient to be unsightly or deleterious;

   c. produce color, visible oil sheen, odor, or other conditions in such degree as to create a nuisance;

   d. are in amounts sufficient to be acutely toxic to , or to otherwise severely injure or kill aquatic life, other animals, plants, or humans;

   e. are in concentrations or combinations that will cause or contribute to the growth of aquatic plants or algae to such a degree as to create a nuisance, be unsightly, or otherwise impair the designated uses.

2. outside the mixing zone, to contain substances in concentrations that on the basis of available scientific data are believed to be sufficient to injure, be chronically toxic to, or be carcinogenic, mutagenic, or teratogenic to humans, animals, aquatic life, or plants.

C. MONITORING AND REPORTING

1. Representative Sampling

   Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge flow and shall be taken at times which reflect the full range and concentration of effluent parameters normally expected to be present. Samples shall not be taken at times to avoid showing elevated levels of any parameters.

2. Monthly Reporting

   The permittee shall submit monitoring reports to the Indiana Department of Environmental Management (IDEM) containing results obtained during the previous month and shall be submitted no later than the 28th day of the month following each completed monitoring period. The first report shall be submitted by the 28th day of the month following the month in which the permit becomes effective.

National Pollutant Discharge Elimination System
Fact Sheet for

SIGECO F.B. Culley Generating Station

Draft modification: March 2024
Final modification: April 2024

Indiana Department of Environmental Management
100 North Senate Avenue
Indianapolis, Indiana 46204
(317) 232-8603
Toll Free (800) 451-6027
www.idem.IN.gov

Permittee:	Southern Indiana Gas and Electric Company (SIGECO) d/b/a CenterPoint Energy Indiana South (CEIS) P.O. Box 209 Evansville, IN 47702
Existing Permit Information:	Permit Number: IN0002259 Expiration Date: February 29, 2028
Facility Contact:	Angela Casbon-Scheller (812) 491-4787; Angela.Casbon-Scheller@centerpointenergy.com
Facility Location:	F.B. Culley Generating Station 3711 Darlington Road Newburgh, IN 47630 Warrick County
Receiving Stream:	Ohio River, Little Pigeon Creek near its confluence with the Ohio River
GLI/Non-GLI:	Non-GLI
Proposed Permit Action:	Modify
Date Application Received:	February 9, 2024
Source Category	NPDES Major – Industrial
Permit Writer:	Nikki Gardner (317) 232-8707;ngardner@idem.in.gov

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1.0 INTRODUCTION

The Indiana Department of Environmental Management (IDEM) received a request from the permittee on February 9, 2024, to modify National Pollutant Discharge Elimination System (NPDES) Permit IN0002259. The current five-year permit was issued with an effective date of March 1, 2023, in accordance with 327 IAC 5-2-6(a). The permit was subsequently modified on July 6, 2023, and August 30, 2023.

The Federal Water Pollution Control Act (more commonly known as the Clean Water Act), as amended, (Title 33 of the United States Code (U.S.C.) Section 1251 et seq.), requires an NPDES permit for the discharge of pollutants into surface waters. Furthermore, Indiana law requires a permit to control or limit the discharge of any contaminants into state waters or into a publicly owned treatment works. This proposed permit action by IDEM complies with and implements these federal and state requirements.

In accordance with Title 40 of the Code of Federal Regulations (CFR) Sections 124.8 and 124.56, as well as Title 327 of the Indiana Administrative Code (IAC) Article 5-3-8, a Fact Sheet is required for certain NPDES permits. This document fulfills the requirements established in these regulations. This Fact Sheet was prepared in order to document the factors considered in the development of NPDES Permit effluent limitations. The technical basis for the Fact Sheet may consist of evaluations of promulgated effluent guidelines, existing effluent quality, receiving water conditions, Indiana water quality standards-based wasteload allocations, and other information available to IDEM. Decisions to award variances to Water Quality Standards or promulgated effluent guidelines are justified in the Fact Sheet where necessary. This Fact Sheet also identifies the modified pages of the permit as issued on February 1, 2023, and subsequently modified on July 6, 2023, and August 30, 2023.

2.0 FACILITY DESCRIPTION

2.1 General

The SIGECO F.B. Culley Generating Station is classified under Standard Industrial Classification (SIC) Code 4911 - Electric Services.

The facility is a coal-fired steam electric generating plant with two (2) generating units; Unit 2 (100 MW) and Unit 3 (270 MW). The permittee has proposed to retire Unit 2 by the end of 2025. The design flow (highest monthly average) based on the most recent 2 years of data is 295 MGD.

The Ohio River accounts for approximately 99% of the facility's intake water with groundwater accounting for the remainder. The design intake flow is 360 MGD.

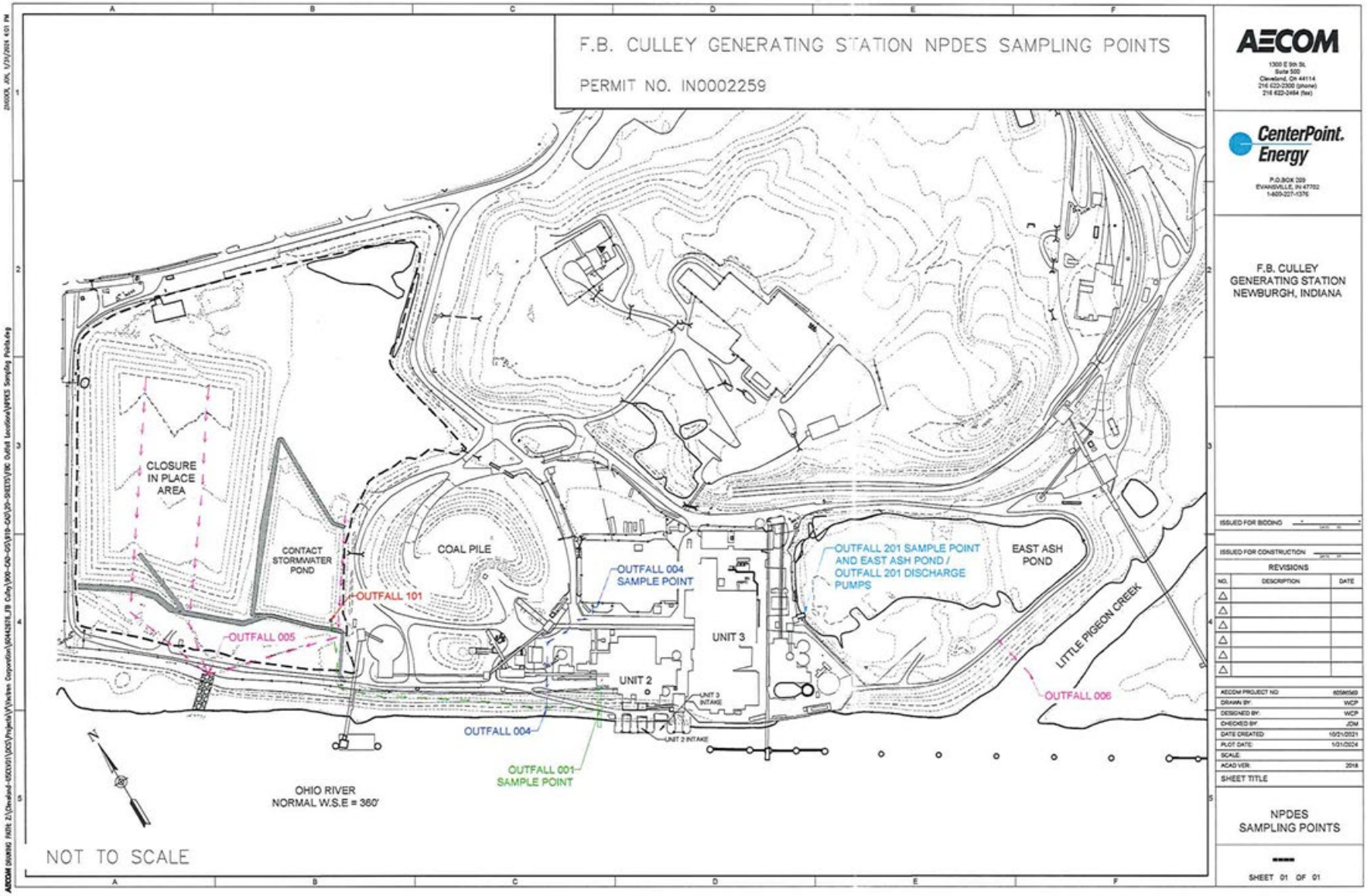
A map showing the location of the facility is included as Figure 1. A map showing locations of the outfalls/sampling locations is included as Figure 2.

Figure 1: Facility Location



3711 Darlington Road
Newburgh, IN 47630
Warrick County

Figure 2: Outfalls/Sampling Location Map



2.2 Outfall Locations

All outfalls are listed here, with the new outfall in **BOLD**. Only the new outfall is affected by the proposed permit modification.

Outfall #	Location		Corresponding Permit Table
Outfall 001	Latitude	37º 54’ 35.39”	Part I.A.1
	Longitude	-87º 19’ 37.99”	
Outfall 101	Latitude	37º 54’ 44.36”	Part I.A.2
	Longitude	-87º 19’ 50.81”	
Outfall 201	Latitude	37º 54’ 34.49”	Part I.A.3
	Longitude	-87º 19’ 27.59”	
Outfall 401	Latitude	37º 54’ 34.78”	Part I.A.4
	Longitude	-87º 19’ 28.98”	
Outfall 004	Latitude	37º 54’ 38.36”	Part I.A.5
	Longitude	-87º 19’ 35.09”	
Outfall 005	Latitude	37º 54’ 42.40”	Part I.A.6
	Longitude	-87º 19’ 51.49”	
Outfall 006	**Latitude**	**37˚ 54’ 29.01”**	**Part I.A.7**
	Longitude	**-87º 19’ 20.66”**	
Outfall 000	Administrative Outfall		Part I.A.8

3.0 PERMIT MODIFICATION

3.1 Modification Request

Southern Indiana Gas and Electric Company (SIGECO) is requesting permit language modifications to the F.B. Culley Generating Station NPDES Permit (No. IN0002259) for activities and changes related to future water management and the temporary perimeter gradient control wells that were added to the facility NPDES permit during a prior modification. The East Ash Pond is currently in the closure process to comply with the Coal Combustion Residuals (CCR) Part A Final Rule. Closure of the East Ash Pond will include removal of the CCR material, verification of the removal of the CCR material, stabilization of disturbed areas (topsoil and vegetative cover), and the installation of a storm water discharge channel that will discharge to the Little Pigeon Creek near its confluence with the Ohio River. The water discharge channel will serve two purposes, as follows:

1. To enable safe construction activities during the closure of the East Ash Pond, a temporary perimeter gradient control well system will be installed outside the limits of the pond. The perimeter gradient control well system will consist of a series of wells which will function for approximately 18-months during construction activities to limit intrusion of Ohio River water into the sides and base of the East Ash Pond. The lower portion of the discharge channel will first be constructed to manage discharge of water collected from the perimeter gradient control well system. The lower portion of the discharge channel will extend from the current Ohio River water surface elevation to a point up the existing embankment to an elevation higher than the seasonal high-water of the Ohio River to allow for the perimeter gradient control well system outlet pipes to remain above the Ohio River during construction activities.

2. The remaining portions of the discharge channel will be constructed following completion of pond excavation activities. The ultimate function of the discharge channel will be to manage noncontact stormwater collected in the former footprint of the East Ash Pond as well as any river water that may enter this area during seasonal high river levels.

A new Outfall 006 is requested for discharge of temporary flows from the perimeter gradient control well system during the ash pond closure process and to manage post-closure noncontact storm and river water flows.

In addition to the request to add a new Outfall 006, a modification of the description to Internal Outfall 201 is requested. In the previous permit modification dated June 21, 2023, the description of Internal Outfall 201 was modified for re-routing of flows away from Internal Outfall 201. These modifications included ceasing discharges from the East Ash Pond, while Internal Outfall 201 would remain in the permit for discharging water from the perimeter gradient control system. Further development of the perimeter gradient control system has identified the need to temporarily discharge higher flows to Internal Outfall 201 than provided in the previous modification request. In addition to the increased flow rate to Internal Outfall 201, flows in excess of Internal Outfall 201's system capacity are anticipated and will be diverted to the new Outfall 006 described previously.

An updated facility water balance diagram is included as Figure 3.

Outfall 201 and proposed Outfall 006 are shown in Figure 4.

Figure 3: Facility Water Balance Diagram

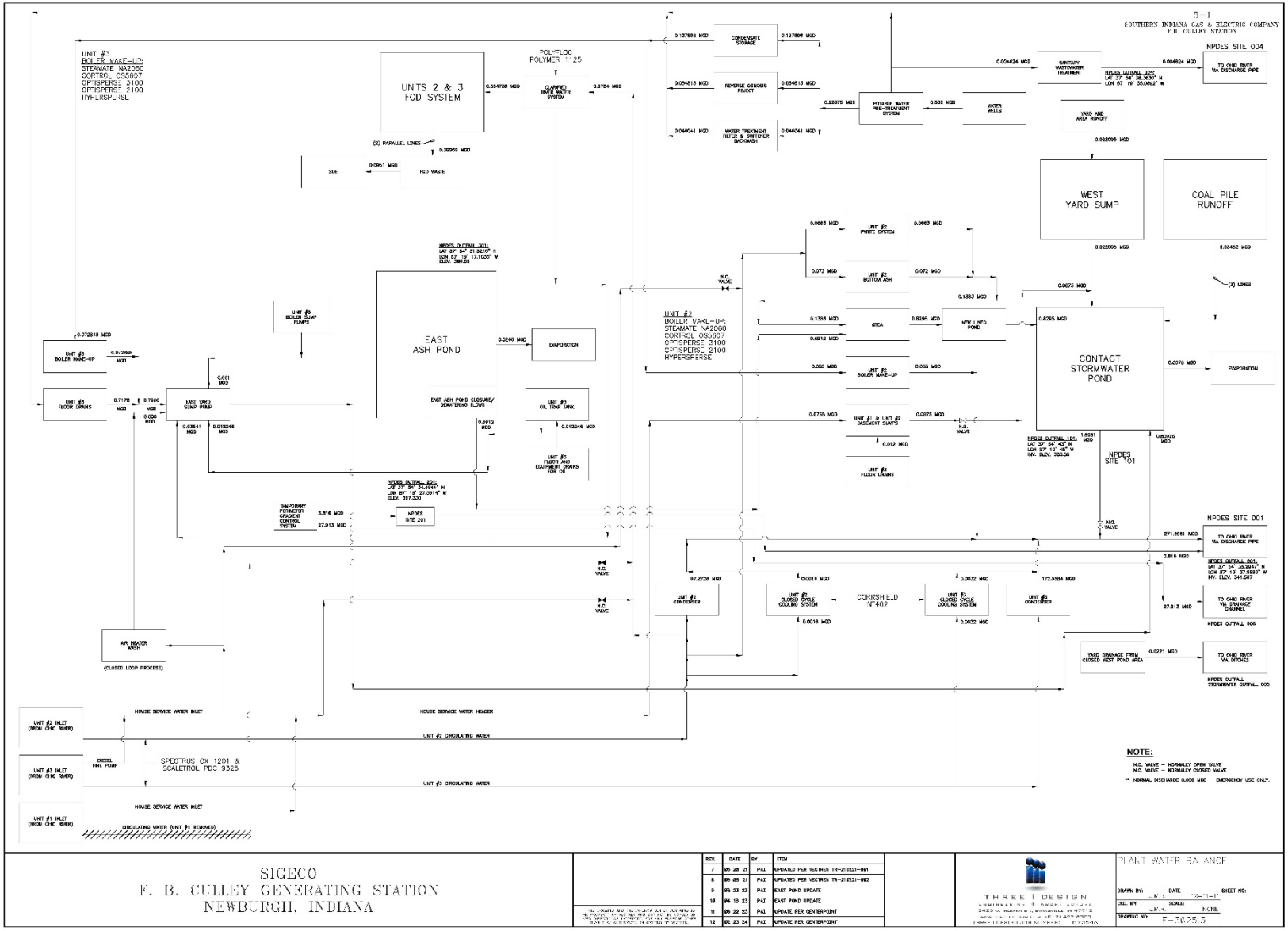
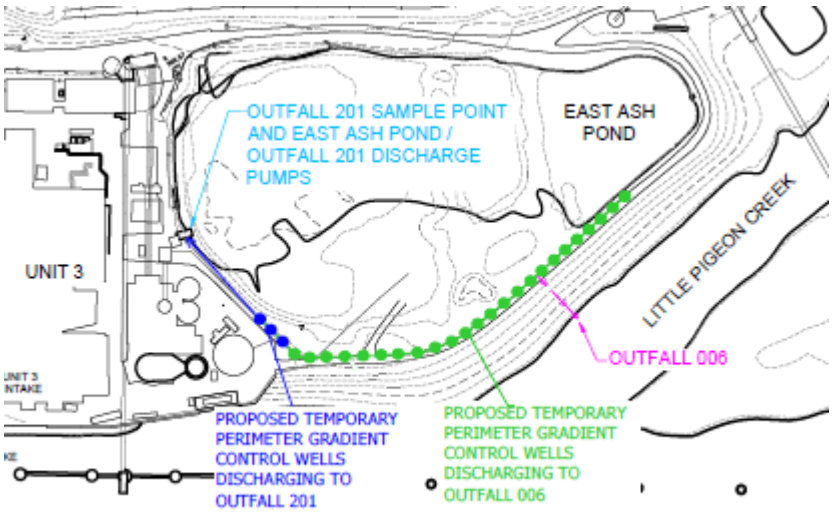


Figure 4: Outfall 201 and proposed Outfall 006



3.2 IDEM's Proposed Modification

The requested permit modification is approved. The following changes have been made:

1. Outfall 006 (Permit Part I.A.6; pages 17-19 of 79)

   Outfall 006 is a new outfall proposed to regulate flows from the perimeter gradient control well system during the East ash pond closure process and to manage post-closure noncontact stormwater flows. This outfall will have sampling requirements consistent with similar NPDES permits issued in Indiana.

   Flow

   The effluent flow is to be monitored in accordance with 327 IAC 5-2-13(a)(2).

   pH

   Discharges to waters of the state are limited to the range of 6.0-9.0 s.u., in accordance with 327 IAC 2-1-6(b)(2).

   Total Dissolved Solids, Total Suspended Solids (TSS), Antimony, Arsenic, Barium, Boron, Cadmium, Chloride, Chromium (Hexavalent), Chromium (Total), Cobalt, Fluoride, Lithium, Lead, Mercury, Molybdenum, Selenium, Sulfate, Thallium, and Zinc

   This facility is a coal-fired steam electric generating plant which has historically used unlined ash ponds. The West Ash Pond was closed prior to the 2023 permit renewal and the East Ash Pond is currently being closed to comply with the Coal Combustion Residuals (CCR) Part A Final Rule.

Unlined ash ponds are potential sources of pollutants associated with coal ash, which could be present in groundwater. Monitoring is proposed to evaluate the presence of these pollutants, and data collected will be used to determine if any of the pollutants have reasonable potential to exceed (RPE) water quality criteria, where a water quality standard has been established and included in 327 IAC 2-1-6.

Fluoride, sulfate, and TDS were selected for monitoring based on the list of constituents for detection monitoring of CCR contaminants found in 40 CFR 257 Appendix III. Antimony, arsenic, barium, cadmium, cobalt, lead, lithium, molybdenum, selenium, and thallium were selected for monitoring based on the list of constituents for assessment monitoring of CCR contaminants found in 40 CFR 257 Appendix IV. Hexavalent chromium was selected for monitoring based on 329 IAC 10 under the discretion of IDEM OLQ.

TSS, total chromium, mercury and zinc were selected because they are pollutants of concern in 40 CFR 423. Boron and chloride were selected because these pollutants are known to be associated with coal ash.

2. While only pages 1, 17, 18, and 19 of the permit have been modified, pages 1 through 21 are being provided to remove the blank pages of the permit.

3. Descriptions of Outfalls 001, 201, and 006 have been updated and changes are in **BOLD**. All facility outfalls are included here for the record.

   Outfall 001:

   Final Outfall 001 discharges to the Ohio River near river mile 773. According to the renewal application, the long-term average flow from the outfall is 181.6 MGD. Using data obtained from EPA ECHO, the design flow (highest monthly average) based on the most recent 2 years of data is 293 MGD. Treatment of the condenser cooling water includes the use of chlorine and bromine. Operations contributing to the flow include:

   - Two (2) Condenser Cooling units (178.3 MGD). Includes Unit #2 and Unit #3.
   - Unit #2 Boiler Make-Up Water (0.055 MGD).
   - Contact Stormwater Pond discharge (1.805 MGD). See Outfall 101 description below.
   - Perimeter gradient control wells (**3.816 MGD**). See Outfall 201 description below.
   - Treated metal cleaning wastewater (0.05 – 0.07 MGD). See Outfall 401 below.

   Outfall 101:

   Internal Outfall 101 is an internal outfall and is the discharge from the Contact Stormwater Pond. Using data obtained from EPA ECHO, the design flow (highest monthly average) based on the most recent 2 years of data is 3.78 MGD. Flow from Outfall 101 ultimately discharges through Outfall 001. Treatment of the contact stormwater pond water consists of sedimentation. The Contact Stormwater Pond receives water from:

- Coal pile run-off.
- New Lined Pond (Unit 2 Bottom Ash Transport water filtrate, East Ash Pond water filtrate from removal of legacy ash pond water and stormwater).
- West yard sump. Includes Unit #1 basement sump & Unit #2 basement sump (which includes the Unit #2 floor drains).
- East side yard sump. Includes Unit #3 Oil Trap Tank, floor drains, greensand water treatment filters regenerant and backwash, softener regenerant streams, RO rejects, Unit #3 Boiler make-up (source is condensate storage), Unit #3 boiler sump pumps, air heater & boiler washes, clarified river water system backwash, and potable water pre-treatment system.
- Metal cleaning wastewater. See Outfall 401.

Outfall 201:

Internal Outfall 201 is an internal outfall and will consist of discharge from the East Ash Pond perimeter gradient control wells. **As part of a previous permit modification issued August 30, 2023, the facility projected the flow from this outfall to be 1.0 MGD. As part of the current permit modification application, the facility has amended the projected flow to 3.816 MGD.** Current limits are being retained.

Outfall 401:

Internal Outfall 401 is an internal outfall which consists of metal cleaning wastewater. Metal cleaning occurs approximately once every 18 months. Metal cleaning wastewater is containerized and treated using pH adjustment, coagulation, and settling prior to commingling with other wastestreams. The treated metal cleaning wastewater will primarily be reused in the FGD process. However, treated metal cleaning wastewater may also be discharged to the closest yard drain, which would then go to the East Yard Sump where it would be combined with other discharges prior to entering the Contact Storm Water Pond, which discharges to Outfall 001 via internal Outfall 101. A single metal cleaning discharge event has an estimated total of 50,000 – 70,000 gallons. Internal Outfall 401 was established as the compliance point for discharging treated metal cleaning wastewater. Because the location of this activity is variable, yet the discharge always passes through the East Yard Sump, the latitude and longitude of the East Yard Sump will be used as Outfall 401 for data entry purposes. Samples should be collected after treatment and prior to entering a yard drain.

Outfall 004:

Final Outfall 004 consists of discharge from the sanitary wastewater package plant to the Ohio River. Treatment of the sanitary water consists of activated sludge and disinfection with ultraviolet light. Using data obtained from EPA ECHO, the design flow (highest monthly average) based on the most recent 2 years of data is 0.0249 MGD.

Outfall 005:

Final Outfall 005 consists of noncontact stormwater from the final cover system of the former West Ash Pond and adjacent green areas of the plant. The noncontact stormwater drains through a series of flow channels prior to discharging into the Ohio River via Outfall 005. The discharge from this outfall is not treated. Using data obtained from EPA ECHO, the maximum total flow reported during the most recent 2 years is 0.64 MGD. Flow will be variable due to the nature of the discharge.

Outfall 006:

Final Outfall 006 is a proposed new outfall that will discharge from the perimeter gradient control wells (27.913 MGD) located outside the perimeter of the East Ash Pond to Little Pigeon Creek near its confluence with the Ohio River. Following the cessation of pumping from the perimeter gradient control wells, Outfall 006 will discharge noncontact storm water from the former footprint of the East Ash Pond and adjacent green areas surrounding the former footprint. The calculated peak discharge of noncontact stormwater is 3.364 MGD for the 100-yr design storm event.

Outfall 000:

This is an administrative outfall for cooling water intake structure reporting.

3.3 Antibacksliding

Indiana's prohibitions on backsliding under 327 IAC 5-2-10(a)(11) are applicable to BPJ case-by-case technology-based effluent limitations, when proposed to be increased based on subsequently promulgated effluent guidelines under Section 304(b) of the CWA, and limitations based on Indiana water quality standards or treatment standards (327 IAC 5-10). Prohibitions on other types of backsliding (e.g., backsliding from limitations derived from effluent guidelines, from existing case-by-case limitations to new case-by-case limitations, and from conditions such as monitoring requirements that are not effluent limitations) are covered under federal regulation at 40 CFR 122.44(l)(1).

Under 327 IAC 5-2-10(a)(11), unless an exception under 327 IAC 5-2-10(a)(11)(B) applies, a permit may not be renewed, reissued or modified to contain effluent limitations that are less stringent than the comparable effluent limitations in the previous permit. For effluent limitations based on Indiana water quality or treatment standards, less stringent effluent limitations may also be allowed if they are in compliance with Section 303(d)(4) of the CWA. Under 40 CFR 122.44(l)(1), a permit may not be renewed or reissued to contain less stringent interim effluent limitations, standards or conditions than the final effluent limitations, standards or conditions in the previous permit unless the circumstances on which the previous permit was based have materially and substantially changed since the time the permit was issued and would constitute cause for permit modification or revocation and reissuance under 40 CFR 122.62.

None of the limits included in this permit are less stringent than the comparable effluent limitations in the previous permit, therefore, backsliding is not an issue in accordance with 327 IAC 5-2-10(a)(11) and 40 CFR 122.44(l)(1).

3.4 Antidegradation

Indiana's Antidegradation Standards and Implementation procedures are outlined in 327 IAC 2-1.3. The antidegradation standards established by 327 IAC 2-1.3-3 apply to all surface waters of the state. The permittee is prohibited from undertaking any deliberate action that would result in a new or increased discharge of a bioaccumulative chemical of concern (BCC) or a new or increased permit limit for a regulated pollutant that is not a BCC unless information is submitted to the commissioner demonstrating that the proposed new or increased discharge will not cause a significant lowering of water quality, or an antidegradation demonstration submitted and approved in accordance 327 IAC 2-1.3-5 and 2-1.3-6.

The NPDES permit does not propose to establish a new or increased loading of a regulated pollutant; therefore, the Antidegradation Implementation Procedures in 327 IAC 2-1.3-5 and 2-1.3-6 do not apply to the permitted discharge.

3.5 Spill Response and Reporting Requirement

Reporting requirements associated with the Spill Reporting, Containment, and Response requirements of 327 IAC 2-6.1 are included in Part II.B.2.(d), Part II.B.3.(c), and Part II.C.3. of the NPDES permit. Spills from the permitted facility meeting the definition of a spill under 327 IAC 2-6.1-4(15), the applicability requirements of 327 IAC 2-6.1-1, and the Reportable Spills requirements of 327 IAC 2-6.1-5 (other than those meeting an exclusion under 327 IAC 2-6.1-3 or the criteria outlined below) are subject to the Reporting Responsibilities of 327 IAC 2-6.1-7.

It should be noted that the reporting requirements of 327 IAC 2-6.1 do not apply to those discharges or exceedances that are under the jurisdiction of an applicable permit when the substance in question is covered by the permit and death or acute injury or illness to animals or humans does not occur. In order for a discharge or exceedance to be under the jurisdiction of this NPDES permit, the substance in question (a) must have been discharged in the normal course of operation from an outfall listed in this permit, and (b) must have been discharged from an outfall for which the permittee has authorization to discharge that substance.

3.6 Permit Processing/Public Comment

Pursuant to IC 13-15-5-1, IDEM will publish the draft permit document online at https://www.in.gov/idem/public-notices/. Additional information on public participation can be found in the "Citizens' Guide to IDEM", available at https://www.in.gov/idem/resources/citizens-guide-to-idem/. A 30-day comment period is available to solicit input from interested parties, including the public.

3.7 Post Public Notice Addendum

Warrick				
United Minerals Co LLC - Seven Hills Mine	NPDES General Permit Public Notice [PDF]	03/27/2024 - 04/15/2024	No	Permit Number: ING040290 Project Manager: Burget, Catherine A
Pigeon Township RSD WWTP	NPDES Final Permit Public Notice [PDF]	03/26/2024 - 04/12/2024	No	Permit Number: IN0062049 Project Manager: Eilerman, Nicholas
F.B. Culley Generating Station	NPDES Draft Permit Public Notice [PDF]	03/19/2024 - 04/19/2024	Yes	Permit Number: IN0002259 Project Manager: Gardner, Nicole

The draft NPDES permit for the SIGECO F.B. Culley Generating Station was made available for public comment from March 19, 20224, through April 19, 2024, as part of Public Notice No. 20240319 – IN0002259– D on IDEM's website at https://www.in.gov/idem/public-notices/public-notices-all-regions/. During this comment period, no comment letters were received.

STATE OF INDIANA
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
PUBLIC NOTICE NO: 20240503 – IN0002259 – F
DATE OF NOTICE: May 03, 2024

The Office of Water Quality has issued the following FINAL NPDES PERMIT:

MAJOR MODIFICATION:

SIGECO F.B. CULLEY GENERATING STATION, Permit No. IN0002259, WARRICK COUNTY, 3711 Darlington Road, Newburgh, IN. This facility is a coal-fired steam electric generating plant with two (2) generating units. The permittee has requested to add a new outfall to the permit, Outfall 006 and to modify the description of internal Outfall 201. IDEM has agreed to modify the above-named permit. Outfall 006 is located at 37º 54' 29.01" N, -87º 19' 20.66" W and will discharge non-contact stormwater at a rate of 3.364 MGD to the Ohio River. Permit Manager: Nikki Gardner, 317/232-8707, ngardner@idem.in.gov. Posted online at https://www.in.gov/idem/public-notices/.

Notice of Right to Administrative Review

If you wish to challenge this Permit, you must file a Petition for Administrative Review with the Office of Adjudication (OEA) and serve a copy of the Petition upon IDEM. The requirements for filing a Petition for Administrative Review are found in IC 4-21.5-3-7, IC 13-15-6-1 and 315 IAC 1-3-2. A summary of the requirements of these laws is provided below.

A Petition for Administrative Review must be filed with the Office of Environmental Adjudication (OEA) within fifteen (15) days of the issuance of this notice (eighteen (18) days if you received this notice by U.S. Mail), and a copy must be served upon IDEM. Addresses are:

Director
Office of Environmental Adjudication
Indiana Government Center North
100 North Senate Avenue - Room N103
Indianapolis, Indiana 46204

Commissioner
Indiana Department of Environmental Management
Indiana Government Center North
100 North Senate Avenue - Room 1301
Indianapolis, Indiana 46204

The Petition must contain the following information:

1. The name, address and telephone number of each petitioner.
2. A description of each petitioner's interest in the Permit.
3. A statement of facts demonstrating that each petitioner is:
   a. a person to whom the order is directed.
   b. aggrieved or adversely affected by the Permit.
   c. entitled to administrative review under any law.

4. The reasons for the request for administrative review.
5. The particular legal issues proposed for review.
6. The alleged environmental concerns or technical deficiencies of the Permit.
7. The Permit terms and conditions that the petitioner believes would be appropriate and would comply with the law.
8. The identity of any persons represented by the petitioner.
9. The identity of the person against whom administrative review is sought.
10. A copy of the Permit that is the basis of the petition.
11. A statement identifying petitioner's attorney or other representative, if any.

Failure to meet the requirements of the law with respect to a Petition for Administrative Review may result in a waiver of your right to seek administrative review of the Permit. Examples are:

1. Failure to file a Petition by the applicable deadline.
2. Failure to serve a copy of the Petition upon IDEM when it is filed; or
3. Failure to include the information required by law.

If you seek to have a Permit stayed during the Administrative Review, you may need to file a Petition for a Stay of Effectiveness. The specific requirements for such a Petition can be found in 315 IAC 1-3-2 and 315 IAC 1-3-2.1.

Pursuant to IC 4-21.5-3-17, OEA will provide all parties with Notice of any pre-hearing conferences, preliminary hearings, hearings, stays, or orders disposing of the review of this action. If you are entitled to Notice under IC 4-21.5-3-5(b) and would like to obtain notices of any pre-hearing conferences, preliminary hearings, hearings, stays, or orders disposing of the review of this action without intervening in the proceeding you must submit a written request to OEA at the address above. More information on the appeal review process is available on the website for the Office of Environmental Adjudication at http://www.in.gov/oea.

Angela Casbon-Scheller
Director, Generation Compliance & Carbon Policy
Angela.Casbon-Scheller@CenterPointEnergy.com

P.O. Box 209
Evansville, IN 47702-0209
812-491-4787

February 8, 2024

Submitted via email:
NGardner@idem.IN.gov
OWQWWPer@idem.IN.gov

Ms. Nicole Gardner
Indiana Department of Environmental Management
Office of Water Quality – Industrial NPDES Permit Section
100 North Senate Ave
Indianapolis, IN 46204-2251

RE: NPDES Permit Modification Request
SIGECO F.B. Culley Generating Station
Permit No. IN0002259

Dear Ms. Gardner:

Southern Indiana Gas and Electric Company (SIGECO) is requesting permit language modifications to the F.B. Culley Generating Station NPDES Permit (No. IN0002259) for activities and changes related to future water management and the temporary perimeter gradient control wells that were added to the facility NPDES permit during a prior modification. The East Ash Pond is currently in the closure process to comply with the Coal Combustion Residuals (CCR) Part A Final Rule. Closure of the East Ash Pond will include removal of the CCR material, verification of the removal of the CCR material, stabilization of disturbed areas (topsoil and vegetative cover), and the installation of a storm water discharge channel that will discharge to the Ohio River. The water discharge channel will serve two purposes, as follows:

1. To enable safe construction activities during the closure of the East Ash Pond, a temporary perimeter gradient control well system will be installed outside the limits of the pond. The perimeter gradient control well system will consist of a series of wells which will function for approximately 18-months during construction activities to limit intrusion of Ohio River water into the sides and base of the East Ash Pond. The lower portion of the discharge channel will first be constructed to manage discharge of water collected from the perimeter gradient control well system. The lower portion of the discharge channel will extend from the current Ohio River water surface elevation to a point up the existing embankment to an elevation higher than the seasonal high-water of the Ohio River to allow for the perimeter gradient control well system outlet pipes to remain above the Ohio River during construction activities.
2. The remaining portions of the discharge channel will be constructed following completion of pond excavation activities. The ultimate function of the discharge channel will be to manage non-contact stormwater collected in the former footprint of the East Ash Pond as well as any river water that may enter this area during seasonal high river levels.

A new Outfall 006 is requested for discharge to the Ohio River of temporary flows from the perimeter gradient control well system during the ash pond closure process and to manage post-closure noncontact storm and river water flows.

In addition to the request to add a new Outfall 006, a modification of the description to Internal Outfall 201 is requested. In the previous permit modification dated June 21, 2023, the description of Internal Outfall 201 was modified for re-routing of flows away from Internal Outfall 201. These modifications included ceasing discharges from the East Ash Pond, while Internal Outfall 201 would remain in the permit for discharging water from the

CenterPoint Energy

Angela Casbon-Scheller
Director, Generation Compliance & Carbon Policy
Angela.Casbon-Scheller@CenterPointEnergy.com

P.O. Box 209
Evansville, IN 47702-0209
812-491-4787

perimeter gradient control system. Further development of the perimeter gradient control system has identified the need to temporarily discharge higher flows to Internal Outfall 201 than provided in the previous modification request. In addition to the increased flow rate to Internal Outfall 201, flows in excess of Internal Outfall 201's system capacity are anticipated and will be diverted to the new Outfall 006 described previously. These permit language modifications affect the description of Internal Outfall 201, and the addition of new Outfall 006.

We suggest the following language changes in the permit (proposed new language in **bold** text):

- **Part I.A.7**, new section

The permittee is authorized to discharge water from the outfall listed below in accordance with the terms and conditions of this permit. The permittee is authorized to discharge from Outfall 006, located at Latitude 37° 54' 29.01", Longitude -87° 19' 20.66".

- Permit Modification Fact Sheet Section 2.2, Outfall Locations:

Outfall 006	**Lattitude**	**37° 54' 29.01"**
	Longitude	**-87° 19' 20.66"**

- Permit Modification Fact Sheet Section 3.2, **Outfall 006:**
  006: Outfall 006 is an outfall that discharges flows from the perimeter gradient control system (27.913 MGD) located outside the perimeter of the East Ash Pond. Following the cessation of pumping from the perimeter gradient control wells, Outfall 006 will discharge noncontact storm water from the former East Ash Pond and adjacent green areas surrounding the pond. The calculated peak discharge of noncontact stormwater is 3.364 MGD for the 100-yr design storm event. The noncontact storm water drains through an outlet channel prior to discharging into the Ohio River via Outfall 006.

Attached to this letter is the outfall descriptions document that was included in the renewal application packet, with proposed edits as they relate to this modification request. A copy of the updated water balance diagram will be provided once the modifications are deemed acceptable and upon request from IDEM.

If you have any questions about the enclosed information, please contact me at 812-491-4787 or Angela.Casbon-Scheller@centerpointenergy.com.

Sincerely,

Angela Casbon-Scheller
Director, Generation Compliance and Carbon Policy
Environmental Department

Cc: File

SIGECO F.B. Culley Generating Station
NPDES Permit IN0002259 Renewal Application
February 8, 2024

Outfall List

- 001: Outfall 001 discharges to the Ohio River near river mile 773. The average flow from the outfall is 181.6 MGD. Operations contributing to the flow include:
  - Condenser Cooling – two units (269.836 MGD). Treatment includes the use of chlorine (treatment code 2-F) and bromine (2-H)
  - Unit #2 Boiler Make-Up – 0.055 MGD
  - Contact Storm Water pond discharge (see Outfall 101 description below) – 1.805 MGD
  - Perimeter gradient control wells (see Outfall 201 description below) – **3.816 MGD**

- 004: Outfall 004 is an outfall regulating the discharge from the sanitary wastewater package plant. The average flow is 0.011 MGD and the outfall discharges to the Ohio River. Treatment for the sanitary water includes:
  - disinfection with ultra violet light (2-H)
  - activated sludge (3-A)

- 101: Outfall 101 is an internal outfall regulating the discharge from the contact storm water pond (1.805 MGD). The contact storm water pond receives water from the coal pile run-off, new lined pond, west yard sump, and Unit #1 & Unit #2 basement sumps (which includes the Unit #2 floor drains), oil separation tank, east side yard sump, boiler seal troughs, floor drains, greensand water treatment filters regenerant and backwash, softener regenerant streams, and RO rejects. Flow from Outfall 101 ultimately discharges through Outfall 001. Treatment for the contact storm water pond water includes:
  - Polymer addition
  - sedimentation (1-U)

- 201: Outfall 201 is an internal outfall regulating the discharge from the East ash pond perimeter gradient control wells **(3.816 MGD)**. The outfall combines with other plant waters and discharges through Outfall 001.

- 101AS: Semi-Annual monitoring requirements for standard stormwater parameters are included in Internal Outfall 101. Those parameters are reported on a separate Discharge Monitoring Report that is identified as Outfall 101AS.

- 005: Outfall 005S discharges noncontact storm water from the final cover system of the former West Ash Pond and adjacent green areas of the plant. The noncontact storm water drains through a series of flow channels prior to discharging into the Ohio River via Outfall 005.

- **006: Outfall 006 is an outfall that discharges flows from the perimeter gradient control wells (27.913 MGD) located outside the perimeter of the East Ash Pond. Following the cessation of pumping from the perimeter gradient control wells, Outfall 006 will discharge noncontact storm water from the former footprint of the East Ash Pond and adjacent green areas surrounding the former footprint. The calculated peak discharge of noncontact stormwater is 3.364 MGD for the 100-yr design storm event. The noncontact storm water drains through an outlet channel prior to discharging into the Ohio River via Outfall 006.**

- 000: This is the intake structure for water entering the plant.

Water Treatment Additives

The following water treatment additives are used in processes that contribute to Outfall 001 and have been previously approved by IDEM: Scaletrol PDC 9325, Sodium Bisulfite, Cortrol OS 5607, Steamate NA 0280, Optisperse HTP 3001, Optisperse HP 3100, Optisperse HP 2100, Spectrus OX 1201, Corrshield NT 402, Polyfloc AE 1125, 12.5% Bleach (Sodium Hypochlorite), Ferric Chloride, Potassium Permanganate, Metclear 2405, Klaraid PC1190 (polymer), Sodium Hydroxide, and Sodium Chloride.

Microbe-Lift is a water treatment additives that is used in the sanitary wastewater treatment process that discharges to Outfall 004.

Form 2C Data Explanation

Form 2C, part V data was obtained from monthly MMR data sheets (September 2018 – August 2021) previously submitted to the IDEM and two Form 2C specific sampling events on March 18, 2021 and July 20, 2021. The "Long Term Average Value" column is the average of the monthly averages reported on the MMRs during the past one-year period. The "Maximum 30-Day Values" column is the highest calendar month average that occurred during the data set. All supporting data has been summarized in spreadsheets which are included in tab 2 of this application.

Drawings in Tab 7

- Plant water balance diagram (full size and 11 x 17)
- Outfall Locations
- Google Earth view

I. Identification of Potentially Affected Persons

Please list here any and all persons whom you have reason to believe have a substantial or proprietary interest in this matter, or could otherwise be considered to be potentially affected under the law. Failure to notify any person who is later determined to be potentially affected could result in voiding our decision on procedural grounds. To ensure conformance with AOPA and to avoid reversal of a decision, please list all such parties. The letter attached to this form will further explain the requirements under the AOPA. Attach additional names and addresses on a separate sheet of paper, as needed. Please indicate below the type of action you are requesting.

Name: Dan Saylor - Warrick County Commissioner		Name: Terry Phillippe - Warrick County Commissioner
Street address: Old Courthouse 107 West Locust, Ste 301		Street address: Old Courthouse 107 West Locust, Ste 301
City/State/ZIP code: Boonville, IN 46701		City/State/ZIP code: Boonville, IN 46701
Name: Robert Johnson - Warrick County Commissioner		Name: Stacie Krieger - Newburgh Town Council President
Street address: Old Courhouse 107 West Locust, Ste 301		Street address: 23 W. Jennings Street
City/State/ZIP code: Boonville, IN 46701		City/State/ZIP code: Newburgh, IN 47630
Name: Christy L. Powell - Newburgh Town Manager		Name:
Street address: 23 W. Jennings Street		Street address:
City/State/ZIP code: Newburgh,, IN 47630		City/State/ZIP code:
Name:		Name:
Street address:		Street address:
City/State/ZIP code:		City/State/ZIP code:
Name:		Name:
Street address:		Street address:
City/State/ZIP code:		City/State/ZIP code:
Name:		Name:
Street address:		Street address:
City/State/ZIP code:		City/State/ZIP code:
Name:		Name:
Street address:		Street address:
City/State/ZIP code:		City/State/ZIP code:
Name:		Name:
Street address:		Street address:
City/State/ZIP code:		City/State/ZIP code:
Name:		Name:
Street address:		Street address:
City/State/ZIP code:		City/State/ZIP code:
Name:		Name:
Street address:		Street address:
City/State/ZIP code:		City/State/ZIP code:

II. Please complete this form by signing the following statement.

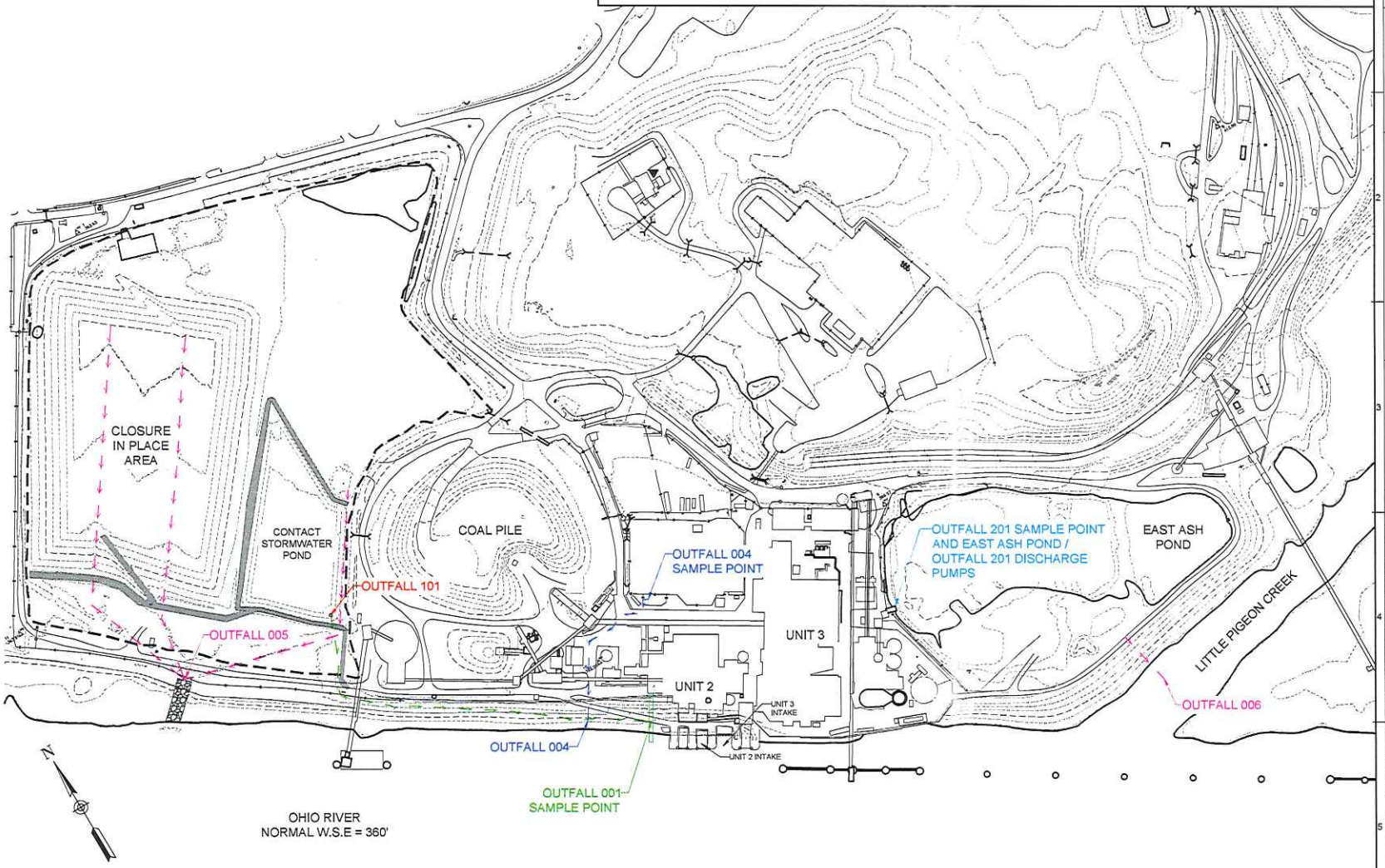
I certify to the best of my knowledge I have listed all potentially affected parties, as defined by IC 4-21.5.		
Signature: F Shane Bradford		
Printed name: F. Shane Bradford		Date *(month, day, year)*: 2-8-2024
Name of facility: Southern Indiana Gas and Electric Company, F.B. Culley Generating Station		
Address of facility *(number and street)*: 3711 Darlington Road		
City of facility: Newburgh	State of facility: IN	ZIP code: 47630

III. Type of Action (check one)

- ☑ NPDES Permit-327 IAC 5
- ☐ Pretreatment Permit -327 IAC 5
- ☐ Construction Permit-327 IAC 3

F.B. CULLEY GENERATING STATION NPDES SAMPLING POINTS

PERMIT NO. IN0002259



NOT TO SCALE

AECOM
1300 E 9th St.
Suite 500
Cleveland, Oh 44114
216 622-2300 (phone)
216 622-2484 (fax)

CenterPoint Energy
P.O.BOX 209
EVANSVILLE, IN 47702
1-800-227-1376

F.B. CULLEY
GENERATING STATION
NEWBURGH, INDIANA

ISSUED FOR BIDDING — DATE: —

ISSUED FOR CONSTRUCTION — DATE: —

REVISIONS

NO.	DESCRIPTION	DATE
△		
△		
△		
△		
△		
△		

AECOM PROJECT NO:	60580560
DRAWN BY:	WCP
DESIGNED BY:	WCP
CHECKED BY:	JDM
DATE CREATED:	10/21/2021
PLOT DATE:	1/31/2024
SCALE:	
ACAD VER:	2018

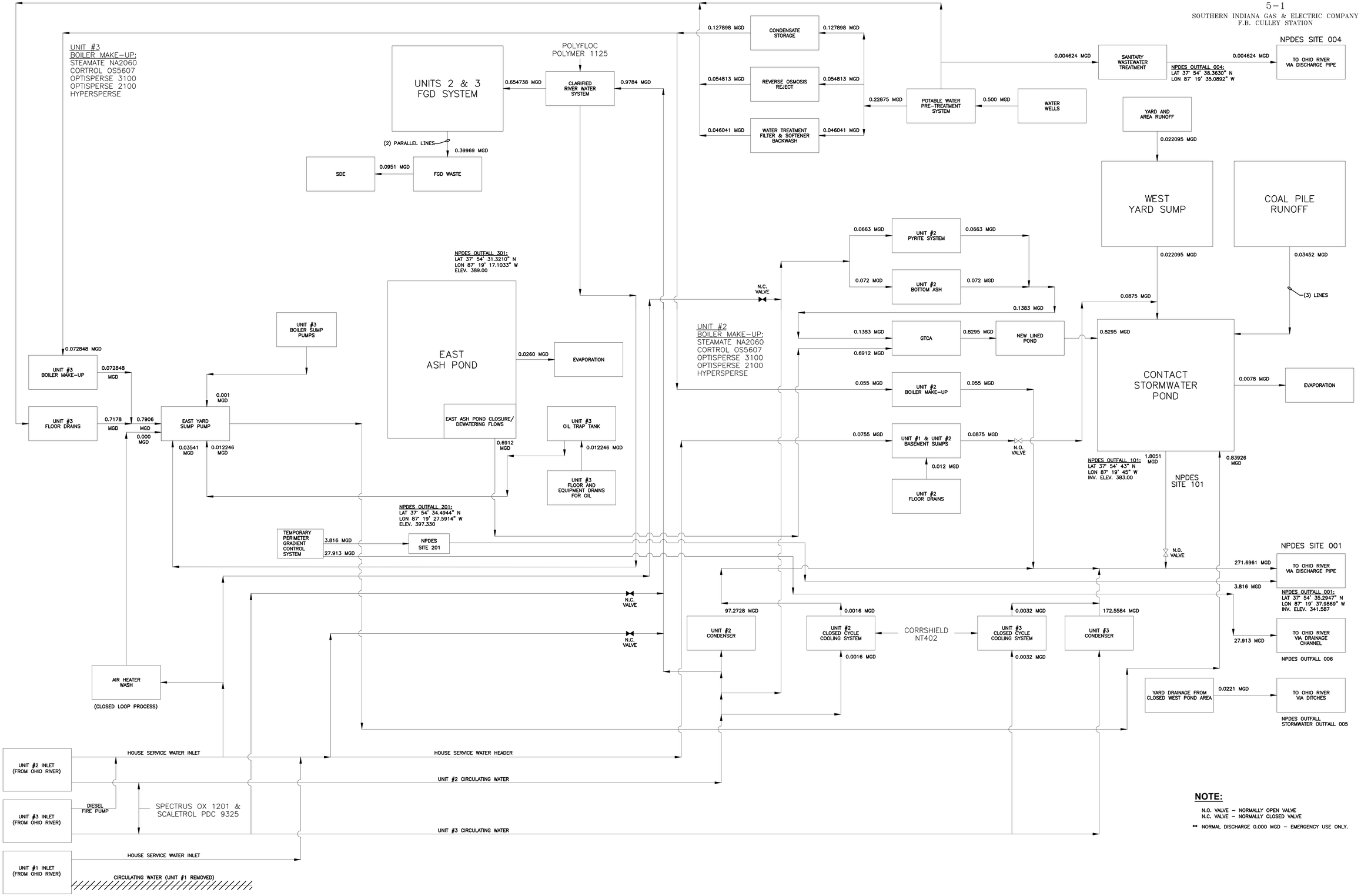
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SAMPLING POINTS

SHEET 01 OF 01

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SOUTHERN INDIANA GAS & ELECTRIC COMPANY
F.B. CULLEY STATION



NOTE:

N.O. VALVE – NORMALLY OPEN VALVE
N.C. VALVE – NORMALLY CLOSED VALVE

** NORMAL DISCHARGE 0.000 MGD – EMERGENCY USE ONLY.

SIGECO
F. B. CULLEY GENERATING STATION
NEWBURGH, INDIANA

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REV.	DATE	BY	ITEM
7	05 20 21	PAI	UPDATED PER VECTREN TR-210221-001
8	06 08 21	PAI	UPDATED PER VECTREN TR-210221-002
9	03 23 23	PAI	EAST POND UPDATE
10	04 18 23	PAI	EAST POND UPDATE
11	06 22 23	PAI	UPDATE PER CENTERPOINT
12	02 23 24	PAI	UPDATE PER CENTERPOINT

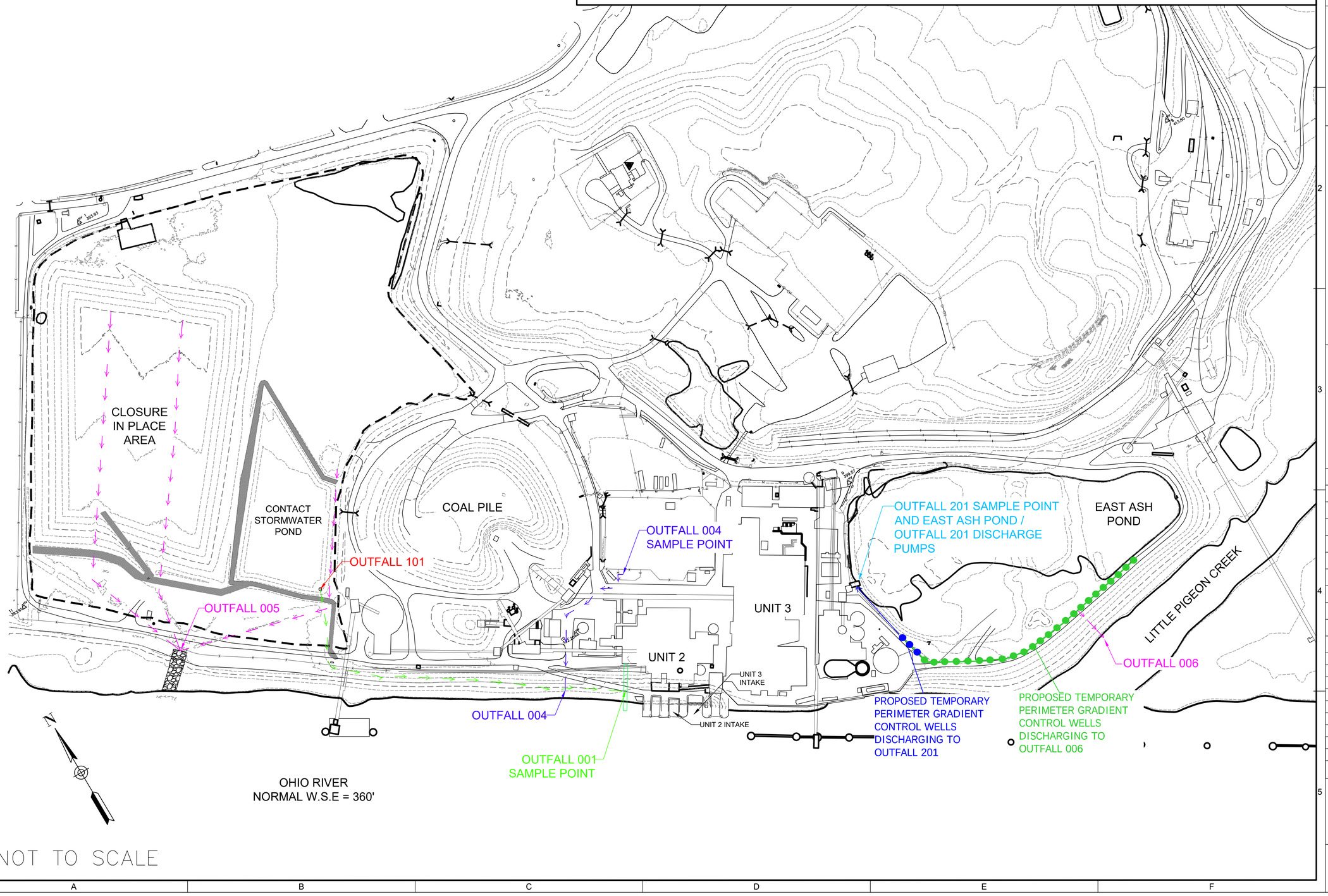
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ENGINEERING + ARCHITECTURE
2425 W. INDIANA ST., EVANSVILLE, IN 47712
WWW.THREEIDESIGN.COM (812) 423-6800
THREE I DESIGN JOB NUMBER: 07354A

PLANT WATER BALANCE

DRAWN BY: J.M.R.	DATE 10-11-11	SHEET NO:
CKD. BY: J.M.R.	SCALE: NONE	
DRAWING NO: F-3025.3		

F.B. CULLEY GENERATING STATION NPDES SAMPLING POINTS

PERMIT NO. IN0002259



NOT TO SCALE

AECOM
1300 E 9th St.
Suite 500
Cleveland, Oh 44114
216 622-2300 (phone)
216 622-2464 (fax)

CenterPoint Energy
P.O.BOX 209
EVANSVILLE, IN 47702
1-800-227-1376

F.B. CULLEY
GENERATING STATION
NEWBURGH, INDIANA

ISSUED FOR BIDDING	- DATE	- BY
ISSUED FOR CONSTRUCTION	DATE	BY

REVISIONS

NO.	DESCRIPTION	DATE
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AECOM PROJECT NO:	60586569
DRAWN BY:	WCP
DESIGNED BY:	WCP
CHECKED BY:	JDM
DATE CREATED:	10/21/2021
PLOT DATE:	1/31/2024
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ACAD VER:	2018

SHEET TITLE

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SHEET 01 OF 01

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BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-25-12
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	))))	Order No. 202-25-13

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 29
Bradford 2025 CCR Testimony

FILED
May 7, 2025
INDIANA UTILITY
REGULATORY COMMISSION

SOUTHERN INDIANA GAS AND ELECTRIC COMPANY
d/b/a CENTERPOINT ENERGY INDIANA SOUTH
(CEI SOUTH)

IURC CAUSE NO. 45052 ECA 6

DIRECT TESTIMONY
OF
F. SHANE BRADFORD

VICE PRESIDENT, INDIANA ELECTRIC

ON

UPDATES ON A.B. BROWN ASH POND CLOSURE PROJECT, F.B. CULLEY 3 COMPLIANCE PROJECT, CCR COMPLIANCE PROJECTS, AND F.B. CULLEY EAST ASH POND CLOSURE PROJECT

SPONSORING PETITIONER'S EXHIBIT NO. 1, ATTACHMENT FSB-1 (CONFIDENTIAL)

DIRECT TESTIMONY OF F. SHANE BRADFORD

INTRODUCTION

Q. Please state your name and business address.

A. My name is F. Shane Bradford. My business address is 211 NW Riverside Drive, Evansville, Indiana, 47708.

Q. By whom are you employed?

A. I am employed by Southern Indiana Gas and Electric Company d/b/a CenterPoint Energy Indiana South ("CEI South," "Petitioner," or "Company"), which is an indirect subsidiary of CenterPoint Energy, Inc.

Q. On whose behalf are you submitting this direct testimony?

A. I am submitting testimony on behalf of CEI South.

Q. What is your role with respect to CEI South?

A. I am the Vice President of Indiana Electric.

Q. Please describe your educational background.

A. I received a Bachelor of Science in Civil Engineering (1992) from the University of Dayton and a Master of Business Administration (2002) from Indiana State University.

Q. Please describe your professional background.

A. My career in the utility industry began at Dayton Power and Light Co., where I worked in maintenance and production roles within electric generation from 1992 to 1999. I then joined Cinergy's electric generation division until 2003, when I became a plant manager for one of Cinergy's subsidiaries, Trigen Cinergy Solutions LLC. In 2004, I

joined CEI South[1] as Power Plant Director, overseeing safe, reliable, and environmentally responsible electric generation. By 2021, I transitioned to Director of Power Supply Service, focusing on Wholesale Power Marketing, Market Settlements, and Market Development. In January 2023, I was promoted to Vice President of Power Generation Operations, managing budgeting, operations, maintenance, and personnel decisions for CEI South's generation fleet. In that role, I had responsibility for ensuring customer demand is met sustainably and affordably while complying with environmental regulations. I also oversaw cost inputs for the Integrated Resource Plan ("IRP") process and managed commercial negotiations with generation resources. I assumed my current position in July 2024.

Q. What are present duties and responsibilities as Vice President of Indiana Electric?

A. I am responsible for all operations within CEI South's electric utility sector in Indiana, alongside managing the Company's Generation Transition Plan, as outlined in the 2019/2020 IRP and the 2022/2023 IRP, the latter of which was submitted to the Indiana Utility Regulatory Commission (the "IURC" or "Commission") in May 2023. My responsibilities include the oversight of operations and maintenance ("O&M"), capital budgets, transmission and distribution operations, engineering, generation, development of new renewable projects, and construction of natural gas generation projects to complement renewables.

Q. Have you previously testified before the Indiana Utility Regulatory Commission ("Commission")?

A. Yes. I have testified before the Commission on behalf of CEI South for a certificate of public convenience and necessity ("CPCN") in Cause Nos. 45501, 45564, 45754, 45836, 45847, and 45903. Similarly, I've testified for approval of Power Purchase Agreements ("PPAs") in Cause Nos. 46058 and 46218. Additionally, I have testified

[1] For the sake of clarity, my testimony refers to CEI South, even though in certain situations, I may be referring to Southern Indiana Gas and Electric Company operating under a prior assumed business name.

on behalf of CEI South in its Fuel Adjustment Clause ("FAC") proceedings and the FAC 137 sub docket under Cause No. 38708; its Clean Energy Cost Adjustment ("CECA") under Cause No. 44909; its Environmental Cost Adjustment ("ECA") under Cause No. 45052; the Midcontinent Independent System Operator ("MISO") Cost and Revenue Adjustment ("MCRA") under Cause No. 43354; and Reliability Cost and Revenue Adjustment ("RCRA") under Cause No. 43406. I also provided testimony before the Commission in Cause No. 45990 in support of CEI South's electric rate case and in Cause No. 46140 in support of CEI South's request for approval of a disposal agreement to effectuate the sale of CEI South's interest in the Warrick Unit 4 Generating Unit.

Q. What is the purpose of your testimony in this proceeding?

A. My testimony will provide updates on the status of the A.B. Brown Ash Pond Closure Federal Mandate Compliance Project ("Brown Pond Project"), which was approved by the Commission in its May 13, 2020 Order in Cause No. 45280 ("45280 Order"); and the F.B. Culley Federal Mandate Compliance Project ("Culley 3 Project"), which was approved by the Commission in its April 24, 2019 Order in Cause No. 45052 ("45052 Order"). I provide updates on the status of the Federally Mandated Compliance Projects approved by the Commission in its June 28, 2022 Order in Cause No. 45564 ("45564 Order") including a dry fly ash loading facility ("Dry Ash Compliance Project") and federally mandated lined ponds at CEI South's A.B. Brown and F.B. Culley Generating Stations to handle coal-pile runoff, flue gas desulfurization wastewater, and other flows such as stormwater and landfill leachate in compliance with the EPA's Coal Combustion Residuals ("CCR") Rules and Regulations ("Pond Compliance Project") (collectively, "CCR Compliance Projects"). Lasty, I will provide updates of the status of the F.B. Culley East Ash Pond Closure By Removal ("CBR") Federal Mandate Compliance Project ("Culley East CBR Project"), which was approved by the Commission in its February 7, 2024 Order in Cause No. 45903 ("45903 Order"). My testimony also includes updates on costs incurred through December 31, 2024, for the Brown Pond Project, Culley 3 Project, CCR Compliance Projects, and Culley East CBR Project; in addition to providing specific justification to support CEI South's

request for approval of an updated approved federally mandated cost for the Culley East CBR Project.

Q. Are you sponsoring any attachments in this proceeding?

A. Yes. I am sponsoring Petitioner's Exhibit 1, **Attachment FSB-1 (CONFIDENTIAL)** - 45903 Approved Estimate vs. Revised Estimate.

Q. Was this attachment prepared by you or under your supervision?

A. Yes, it was.

BROWN POND PROJECT

Q. Please summarize the Brown Pond Project approved in the 45280 Order.

A. To comply with the CCR Rules and Regulations, the Brown Pond Project has three major components: (1) the construction of infrastructure required to transport excavated pond ash from the pond to the Ohio River in order to load the ash on barges for delivery to the ash re-user; (2) dewatering, excavation, blending, and conveying ("DEBC") of the ash for reuse; and (3) encapsulating non-conforming CCR material with an impermeable cap that meets environmental requirements.

Q. Please provide an update on the status of the infrastructure construction.

A. The infrastructure component to transport excavated pond ash from the storage area to the Ohio River to be loaded on barges was complete and placed in service in 2021; however, as explained in prior ECA filings and below, some additional investment has been necessary post in-service date to enhance safety and efficiency. Specifically, the river breasting lines, mentioned in my ECA 5 testimony, were completed in 2024 along with the addition of two monopiles and fairleaders. This combination of equipment enables CEI South to safely counteract eddy currents flowing around the river cells and also allows the A.B. Brown barge loading facility to stack/spread barge lids without the assistance of a tugboat and crew, thereby enhancing safety and increasing throughput efficiency. At the pond, dewatering wells were installed to remove pore

water to ensure a safe working distance between crews and the water table can be maintained. Additionally, hopper grate vibrators were installed to mitigate issues that caused the grates to blind during cold weather events or when the moisture specifications in the ash is too high, which required labor-intensive efforts to resolve and created delays in loading the barge. As such, the addition of the hopper grate vibrators increased efficiency throughput and reduced delays.

In addition, the following is scheduled for 2025 to further enhance the safety and efficiency: replace the telescopic barge loading chute; install additional pumping wells for pore water removal to further help maintain a safe water table; install an additional monopile and install a drift prevention fence in the Ohio River to prevent drift-wood from interfering with barge loading and assist with throughput efficiency; purchase equipment to safely access river cells and elevated conveyor points for maintenance; and design and install a maintenance platform to safely access the telescopic chute and boom arm to perform maintenance.

The total 2024 spend as of December 31, 2024, was $1.27 million with a life to date project spend of $59.96 million. As shown in **Table FSB-1** (below), the original infrastructure estimate of $69.0 million has increased to $77.7 million to address the additional investment described above, and the continued effect of higher than anticipated inflation of labor and materials costs. This revised infrastructure estimate of $77.7 million includes $62.8 million for the infrastructure to collect and transport ash to barges on the Ohio River as well as an additional $14.9 million to encapsulate any non-conforming material at the end of the Brown Pond Project.

Q. Please provide an update on encapsulation of non-conforming material.

A. There has been no change since ECA 5. The expected duration of the excavation and shipment of ash will continue for 10 or more years. As such, CEI South and AECOM will continue to evaluate this project as both parties learn more regarding the volume of ash that cannot be blended to meet the ash re-user's specifications.

Q. Please provide an update on the dewatering, excavation, blending, and conveying ("DEBC").

A. The dewatering of the pond, ash excavation, and shipments to the ash re-user continue. CEI South has shipped approximately 924,483 short tons of ash from the Brown ash pond to the ash re-user through 2024. Depending on volumes of conforming ash and the demand from the ash re-user, ash shipments are expected to continue for 10 or more years. CEI South spent $6.7 million on dewatering and excavation activities in 2024, with an overall life to date spend of $26.7 million. Currently, there is no change to the original estimate of $87.2 million for the DECB portion of the Brown Pond Project.

Q. Please provide an update on the Brown Pond Project cost estimate.

A. **Table FSB-1**, below, shows the updates to the Brown Pond Project cost estimate for the infrastructure construction and the dewatering, excavation, blending, and conveying. The ECA 6 revised estimate shows a $3.1 million increase compared to the ECA 5 estimate and a $8.7 million increase from the original estimate, resulting in a 5.6% total increase over the original estimate approved in the 45280 Order. Because the ECA 6 revised estimate for the Brown Pond Project is less than 25% over the original estimate approved in the 45280 Order, there is no need for additional approval under the Federal Mandate Statute (Ind. Code ch. 8-1-8.4).

Table FSB-1 – Brown Pond Project Estimate[2]

Description	45280 Approved Estimate	ECA 2 Estimate	ECA 3 Estimate	ECA 4 Estimate	ECA 5 Estimate	ECA 6 Estimate
Infrastructure Construction	$69.0M	$69.0M	$69.0M	$72.6M	$74.6M	$77.7M
DEBC	$87.2M	$87.2M	$87.2M	$87.2M	$87.2M	$87.2M
Total	$156.2M	$156.2M	$156.2M	$159.8M	$161.8M	$164.9M
Percent Change from 45280 Approved Estimate		0%	0%	2.3%	3.5%	5.6%

CULLEY 3 PROJECT

Q. Please summarize the Culley 3 Project approved in the 45052 Order.

A. To achieve compliance with the CCR and Effluent Limitations Guidelines ("ELG") Rules and Regulations, the Culley 3 Project, approved in the 45052 Order, included (1) conversion of the Unit 3 wet bottom ash handling system to a dry bottom ash handling system; (2) installation of an FGD wastewater spray dryer evaporator ("SDE") system; and (3) closure of the West ash pond and construction of a new lined process and storm water retention pond in the footprint of the closed West ash pond.

Q. Please provide an update on the status of the Culley 3 Project as well as its cost estimate.

A. The Unit 3 dry bottom ash handling system conversion was placed in-service on November 23, 2020. The FGD Wastewater SDE was placed in-service on May 1, 2023, with a few remaining punch list items, such as the fire standpipe, being completed in 2024. The West ash pond closure was completed, and new lined retention pond placed in-service on December 17, 2020.

The 45052 Order approved an original cost estimate of $94.2 million; however, in its

[2] As discussed in CEI South Witness Chrissy M. Behme's Direct Testimony, capital investments from the Brown Pond Project completed and placed in service before December 31, 2024, have now been moved into CEI South's base rates.

October 28, 2020 Order in Cause No. 45052 ECA 1 ("ECA 1 Order"), the Commission found CEI South's revised cost estimate of $106.3 million for the Culley 3 Project to be reasonable and within the amount previously approved in the 45052 Order.[3] **Table FSB-2**, below, shows the total capital spend for each component.

Table FSB-2 – Culley 3 Project Estimate

Description	45052 Approved Estimate	ECA 1 Approved Estimate	ECA 2 Estimate	ECA 3 Estimate	ECA 4 Estimate	ECA 5 Estimate	ECA 6 Estimate
Unit 3 Dry Bottom Ash	$14.5M	$14.5M	$14.0M	$13.7M	$13.6M	13.6M	13.6M
FGD Wastewater SDE	$51.7M	$51.7M	$51.7M	$51.7M	$45.7M	$47.2M	$46.7M
West Ash Pond & New Lined Pond	$28.0M	$40.1M	$40.6M	$40.7M	$40.6M	$40.5M	$40.5M
Total Culley 3 Project	$94.2M	$106.3M	$106.3M	$106.1M	$99.9M	$101.3M	$100.8M
Percentage Change from Revised ECA 1 Approved Estimate			0%	0%	-6.0%	-4.7%	-5.7%

Q. Please describe any future changes in reporting related to the 45052 Culley 3 Projects.

A. As discussed by CEI South Witness Chrissy M. Behme, capital investments from the components of the 45052 Culley 3 Project (i.e., Unit 3 Dry Bottom Ash, FGD Wastewater SDE, and West Ash Pond & New Lined Pond) that were placed in service before December 31, 2024, have been moved into CEI South's base rates[4] and, therefore, are not included within this ECA filing.

CCR COMPLIANCE PROJECTS

Q. Please summarize the CCR Compliance Projects approved in the 45564 Order.

A. The CCR Compliance Projects approved in the 45564 Order include (1) the Dry Ash Compliance Project; and (2) the Pond Compliance Project. The Dry Ash Compliance

[3] The revised cost estimate was less than a 25% increase over the estimate of $94.2 million approved for the Culley 3 Project in Cause No. 45052.
[4] *S. Ind. Gas and Elec. Co.*, Cause No. 45990 (IURC Feb. 3, 2025).

Project consists of the following three major components: (1) the construction of a silo for accepting ash from Culley,[5] (2) a facility to load ash onto barges for transport to Missouri for beneficial reuse, and (3) a new dry ash handling system since the previous conveyor system was converted for handling of ponded ash.

The Pond Compliance Project involves construction of: (1) a 2- to 3-acre lined CCR-compliant pond at the F.B. Culley Generating Station; and (2) two lined CCR-compliant ponds totaling approximately 10 acres at the A.B. Brown Generating Station.[6]

The Commission initially approved the CCR Compliance Projects with an original cost estimate of $31.0 million in the 45564 Order. In its February 7, 2024 Order in Cause No. 45052 ECA 4 ("ECA 4 Order"), the Commission found CEI South provided sufficient evidence to meet its burden in support of the overages tied to the CCR Compliance Projects; found the revised cost estimate of $50.8 million for the CCR Compliance Projects to be reasonable; and approved the revisions to the federally mandated cost estimate for the CCR Compliance Projects.[7]

Q. Please update the status of the construction of the CCR Compliance Projects.

A. The Dry Ash Compliance Project was placed into-service in August 2022; the total capital spend was $15.5 million. The CCR-compliant pond at the F.B. Culley Generating Station was placed in service on May 1, 2023; the total capital spend was $10.6 million.

Construction on the first of two CCR-compliant ponds at the A.B. Brown Generating

[5] As approved, the silo was designed to accept ash from both A.B. Brown and F.B. Culley Generating Stations; but with the retirement of A.B. Brown Units 1 & 2, the silo is only now accepting ash from the F.B. Culley Generating Station.

[6] The 45564 Order granted CEI South's a certificate of public convenience and necessity (CPCN) to construct a single 10-acre lined CCR-compliant pond at A.B. Brown; however, CEI South requested, and subsequently received, approval in Cause No. 45052 ECA 4 to modify the Pond Compliance Project and construct two separate CCR-compliant ponds at A.B. Brown Generating Station instead of one large CCR-compliant pond. *See* ECA 4 Order. *See also* Bradford testimony in Cause No. 45052 ECA 4, pp. 12-14.

[7] ECA 4 Order at 35 and 36 (Ordering ¶ 4).

Station has been completed and the first CCR-compliant pond was placed in service in October 2023. As of December 31, 2024, the total capital expenditure for the first CCR-compliant pond at the A.B. Brown Generating Station was $20.6 million. Construction on the second CCR-compliant pond has not yet started although the required record drawings and IDEM submittals have been completed.

Q. Please provide an update on the CCR Compliance Projects cost estimate.

A. The estimate in **Table FSB-3** below has been updated to reflect the total costs for completing the Dry Ash Compliance Project, the CCR-compliant pond at the F.B. Culley Generating Station, and one of the two CCR-compliant ponds at the A.B. Brown Generating Station; it also includes an estimate (of $23.6 million) for the second CCR-compliant pond to be constructed at the A.B. Brown Generating Station.[8]

Table FSB-3 – CCR Compliance Projects Estimate

Description	45564 Approved Estimate	ECA 4 Approved Estimate	ECA 5 Estimate	ECA 6 Estimate
Dry Ash Compliance Project	$12.0M	$15.6M	$15.6M	$15.5M
Pond Compliance Project	$19.0M	$35.2M	$34.3M	$34.2M
Total CCR Compliance Project	$31.0M	$50.8M	$49.9M	$49.7M
Percentage Change from Revised ECA 4 Approved Estimate			-1.8%	-2.2%

Q. Please describe any future changes in reporting related to the 45564 CCR Compliance Projects.

A. As with the 45052 Culley 3 Project, certain capital investments related to the CCR Compliance Projects that were placed in service before December 31, 2024, were moved into CEI South's base rates[9] and, therefore, are not included within this ECA filing. Specifically, capital investment related to the Dry Ash Compliance Project; the CCR-compliant pond at the F.B. Culley Generating Station; and one of the two CCR-

[8] This estimate for the second CCR-compliant pond at A.B. Brown Generating Station remains unchanged from the estimate provided in ECA 5.
[9] Cause No. 45990.

compliant ponds at the A.B. Brown Generating Station has been included in CEI South's base rates and is not included in this ECA filing. Future ECA filings will continue to report on the second CCR-compliant pond to be constructed at the A.B. Brown Generating Station.

CULLEY EAST CBR PROJECT

Q. Please summarize the Culley East CBR Project approved in the 45903 Order.

A. In the 45903 Order, the Commission approved closure by removal of the Culley East CBR Project to achieve compliance with the CCR Rules and Regulations. The Commission also approved CEI South's cost estimates for the Culley East CBR Project, including costs of removal, delay costs, and contingency; however, the Commission did not allow the recovery of expenses incurred by CEI South related to its filing in Cause No. 45795.

Q. What cost estimates were approved for the Culley East CBR Project in Cause No. 45903?

A. The Commission approved the following cost estimate related to the Culley East CBR Project:

> We find the federally mandated costs (both incurred and projected) of $52,044,328 in capital costs, plus an estimated $133,000 in annual O&M expenses, as set forth in Petitioner's case-in-chief are just and reasonable and are approved for recovery.

45903 Order at 11.[10] The Commission noted that under Ind. Code § 8-1-8.4-7(c)(3), "[a]ctual costs that exceed the projected federally mandated costs of the approved compliance project by more than twenty-five percent (25%) shall require specific

[10] Ultimately, the cost estimate approved in the 45903 Order was reduced to remove costs incurred in relation to Cause No. 45795. 45903 Order, p.12 (finding "that CEI South is not entitled to recover the costs it incurred in Cause No. 45795." For additional language related to the amount of federally mandated costs approved in Cause No. 45903, s*ee* 45903 Order at 10 ("Based on the evidence of record, we find that CEI South has identified federally mandated costs and reasonably described those costs. The total capital costs are estimated at $52,044,328 and annual O&M costs are estimated at $133,000, and are approved.")

justification by the energy utility and specific approval by the commission before being authorized in the next general rate case filed by the energy utility with the commission."[11]

Q. Please update the status of the Culley East CBR Project.

A. Following testing of the dewatering well along the river embankment, CEI South installed an additional twelve dewatering wells (i.e., deep well pumps) and necessary auxiliary equipment along the dam between the ash pond and the Ohio River to allow employees to safely enter the ash pond to perform excavation. In addition, following a heavy rain event in May 2024, the ash pond exit road required structural repairs. Ash transportation was suspended while repairs were performed. The amount of ash shipped in 2024 to the Blackfoot Landfill was approximately 200,000 tons of ash. The back haul transportation, however, was stopped because the wetness of the material was sticking in the trucks, causing comingling issues with the coal direct haul, necessitating higher cost direct haul transportation. In addition to additional costs being borne because the material can no longer be back hauled, the wetness of the ash is also causing increased labor and equipment costs at the Blackfoot Landfill to offload and handle the material. In addition, starting in 2025, CEI South will begin stability work in the slope area around the ash pond to address slope stability issues encountered in 2024 wherein ash excavation activities created safety hazards in the outer ash pond area making it unsafe to work adjacent and below these areas.

Q. Please provide an update on the Culley East CBR Project cost estimate.

A. The total 2024 spend as of December 31, 2024, was $27.8 million with a life to date project spend of $39.6 million. **Table FSB-4** (below) shows the estimate for the Culley East CBR Project has been increased from the $51.8 million estimate approved in the 45903 Order to $64.8 million. As explained earlier in my testimony, the main drivers for the increase are additional engineering and installation of deep well pumps; required structural repairs to the exit road following the heavy rain event in May 2024;

[11] 45903 Order, p. 13.

increased ash transportation cost due to wet ash material preventing the use of the back haul agreement; and necessary stability work in 2025 – 2026 to address slope stability issues.

Table FSB-4 – Culley East CBR Project Estimate

Description	45903 Approved Estimate	ECA 5 Estimate	ECA 6 Estimate
Culley East CBR Project	$51.8M	$51.8M	$64.8M
Percentage Change from 45903 Approved Estimate		0%	25.1%

Q. Please summarize the relief requested for the Culley East CBR Project.

A. As shown in **Table FSB-4** above, the revised ECA 6 cost estimate is more than 25% of the original estimate approved in Cause No. 45903. Therefore, pursuant to Ind. Code § 8-1-8.4-7(c)(3), CEI South is providing specific justification and seeking specific approval by the Commission of an updated estimate for approved federally mandated costs for the Culley East CBR Project. Since the increased ECA 6 estimate for Culley East CBR Project relates to capital investment to be incurred in calendar year 2025, this request for approval of an updated federally mandated cost estimate for the Culley East CBR Project does not affect the rates in this ECA 6 filing.

Q. Please provide a comparison of the cost estimate approved in Cause 45903 to the revised cost estimate in this ECA 6.

A. Petitioner's Exhibit No. 1, **Attachment FSB-1 (CONFIDENTIAL)** provides a detailed comparison of the 45903 approved estimate to the revised ECA 6 estimate.

Q. Please provide a breakdown for the increase in the revised ECA 6 estimate.

A. Below is a summary of the cost increases:

Table FSB-5 – Cost Increases Culley CBR Project

Cost Increase Driver	Estimated Cost Increase
Increased Engineering and Installation of Deep Well Pumps	$4,460,520
Structural Repairs to Exit Road Following May 2024 Rain Event	$540,000
Increased Ash Transportation and Landfill Cost Due to Wet Ash Material	$2,891,246
Stability Work to Address Slope Stability Work Due to Ash Excavation	$10,448,234
Total Estimated Cost Increase	$18,340,000

Q. Please elaborate on why the deep well pumps were necessary.

A. During excavation plan development for the East Ash Pond, the engineering design calculated fifteen deep well pumps located along the dam area between the Ohio River and the East Ash Pond were necessary to address the influence that the Ohio River has on the East Ash Pond. This excavation plan however was developed utilizing existing monitoring well level readings. During the installation of the fifteen initial deep well pumps, the flow readings showed higher water flow than expected, requiring twelve additional deep well pumps and auxiliary power equipment to address the influence the Ohio River has on the East Ash Pond. To reduce costs, CEI South reused and relocated electrical equipment from the A.B. Brown Generation Station for use at the F.B. Culley Generating Station. The additional deep well pumps were commissioned in 2024 and will operate until pond excavation is completed. The increased cost due to additional deep well pumps and auxiliary electrical equipment is included in the revised Construction cost shown in the Cost Comparison Table provided within Petitioner's Exhibit 1, **Attachment FSB-1 (CONFIDENTIAL)**; and shown in **Table FSB-5**, above.

Q. Please describe the impact of the heavy rain event on the exit road and the necessity of these repairs for project access.

A. In May 2024, F.B. Culley experienced approximately 6" of heavy rain in under an hour. This unforeseen weather event created structural issues to the exit road used by the loaded trucks and required a temporary suspension of ash excavation and

transportation (i.e., ash loading and removal) until critical repairs could be completed. The location of the East Ash Pond does not allow for an alternative exit route. As such, these repairs had to be performed before ash excavation, loading, and transportation could continue, thereby, creating a five-week delay in excavating, loading, and removing the ash from the project site. The road repair and delay cost are included in the revised Construction cost shown in the Cost Comparison Table provided within Petitioner's Exhibit 1, **Attachment FSB-1 (CONFIDENTIAL);** and shown in **Table FSB-5**, above.

Q. Please explain the impact of the wet ash on transportation and landfill logistics and costs.

A. As explained in my Direct Testimony in Cause No. 45903, to get a better transportation rate, CEI South leveraged its existing coal transportation and delivery relationship with Buchta Trucking to negotiate a backhaul agreement. Specifically, for the Culley East CBR Project, CEI South planned to utilize a backhaul agreement where some of the trucks used to deliver coal would haul coal to FB Culley; load the trucks with CCR material; and then backhaul or return to the landfill loaded with East Ash Pond CCR material. As explained earlier in my testimony, however, due to the wet ash sticking to the trucks and not completely dumping at the landfill, to prevent contamination of return coal deliveries, CEI South is unable to utilize the back haul option with the trucks and was required to have dedicated trucks to load and transport the East Ash Pond CCR material to the landfill. The inability to leverage the prior coal delivery/transport relationship and discontinuation of the back haul option caused an increased transportation rate for the transport of the CCR material. In addition to having to use dedicated trucks, the wetness of the pond ash caused increased labor and equipment costs at the landfill to offload and handle the material. The increased transportation and landfill cost are included in the revised Transportation and Landfill cost shown in the Cost Comparison Table provided within Petitioner's Exhibit 1, **Attachment FSB-1 (CONFIDENTIAL)**; and shown in **Table FSB-5**, above.

Q. Please describe the slope stability issues encountered and why it necessitates the additional work.

A. The excavation of ash from the perimeter area of the landfill has left the slope area around the ash pond at an angle that is unsafe to work adjacent to and below these areas. To remedy this issue, the Contractor will be required to excavate these areas in stages. The ash will be removed in sections and cover material will be installed to make the area safe for work. This causes the Contractor to alternate between ash removal and installing cover material decreasing efficiency and increasing project timeline and cost. The slope stabilization and project delay cost are included in the revised Construction cost shown in the Cost Comparison Table provided within Petitioner's Exhibit 1, **Attachment FSB-1 (CONFIDENTIAL)**; and shown in **Table FSB-5**, above.

O&M EXPENSE - 2024 ACTUAL AND 2025 PROJECTION

Q. Please describe the actual 2024 O&M expense and the projected 2025 O&M expense related to the Brown Ash Pond Project and included in this ECA 6.

A. **Table FSB-6** (below) reflects the actual 2024 O&M, and the projected 2025 projected O&M spend for the Brown Ash Pond Project. 2024 O&M expense includes all costs associated with the excavation of ash from the ash pond, temporary storage for additional drying and blending activity to ensure the ash meets specifications and maximizing the volume of ash to be beneficially reused, loading ash into the ash hopper to be placed on the tube belt for transporting and loading into barges on the Ohio River, testing and reporting of ash quality, and operation and maintenance of all systems. CEI South Witness Chrissy M. Behme discusses the accounting treatment related to Brown Pond Project costs and offsetting ash sales and insurance proceeds pursuant to the Settlement Agreement approved in the 45280 Order.

Table FSB-6 – Brown Ash Pond O&M

Description	2024 Actual O&M	2025 Projected O&M
Brown Ash Pond	$6.7 million	$6.4 million

Q. What are the actual 2024 O&M expense for the Culley 3 Project?

A. **Table FSB-7** (below) reflects the actual 2024 O&M spend for each component of the Culley Unit 3 Project.

Table FSB-7 – Culley 3 Projects: 2024 Actual O&M

Culley 3 Project	2024 Actual O&M
West Ash Pond & Lined Retention Pond	$197,139
Dry Bottom Ash	$78,053
FGD Wastewater SDE	$41,062

Q. What are the actual 2024 O&M expense and the projected 2025 O&M expense for the CCR Compliance Projects?

A. **Table FSB-8** (below) identifies the actual 2024 O&M and the projected 2025 O&M spend for each component of the CCR Compliance Projects.

Table FSB-8 – CCR Compliance Projects O&M

CCR Compliance Projects	2024 Actual O&M	2025 Projected O&M
Dry Ash Compliance Project	$640,935	$508,332
Pond Compliance Project	$189,944	$220,704

CONCLUSION

Q. Does this conclude your direct testimony?

A. Yes, at the present time**.**

VERIFICATION

I affirm under penalties for perjury that the foregoing representations are true to the best of my knowledge, information, and belief.

SOUTHERN INDIANA GAS AND ELECTRIC COMPANY D/B/A CENTERPOINT ENERGY INDIANA SOUTH

F. Shane Bradford
Vice President, Power Generation Operations

5/6/2025
Date

Petitioner's Exhibit 1, **Attachment FSB-1 (CONFIDENTIAL)**

is confidential and will be provided under seal to the Commission.

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-25-12
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	))))	Order No. 202-25-13

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 30
DOE Rehearing Procedures

An official website of the United States government Here's how you know

U.S. DEPARTMENT of ENERGY

DOE 202(c) Order Rehearing Procedures

DOE may revise these procedures through advance written notification to the parties and posting here.

Intervention. Any person seeking to intervene to become a party must file a written motion to intervene by emailing AskCR@hq.doe.gov. A motion to intervene must state the movant's interest in sufficient factual detail to demonstrate that the movant has or represents an interest which may be directly and substantially affected by the outcome of the proceeding. A motion to intervene must be filed within 30 days after the

issuance of a section 202(c) order, which includes an original order or a renewal order. No grant of late intervention is permitted unless DOE finds good cause. The grant of party status will be expressly stated by DOE order within thirty days of filing. A motion to intervene may be combined with a motion for rehearing, answer, or other motion.

Rehearing. Pursuant to 16 U.S. Code § 825*l*, any party applying for rehearing must file a written motion for rehearing by emailing AskCR@hq.doe.gov within 30 days after the issuance of a section 202(c) order. The motion for rehearing must set forth specifically the ground or grounds upon which such motion is based and must contain a clear and concise statement of the facts and law which support the motion and the specific relief or ruling requested. Any grounds not specifically identified in such motion shall be waived. All motions for rehearing will be addressed in a consolidated proceeding and order on rehearing. Unless DOE acts upon the motion for rehearing within 30 days of filing, such motion may be deemed to have been denied.

Answers. Any party may file an answer to another party's motion by emailing AskCR@hq.doe.gov within 7 days after the motion is filed. An answer must contain a clear and concise statement of any disputed factual allegations and any law upon which the answer relies. An answer to an answer is not permitted.

Timing and Service. DOE will use best efforts to post filings here within 24 hours of receipt. Such posting constitutes service to all parties. Filing or posting due dates that fall on a federal holiday or weekend shall be extended to the next business day. Documents received after 4:30 p.m. Eastern Time are deemed filed on the next business day.

Confidentiality. DOE strongly encourages that all filings be limited to information suitable for public release. If procedures to maintain confidentiality are requested, DOE will provide them as needed at the discretion of DOE.

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