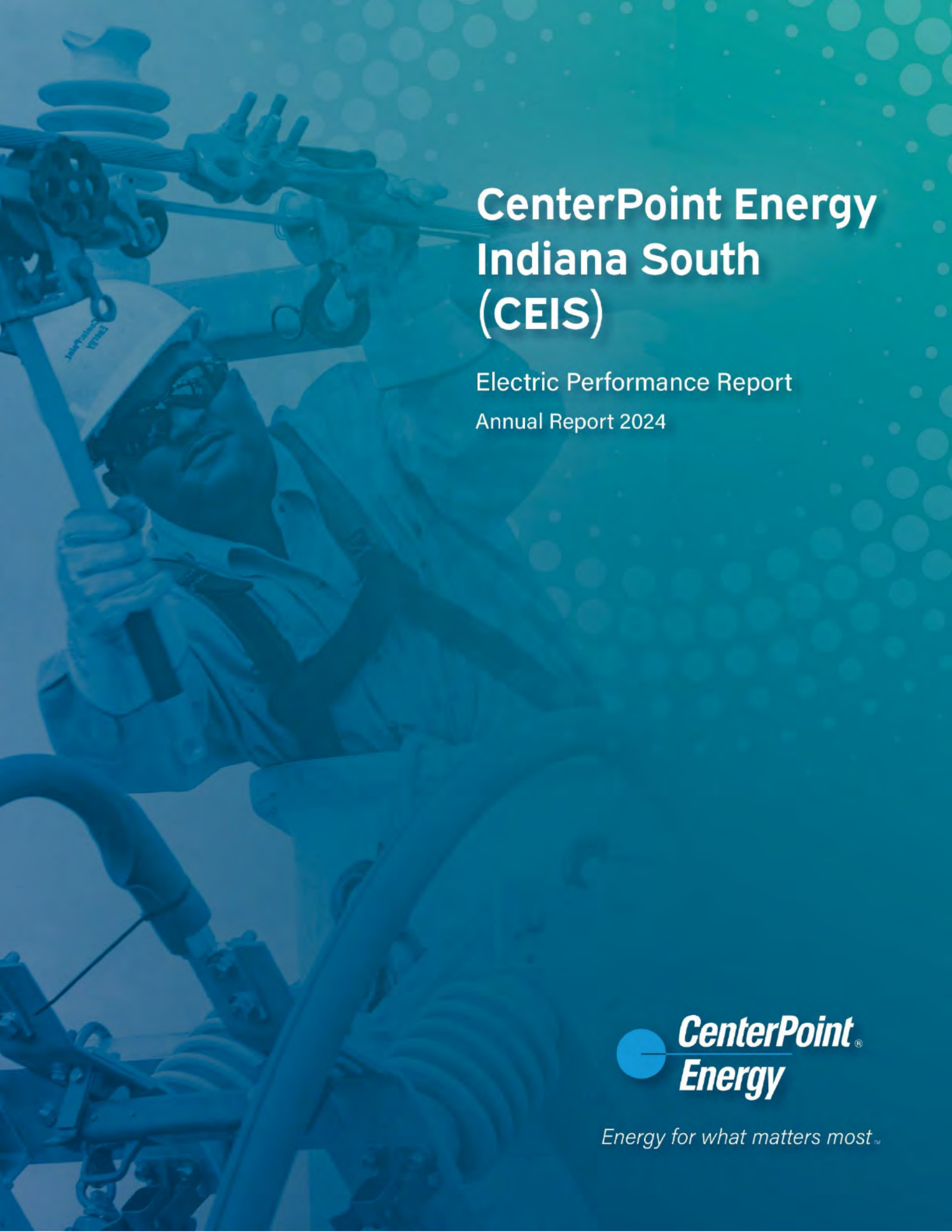
BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

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."

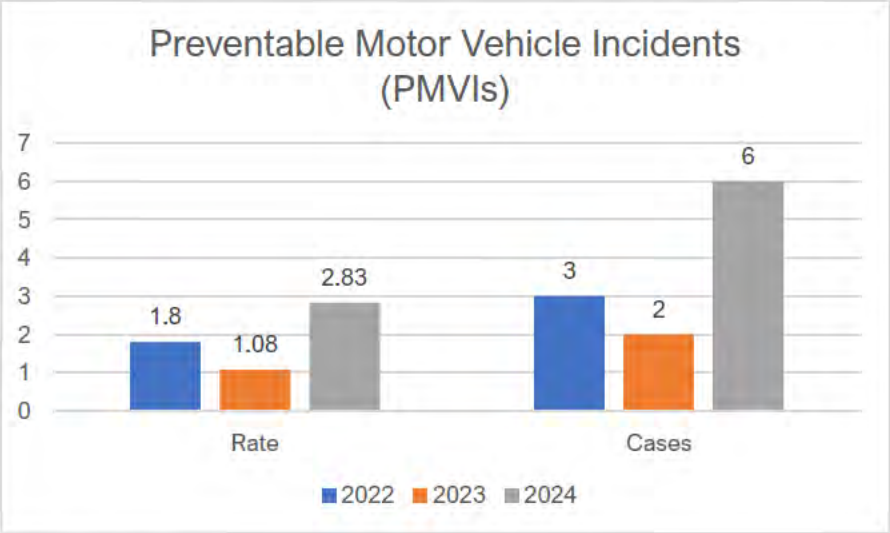
**We've updated our 2023 data for OSHA Recordable Incidents, DART and Lost Time Rate after standardizing how we collect the data internally.*

Safety and training (Continued)

Preventable Motor Vehicle Incidents

Preventable Motor Vehicle Incidents (PMVIs) are calculated using the following formula:

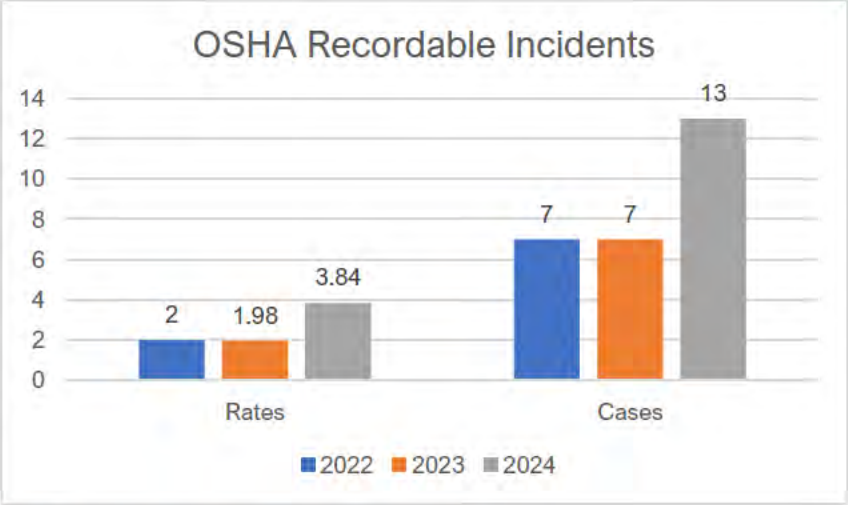
$$\text{PMVI rate} = \frac{\text{\# of PMVIs x 1,000,000}}{\text{Actual miles driven}}$$



OSHA Recordable Incidents

OSHA Recordable Incidents are found using the formula:

$$\text{OSHA Recordable Incident rate} = \frac{\text{\# of OSHA recordable injuries X 200,000}}{\text{Actual hours worked}}$$

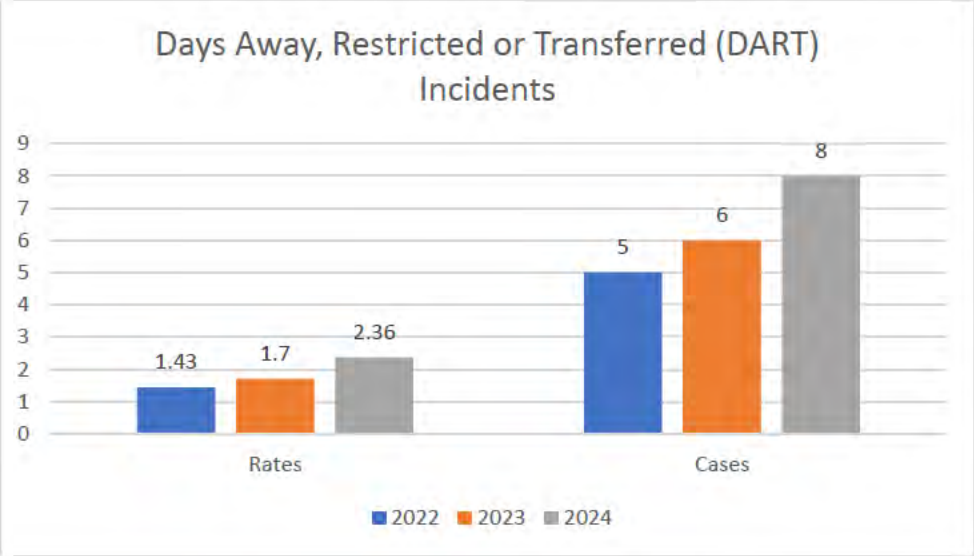


Safety and training (Continued)

Days Away, Restricted or Transferred (DART) incidents

DART incidents are calculated with:

$$\text{DART incident rate} = \frac{\text{\# of DART injuries X 200,000}}{\text{Actual hours worked}}$$

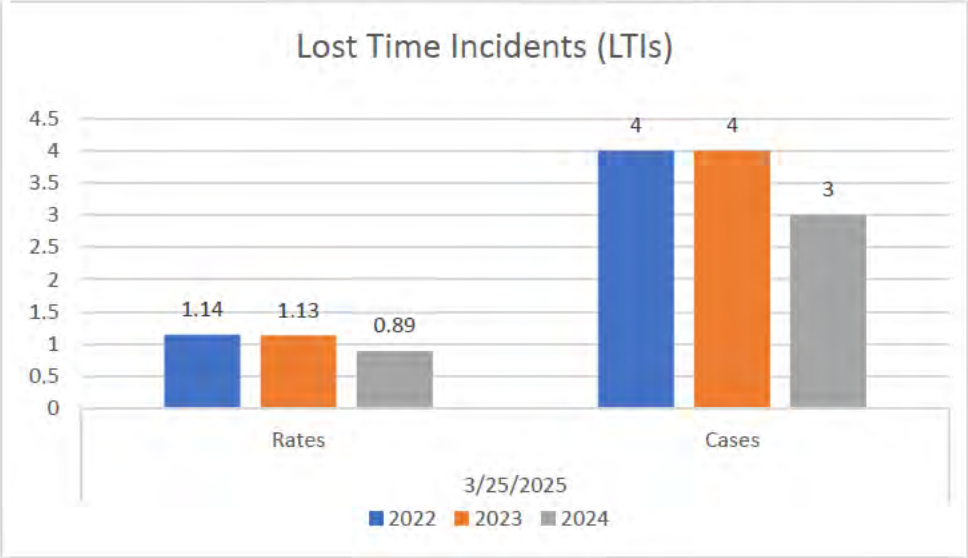


Safety and training (Continued)

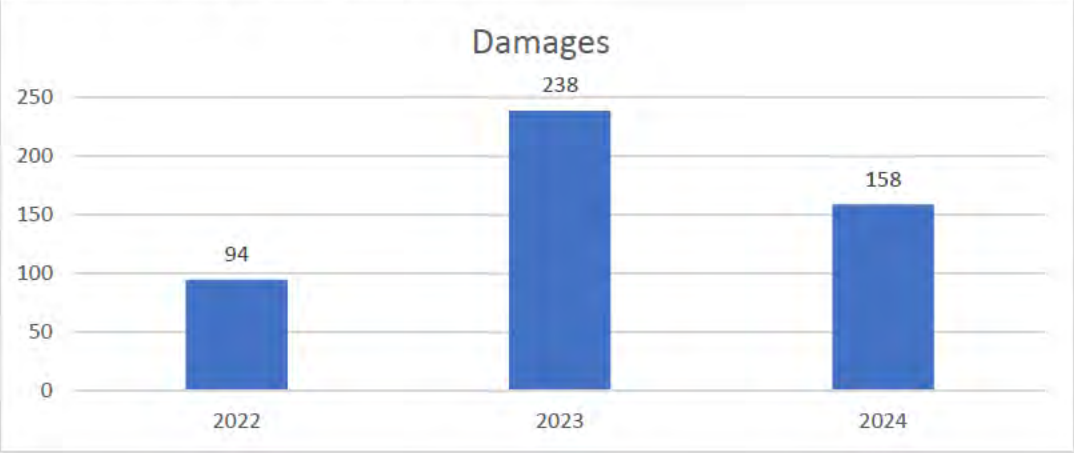
Lost Time Incident rate

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)

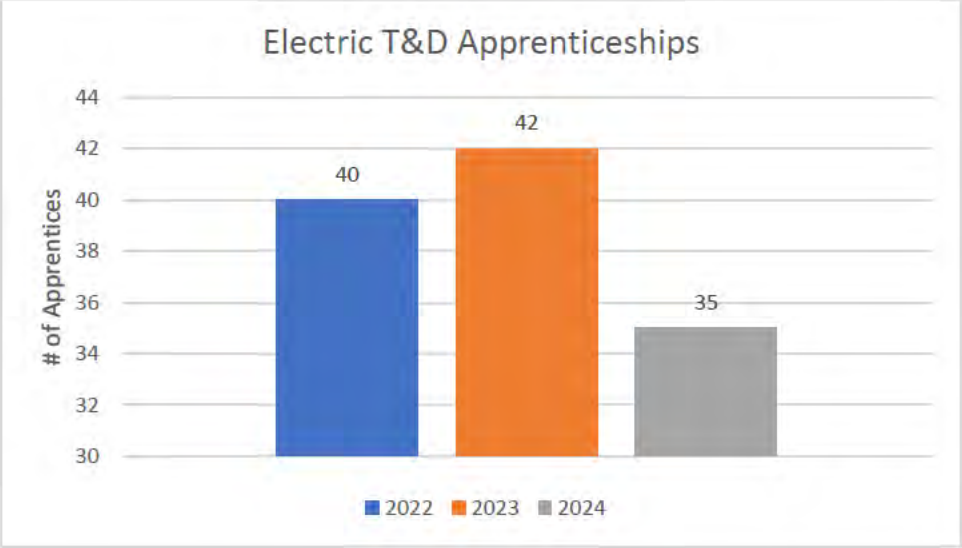
In the past we have provided data for combined gas and electric utilities. In an effort to report data specific to the electric utility, the data referenced on previous pages includes our above and below ground damage cases for our electric utility. These numbers include pole damages and excavation from 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.

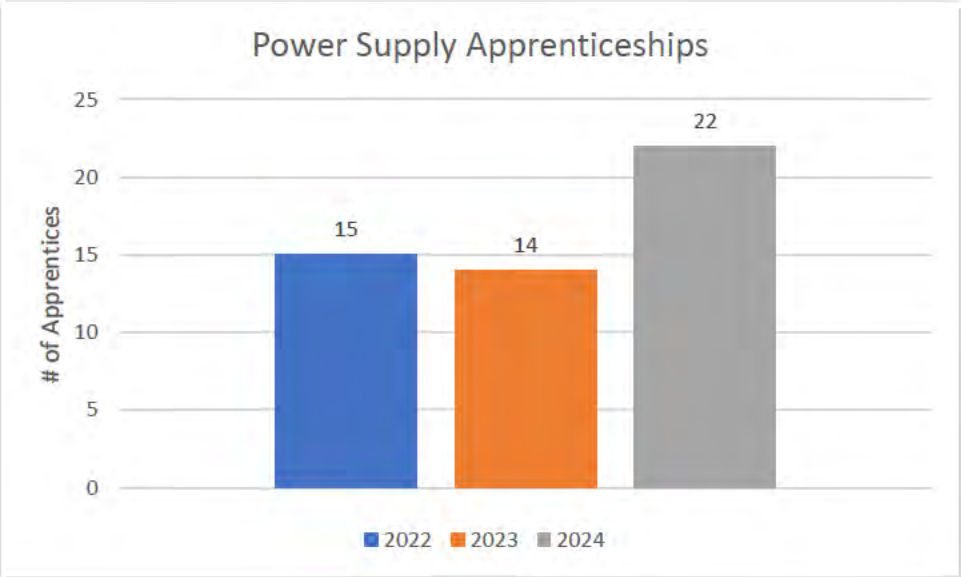
Electric T&D and Power Supply Apprenticeships

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.

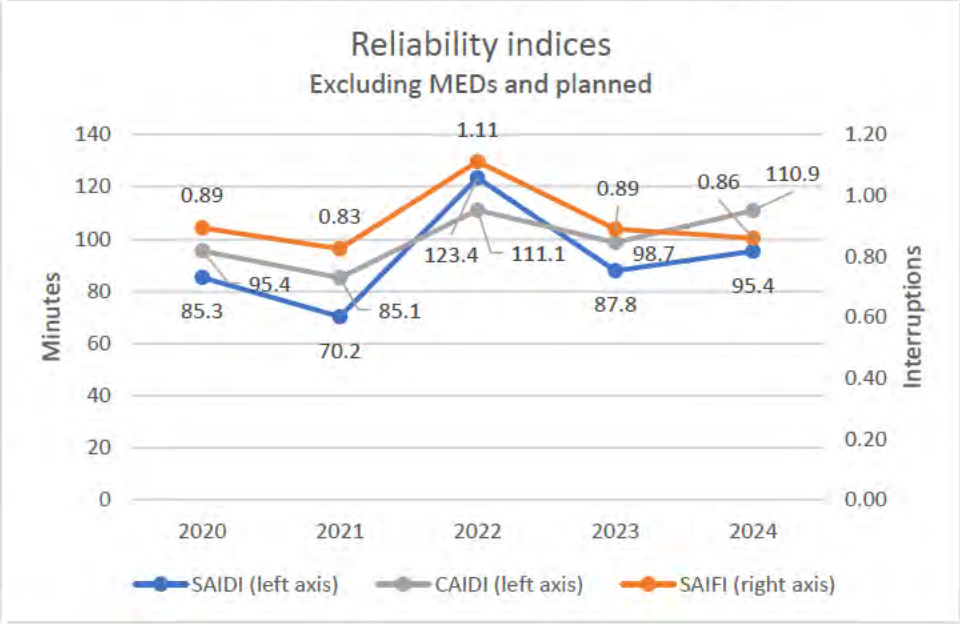
Reliability performance is impacted by MEDs, which are not representative of normal performance. The IEEE defines MEDs as, "…all days that have a SAIDI greater than T_{MED}." (IEEE Std 1366-2022) Thus, T_{MED} is a calculated daily SAIDI value derived from the past five-year performance and is used as 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)

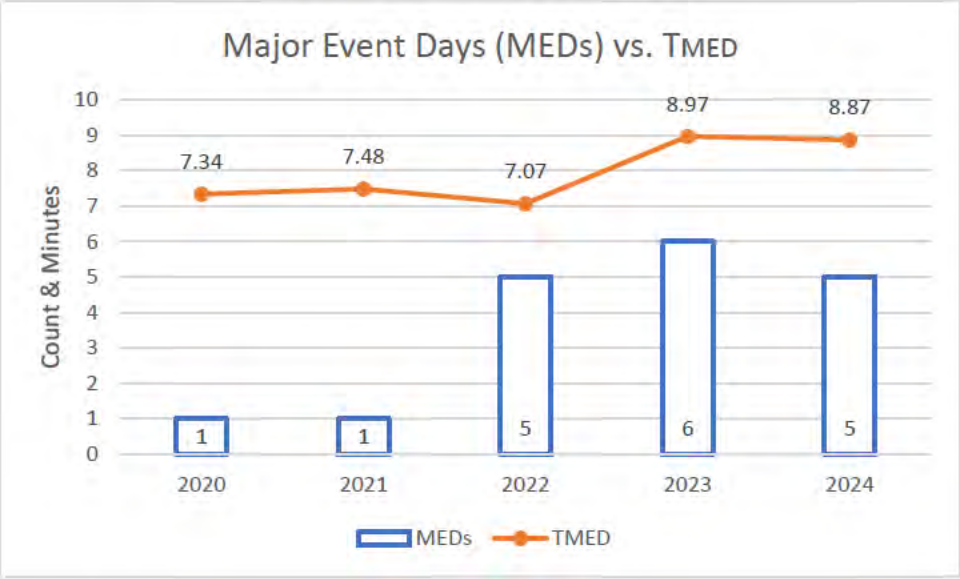
CEIS experienced three events in 2024 totaling five Major Event Days (April 2-3, May 26, and July 30-31) – see Figure 2.

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.

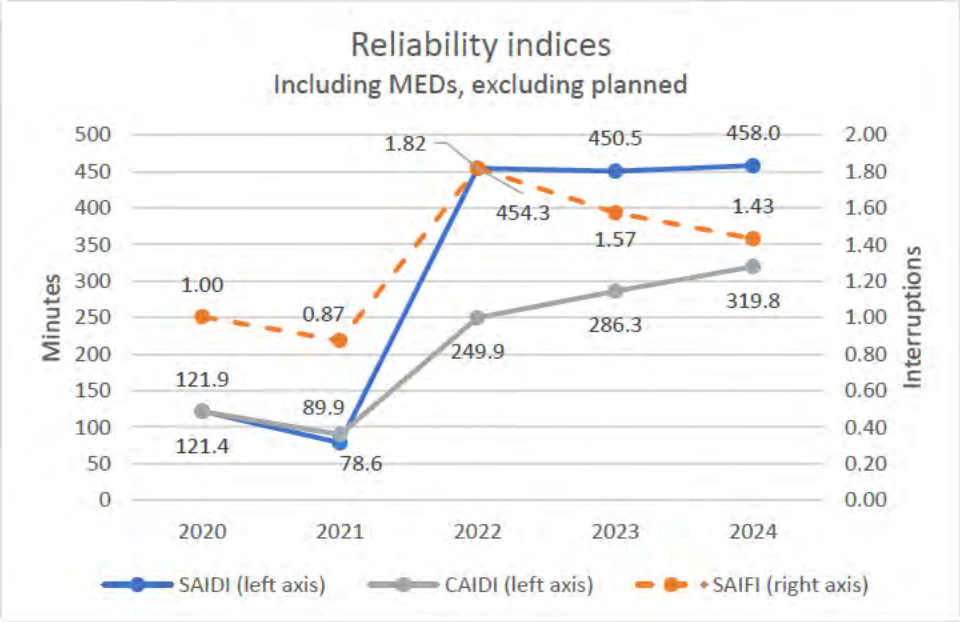
Figure 2: Major Event Days (MEDs)



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).

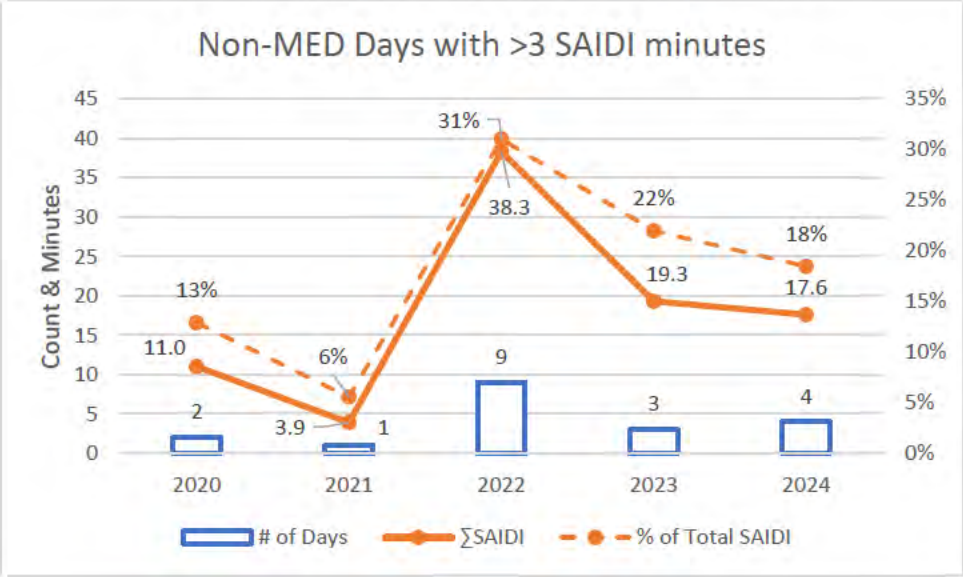
Figure 3: Reliability indices with MEDs



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.

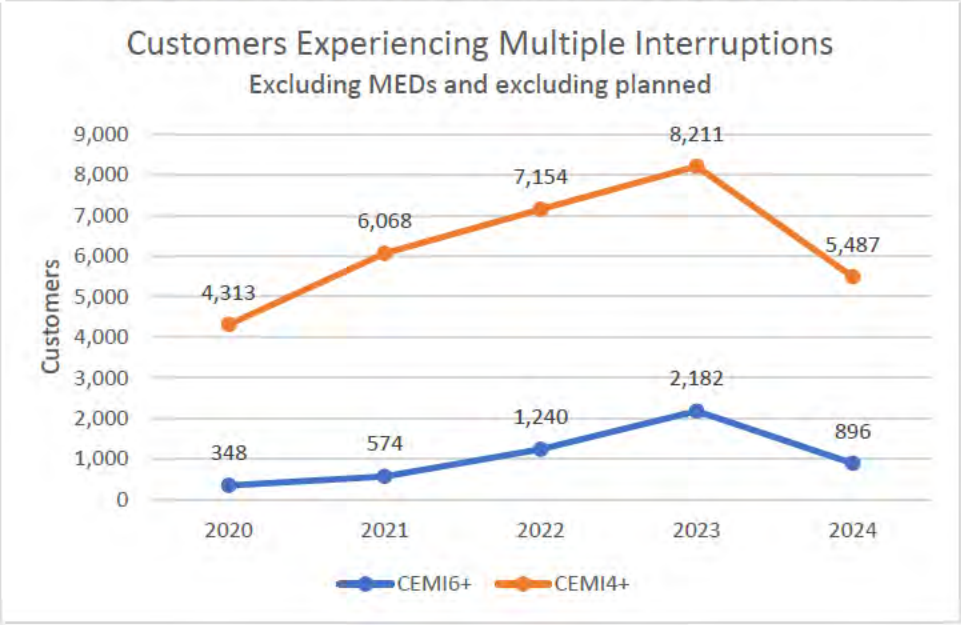
Figure 4: Non-MED days with >3 SAIDI minutes



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.

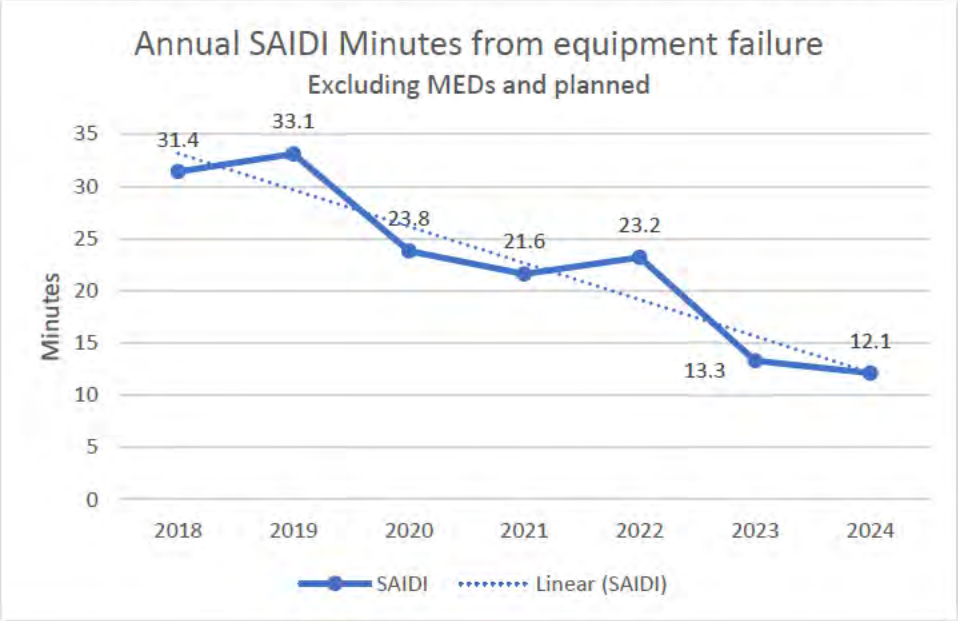
Figure 5: Customer experiencing multiple interruptions



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

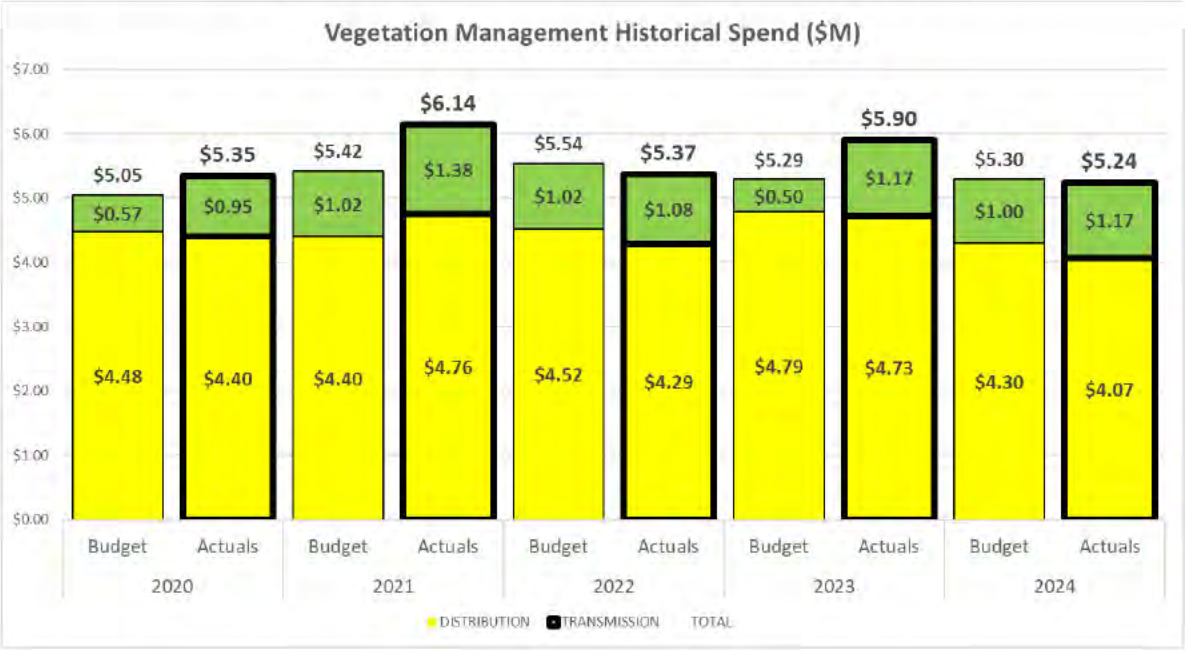


Other causes of SAIDI are outages related to vegetation and public interference, vehicle accidents with utility poles. This chart demonstrates the impact of our TDSIC work to replace and upgrade equipment, which has led to a decrease in equipment-caused outages.

Vegetation management

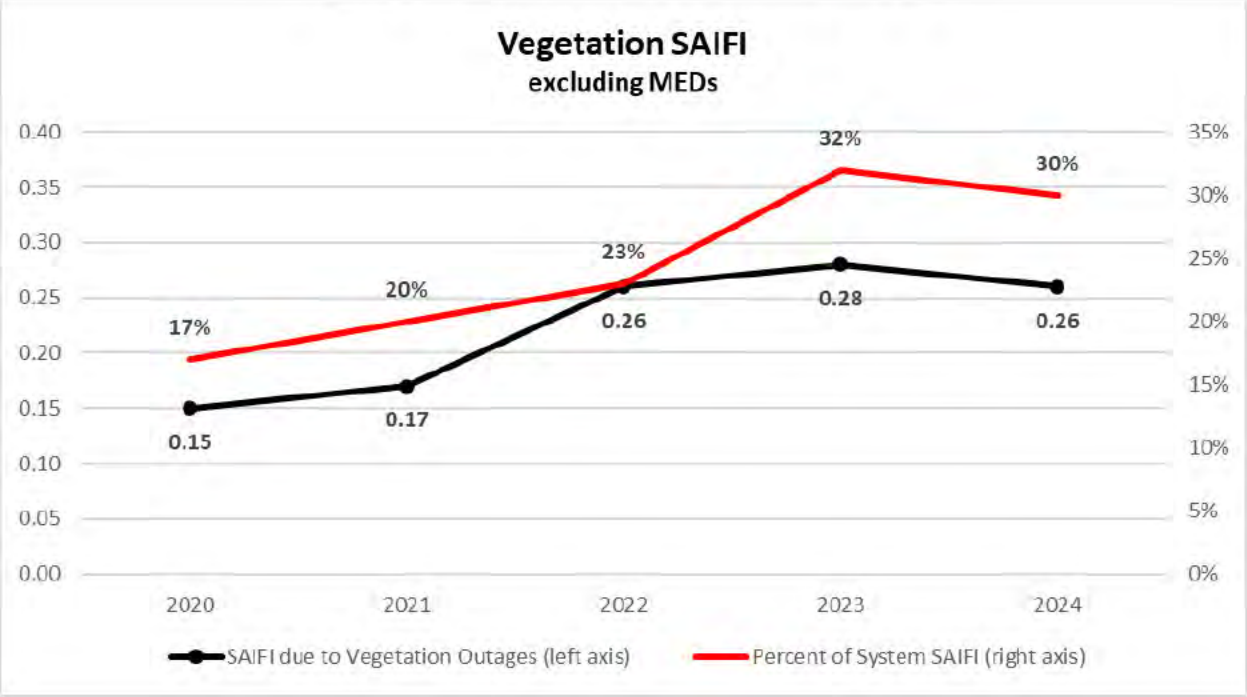
Consistent vegetation management is important to improve and maintain our reliability performance. This targeted spend keeps our rights of way and easements clear of trees and obstructions by addressing trees in our easements or rights of ways that have the potential to interfere with our powerlines 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

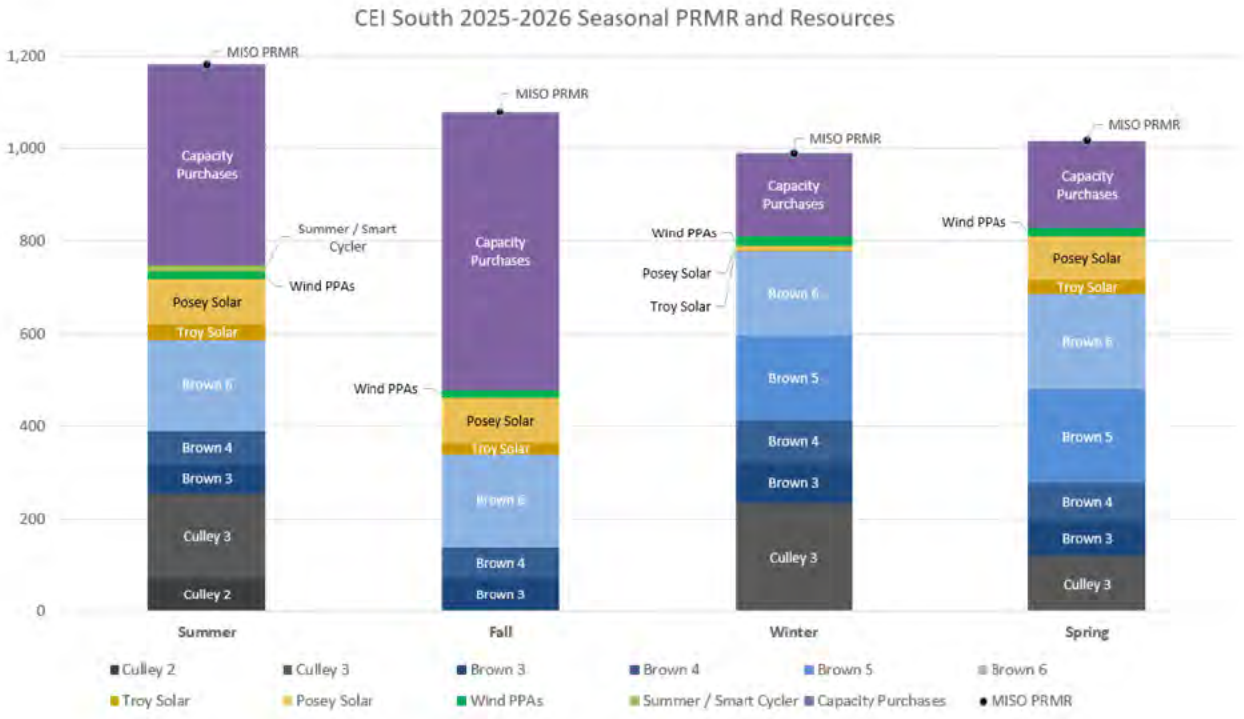
CEIS's current generation portfolio mix includes thermal coal, natural gas peaking and solar resources that are owned by CEIS, as well as purchase agreements for wind energy and capacity. CEIS owns and operates 360 MW of installed coal-fired capacity at the F.B. Culley generating station. An additional 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

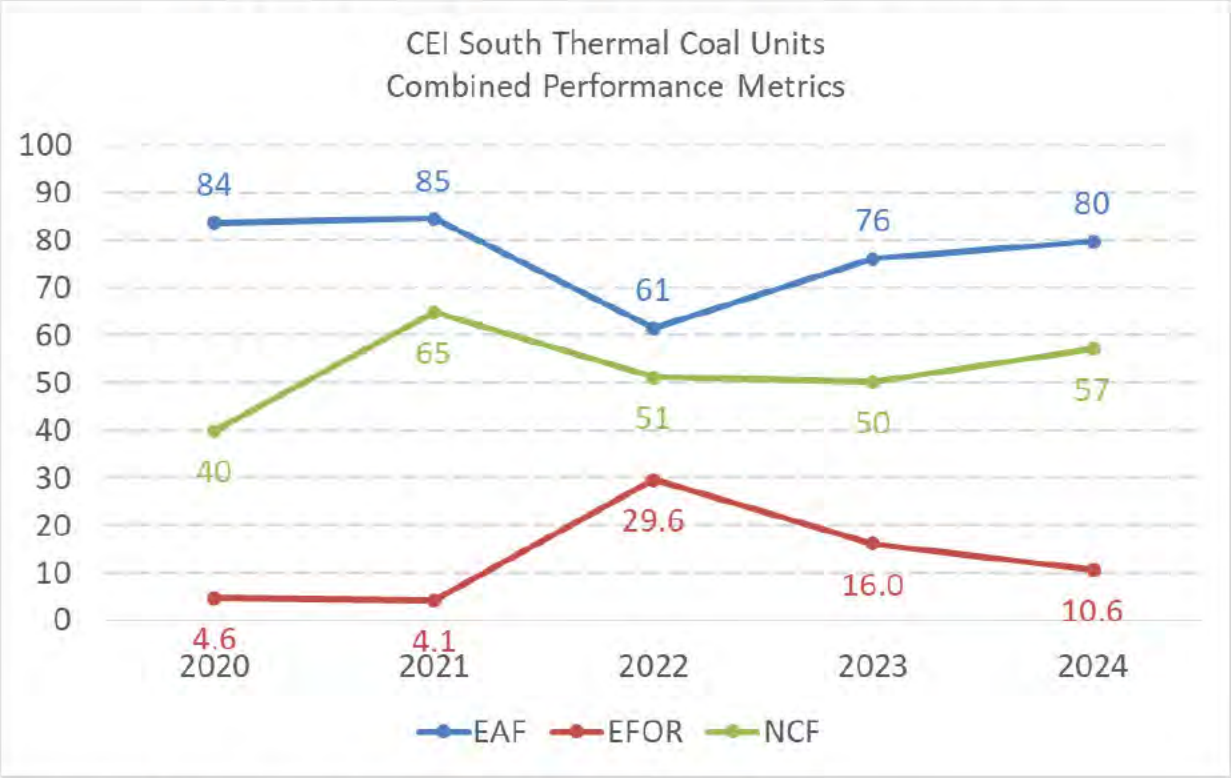
The performance metrics below represent the monthly, combined, weighted measures for the A.B. Brown and F.B. Culley thermal coal units.

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

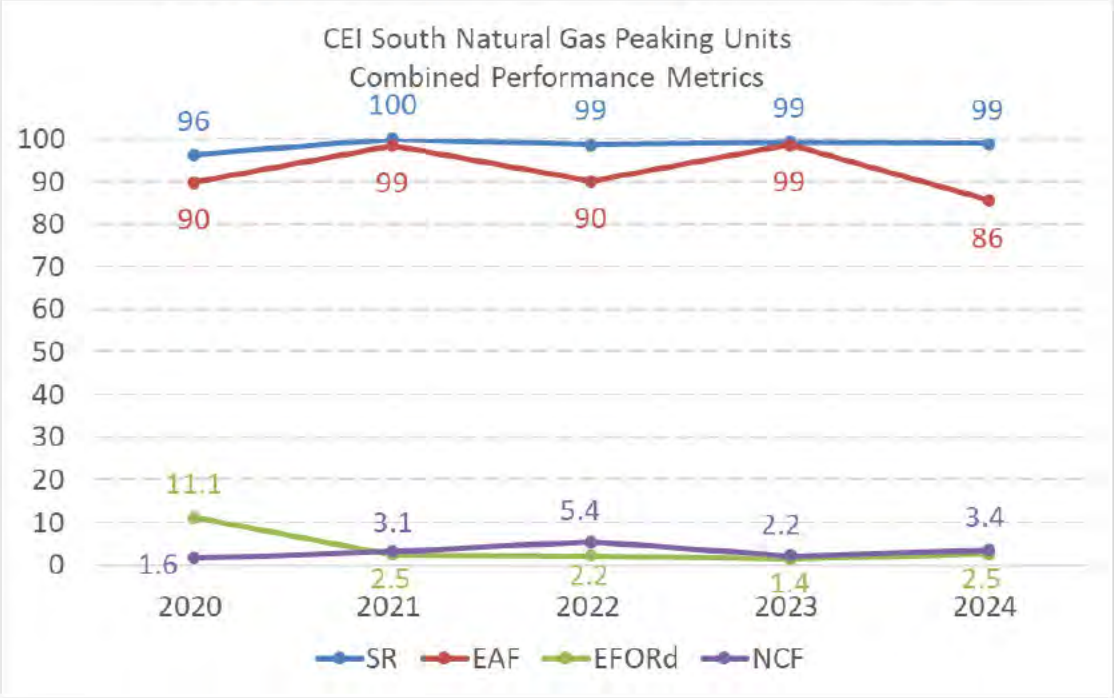
The performance metrics below represent the annual combined measures for the Brown 3 and Brown 4 simple cycle gas peaking units for 2020–2024.

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

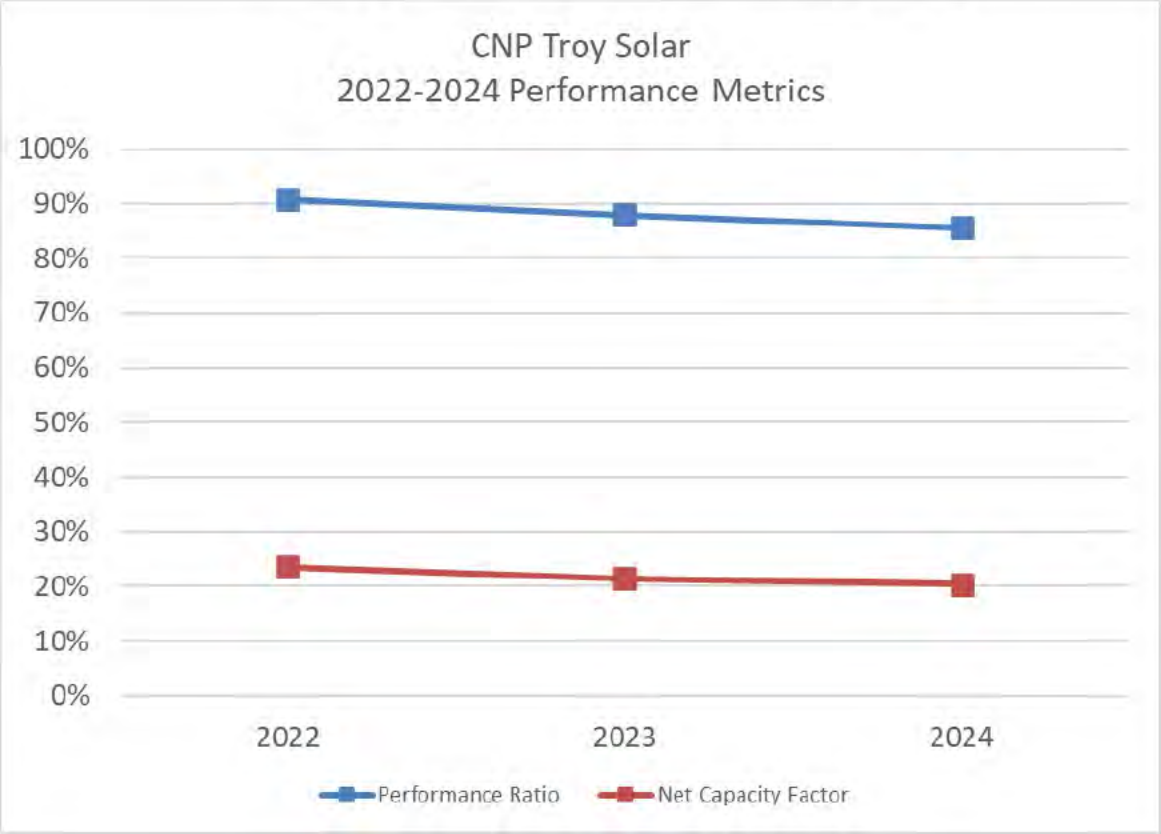
Net Capacity Factor and Performance Ratio are the selected measures for the nominal 50 MW Troy Solar facility.

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.

.

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.





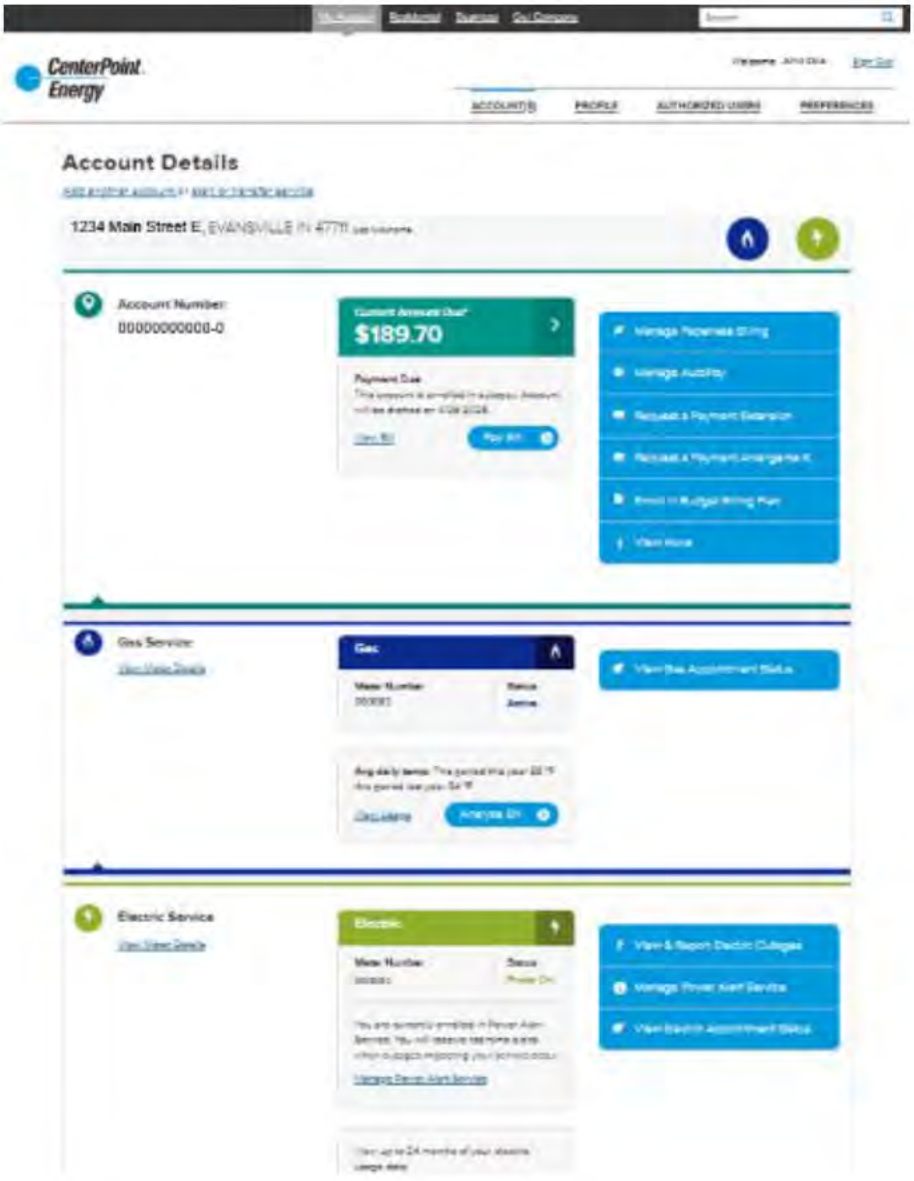
Communications are also focused on educating customers on the value they receive from CenterPoint utility services and encouraging customers to participate in programs which may help better manage their energy usage and learn about assistance opportunities.



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.

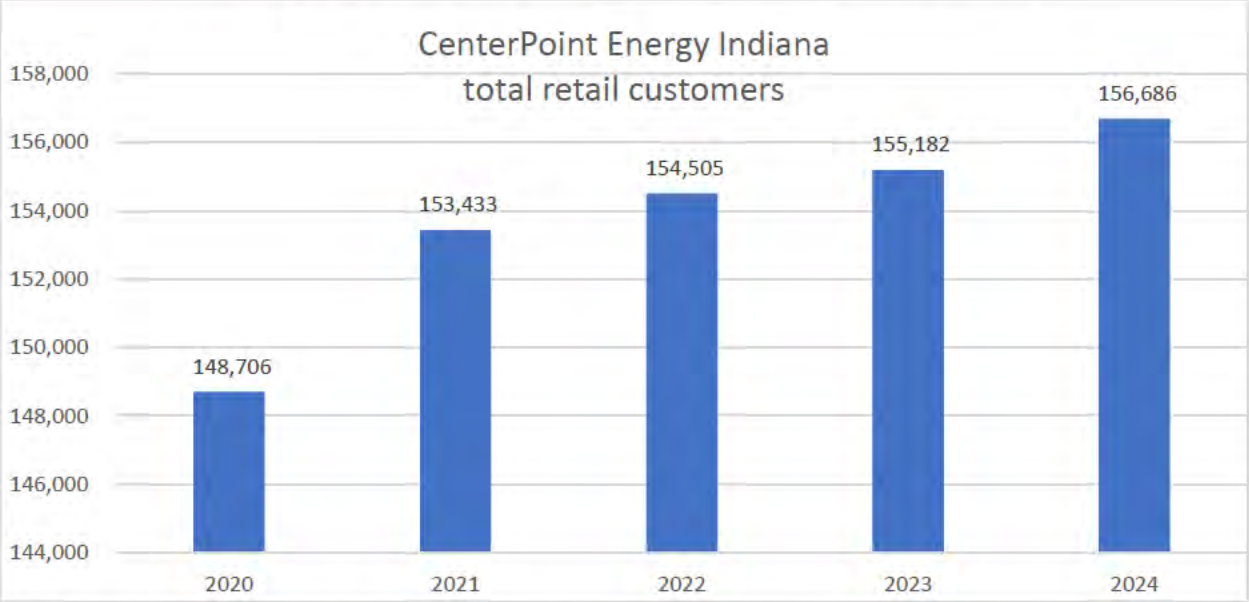
This initiative represents a significant step in our ongoing journey to deliver exceptional customer experiences. By focusing on First-Contact Resolution, customer empowerment and operational excellence, we are aligning with our CEO's vision of becoming '***Customer Obsessed***.' As we move into 2025 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

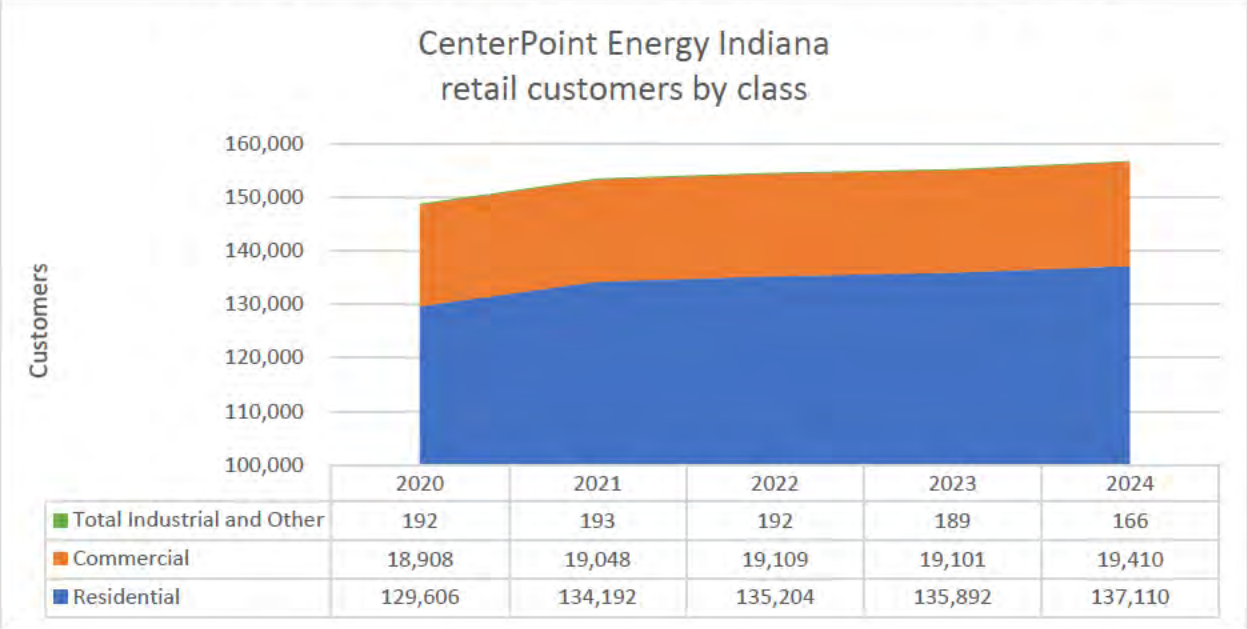
Figure 13: CenterPoint Energy Indiana total retail customers



- 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

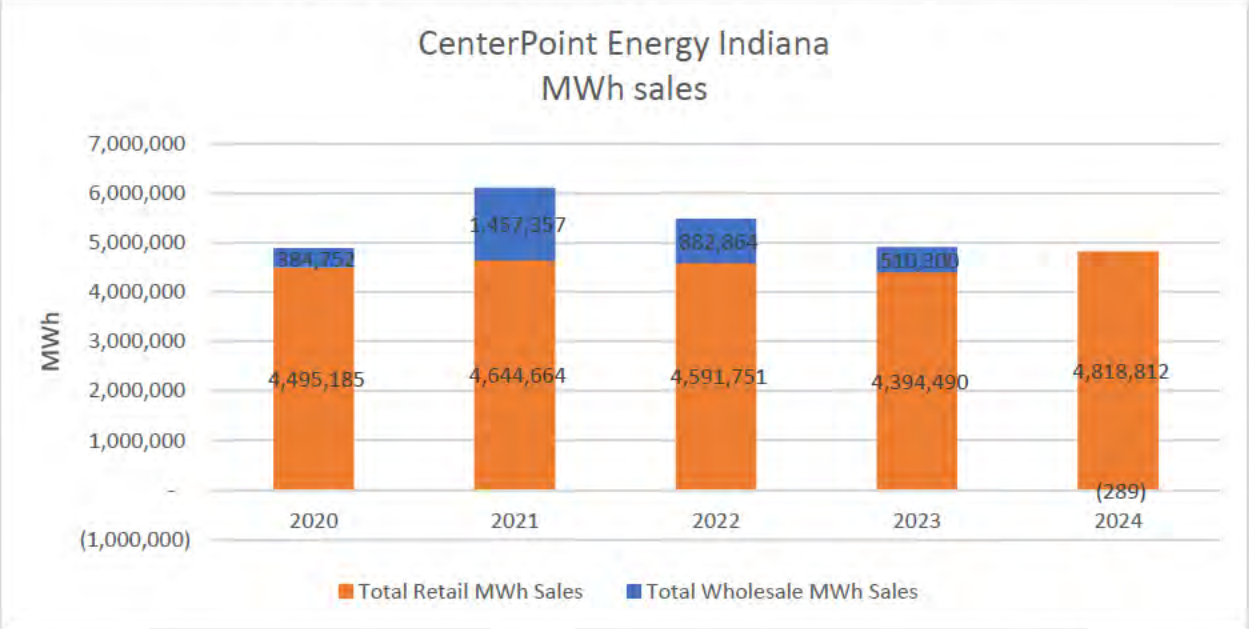


	2020	2021	2022	2023	2024
Total Industrial and Other	192	193	192	189	166
Commercial	18,908	19,048	19,109	19,101	19,410
Residential	129,606	134,192	135,204	135,892	137,110

- 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)*

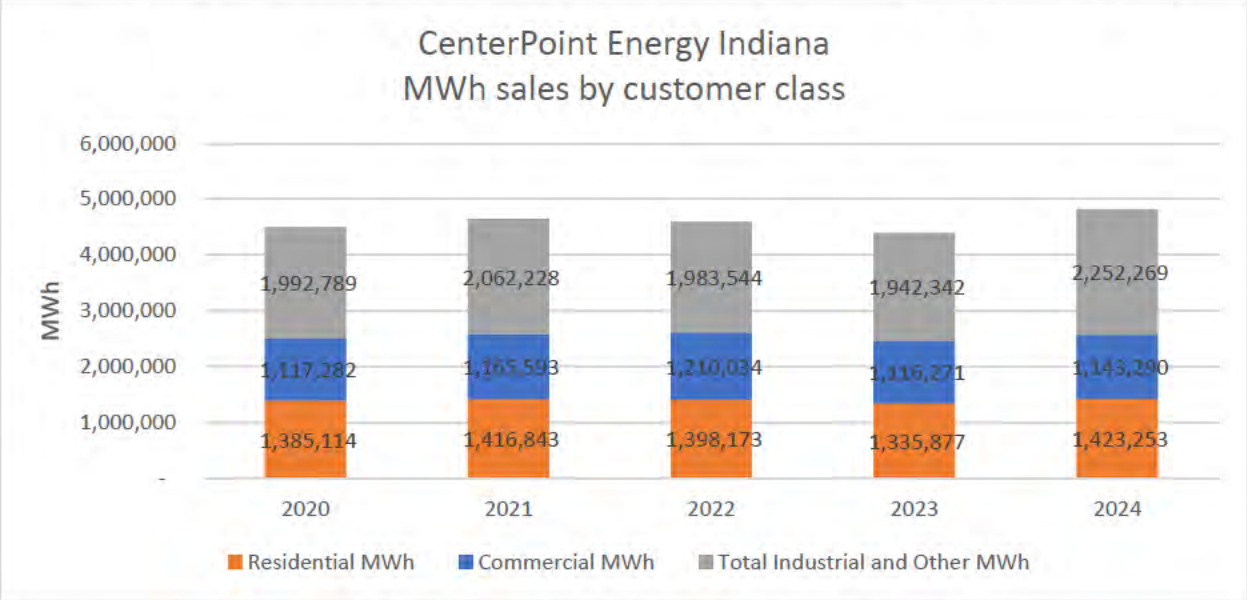
Figure 15: CenterPoint Energy Indiana energy sales (MWh)



- 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)*

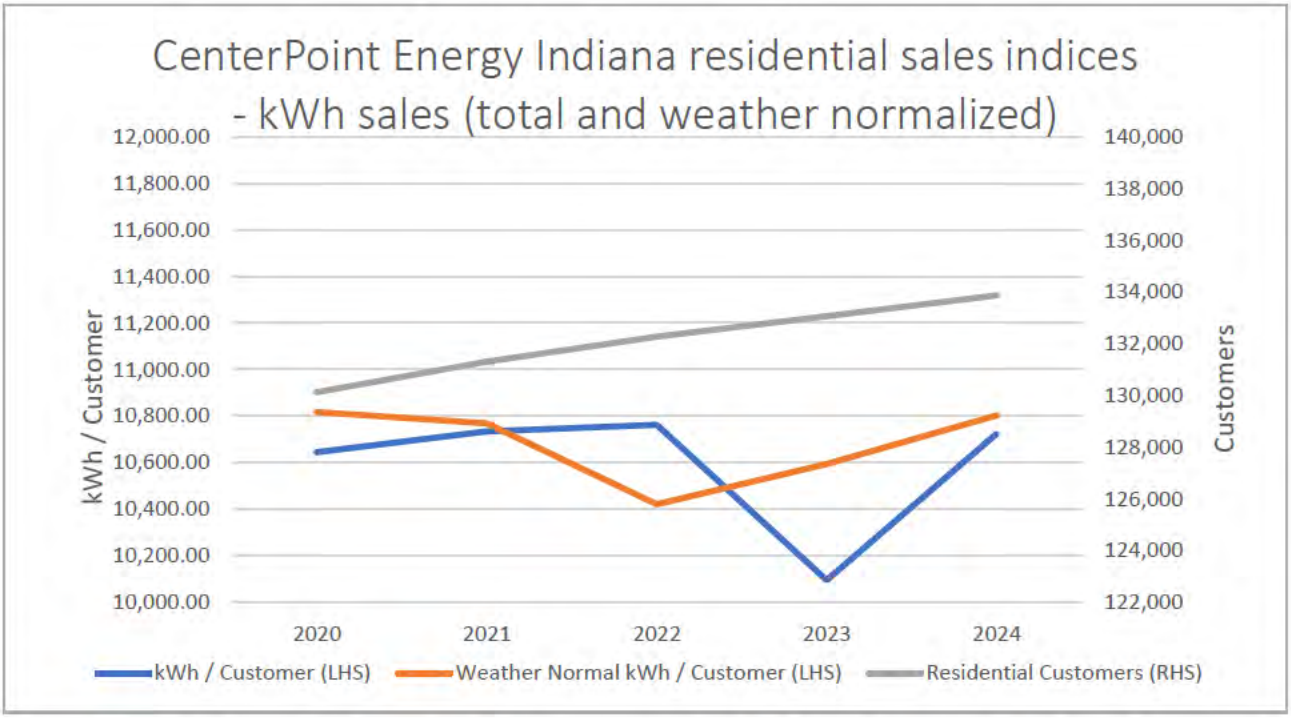
Figure 16: CenterPoint Energy Indiana total retails MWh sales per customer class



- 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.

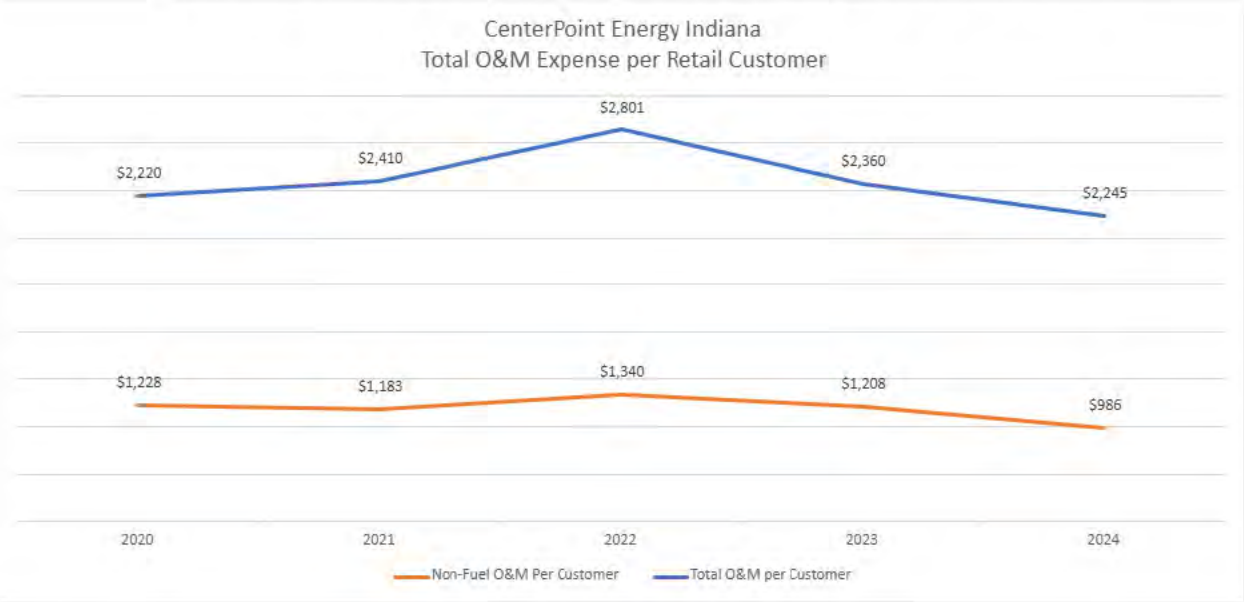
Operations metrics *(Continued)*

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).

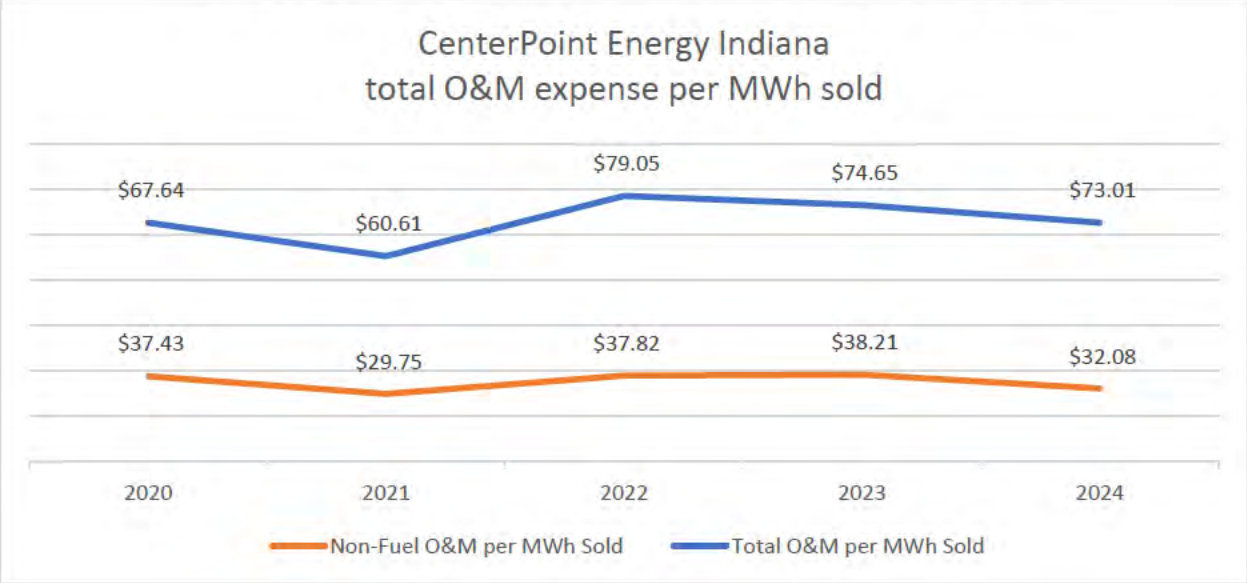
Figure 18: CenterPoint Energy Indiana total O&M per retail customer



- 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)*

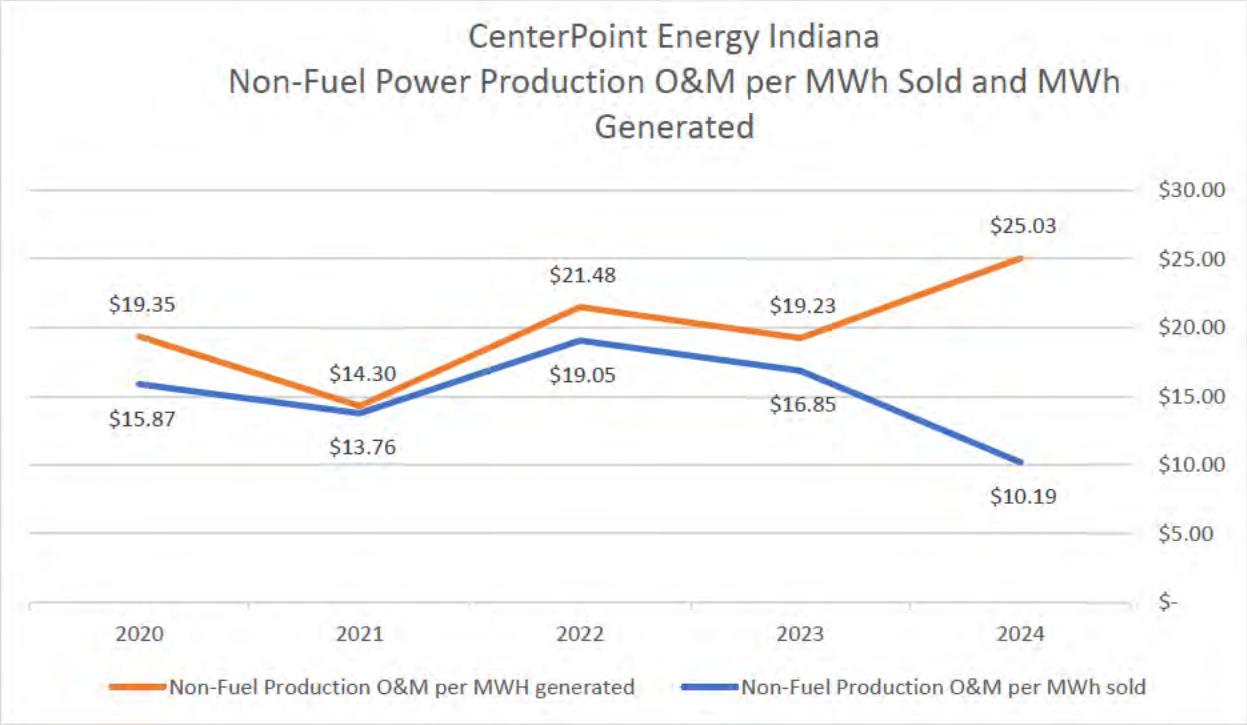
Figure 19: CenterPoint Energy Indiana total O&M per MWh sold



- 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)*

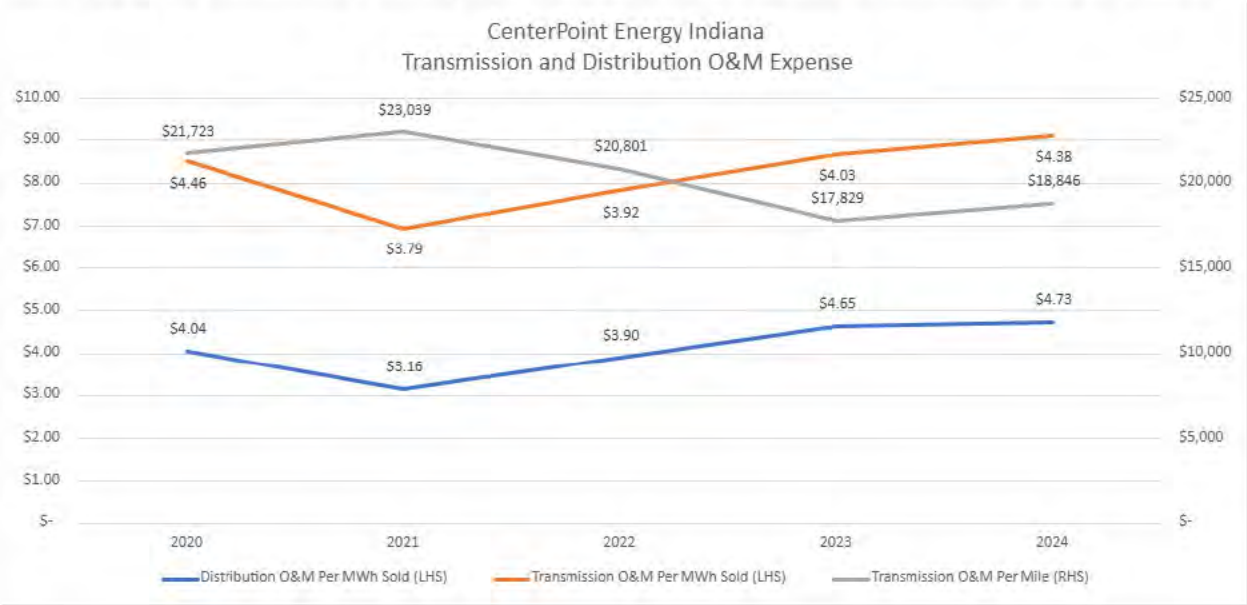
Figure 20: CenterPoint Energy Indiana non-fuel production O&M per MWh sold and per MWh generated



- Non-fuel O&M per FERC Form 1, pages 320-323.
- Total MWh sales include retail and wholesale.

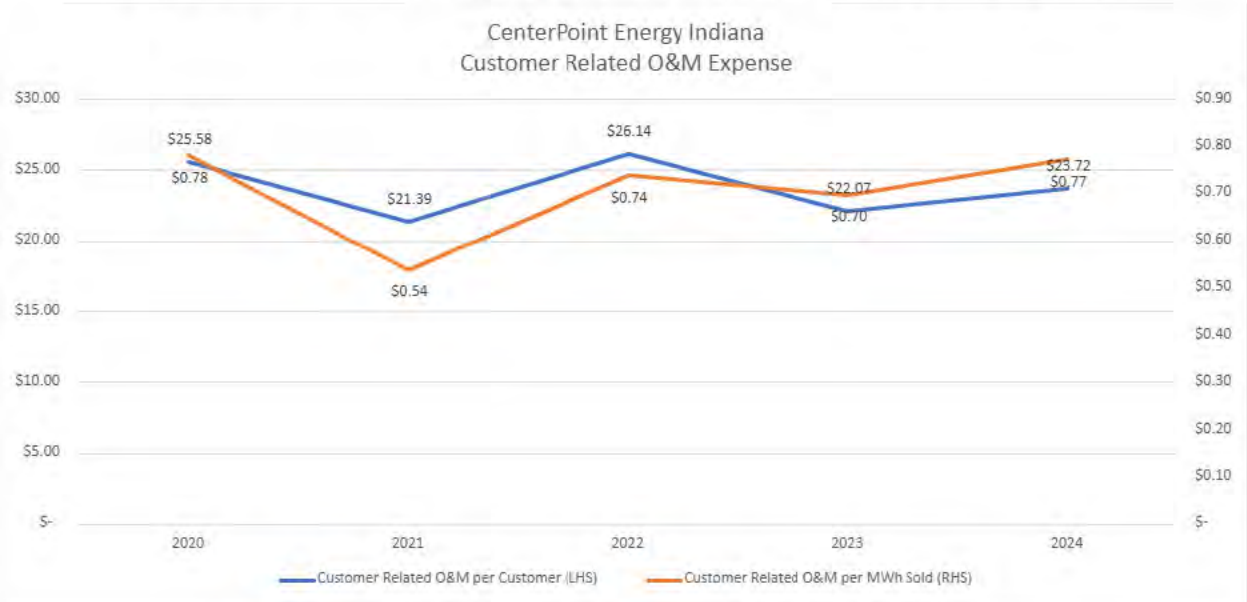
Operations metrics *(Continued)*

Figure 21: CenterPoint Energy Indiana transmission and distribution O&M expense



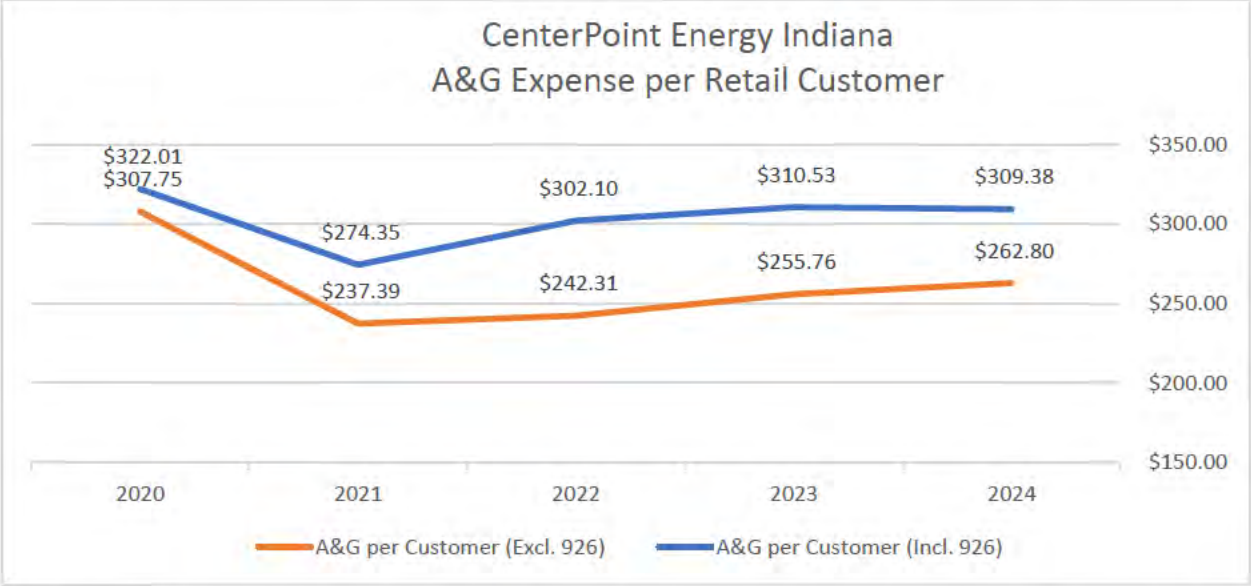
Transmission O&M is impacted by both internal maintenance costs and MISO related costs.

Figure 22: CenterPoint Energy Indiana customer-related O&M expense



Operations metrics *(Continued)*

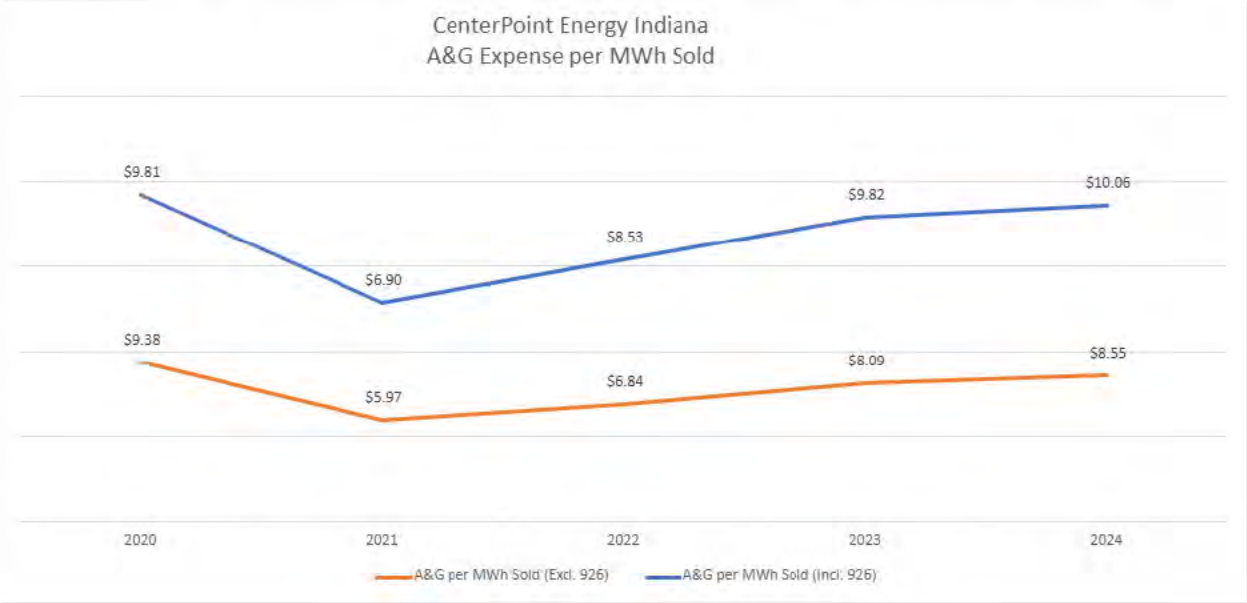
Figure 23: CenterPoint Energy Indiana Administrative and General (A&G) expense per retail customer



- 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)*

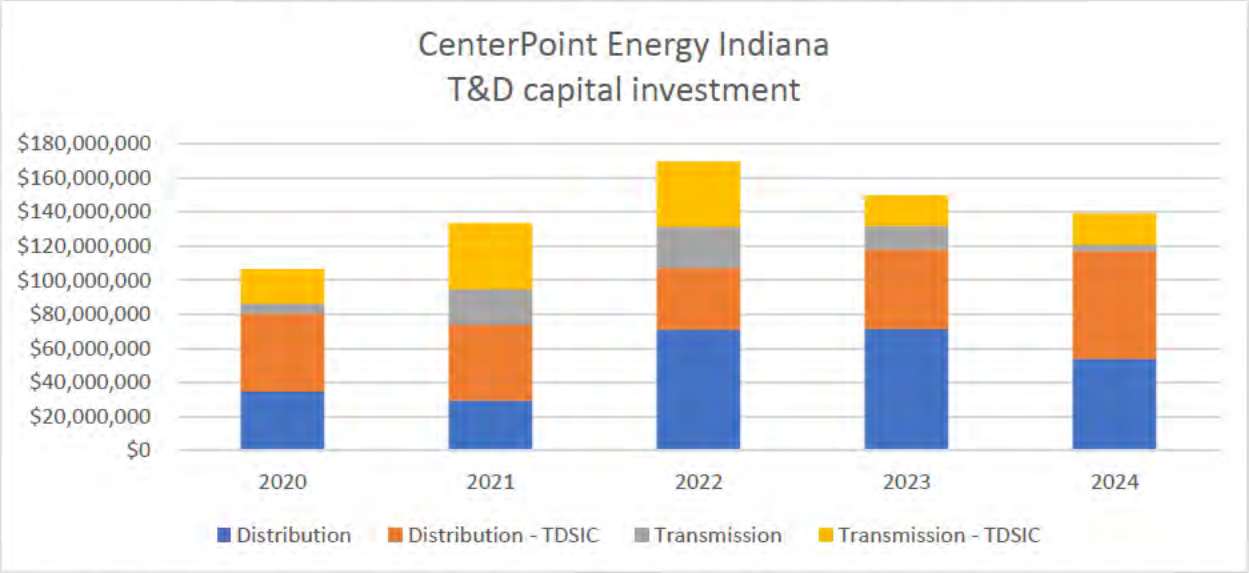
Figure 24: CenterPoint Energy Indiana Administrative and General (A&G) expense per MWh sold



Operations metrics *(Continued)*

Capital investments – T&D

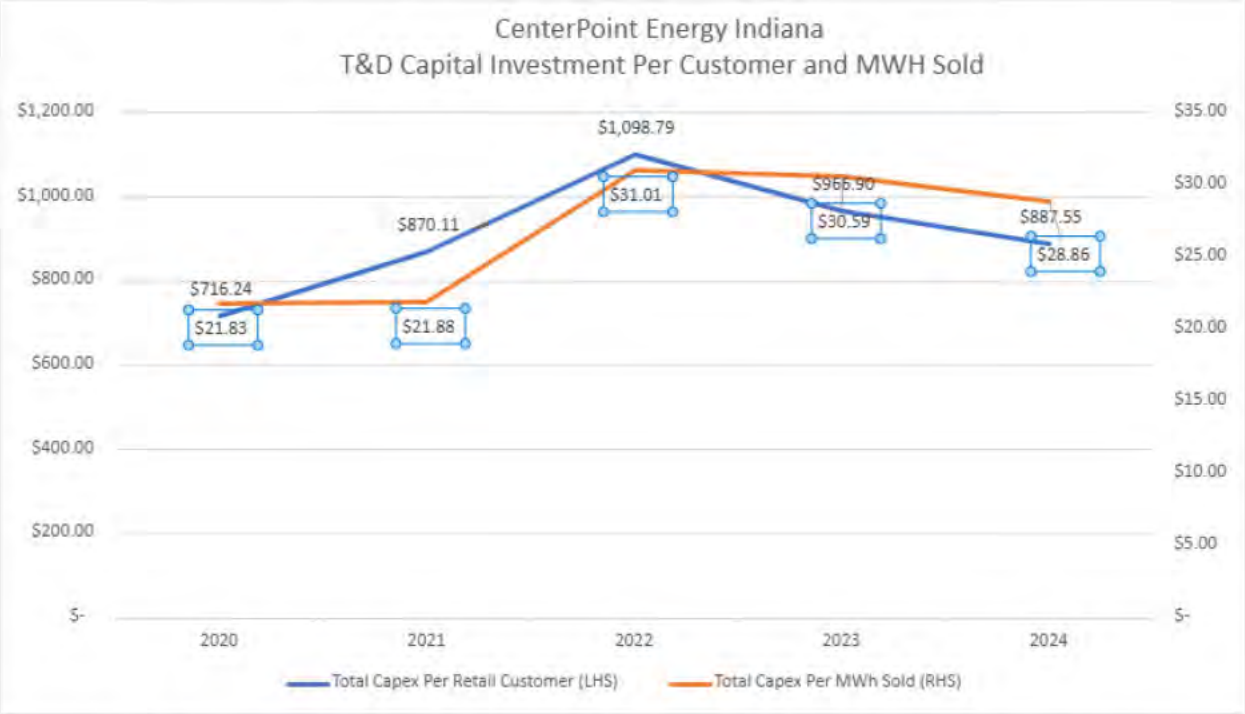
Figure 25: CenterPoint Energy Indiana T&D capital investment



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)*

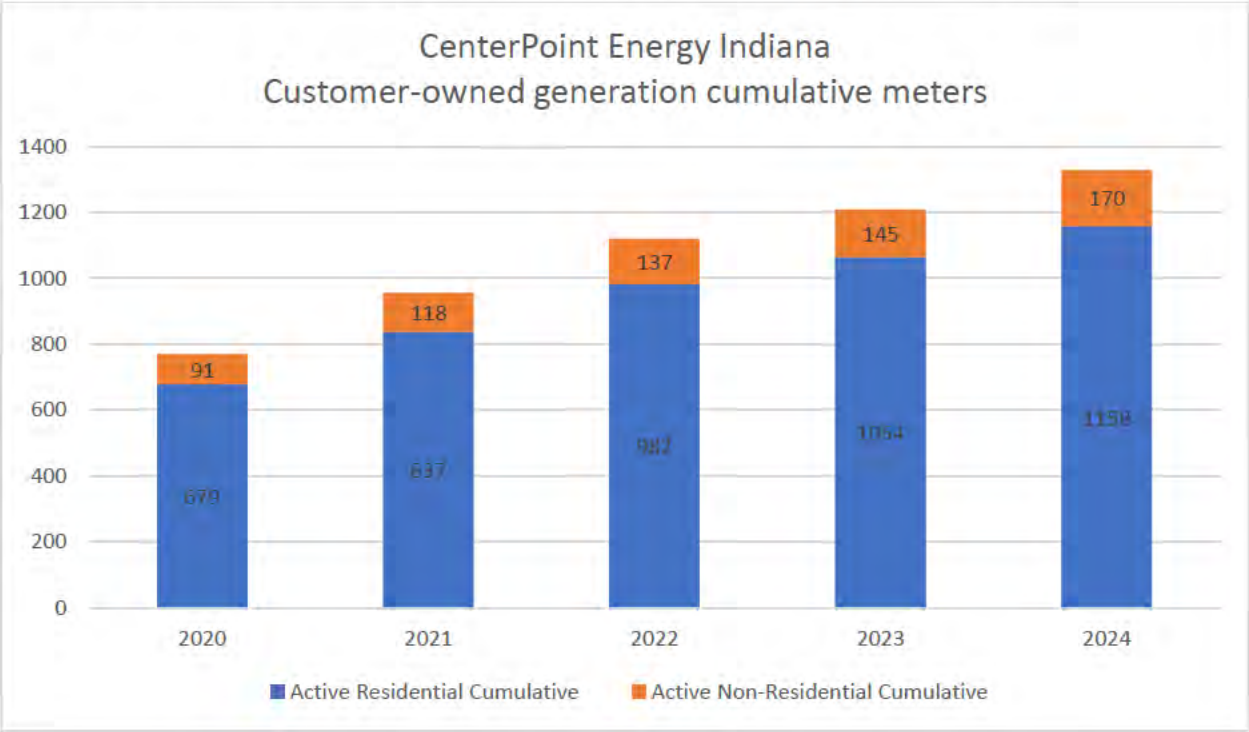
Figure 26: CenterPoint Energy Indiana T&D Capital Investment by retail customer and MWhs sold



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

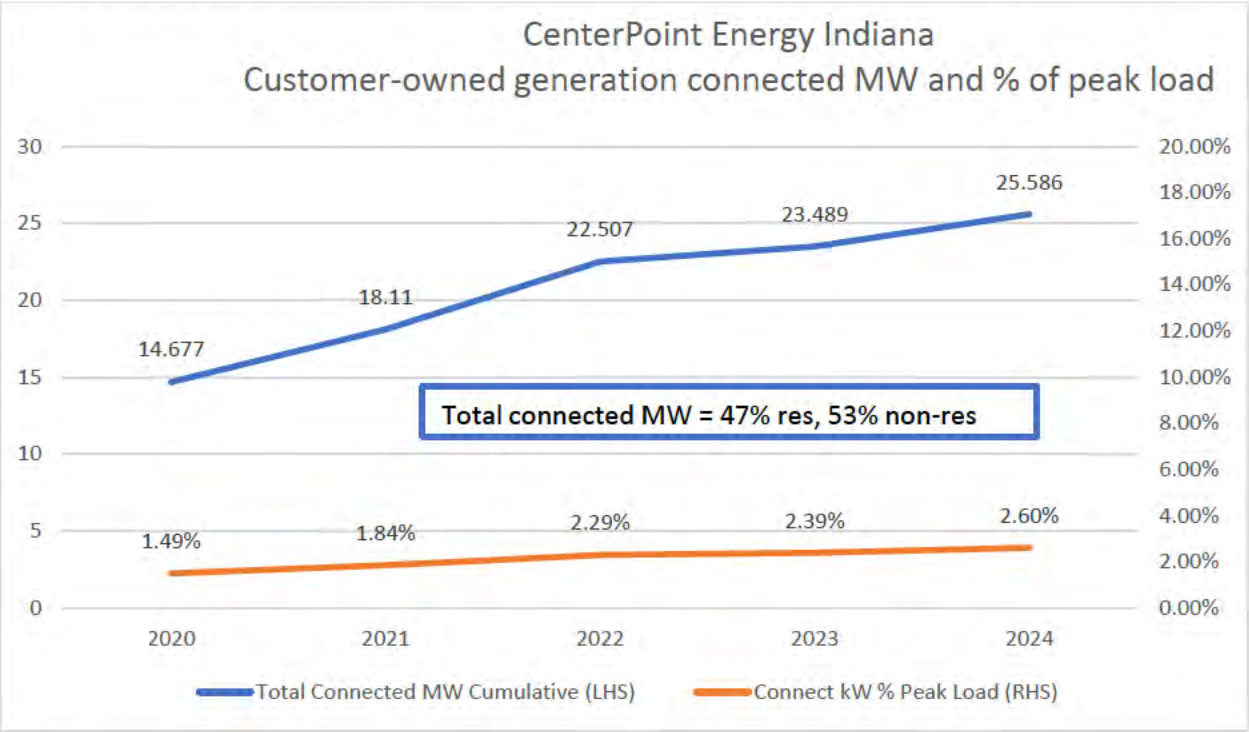
Figure 27: Customer-owned generation cumulative meters by customer class



- 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)*

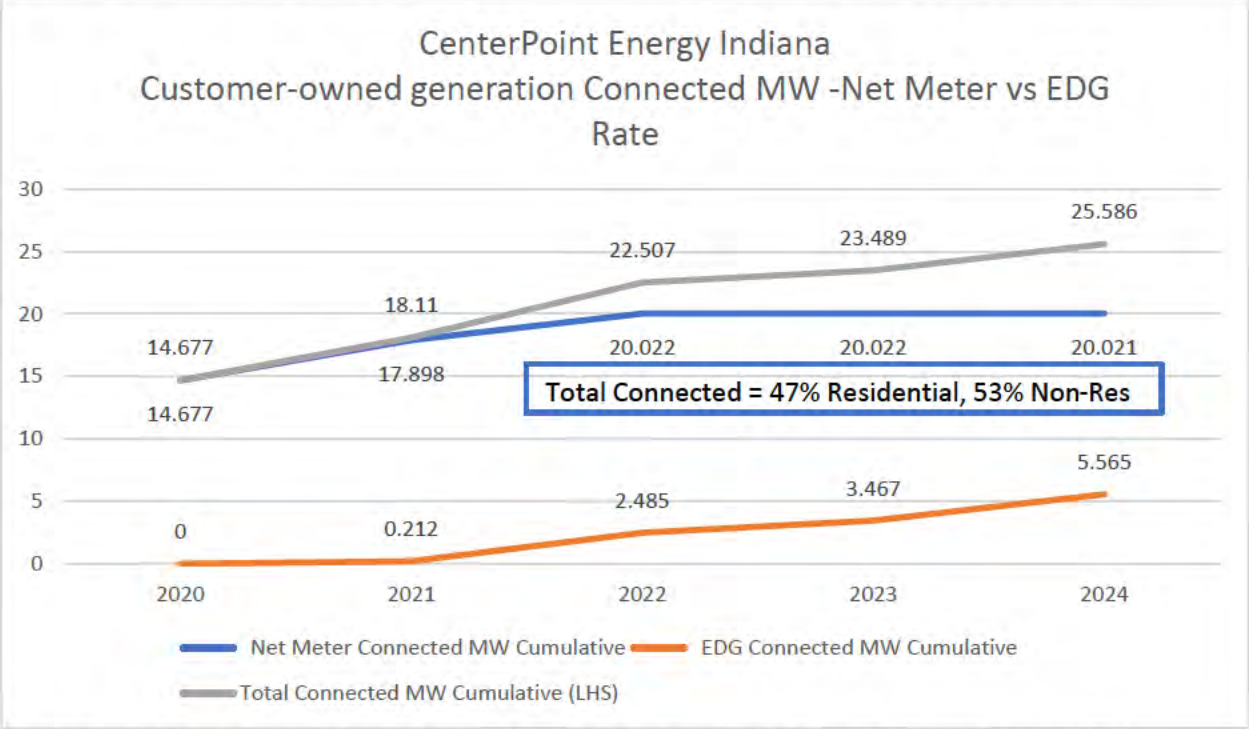
Figure 28A: Customer-owned generation connected MW and % of peak load



- 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)*

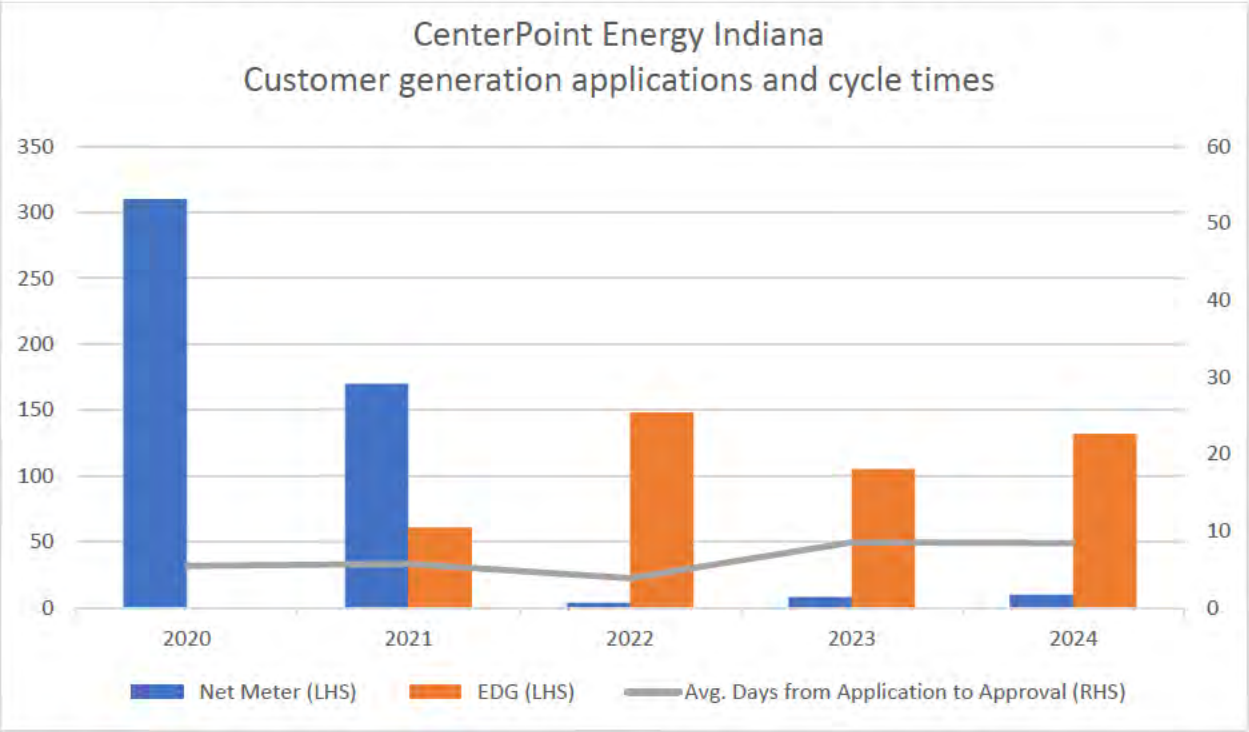
Figure 28B: Customer-owned generation connected MW – Net meter vs EDG rate



- 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

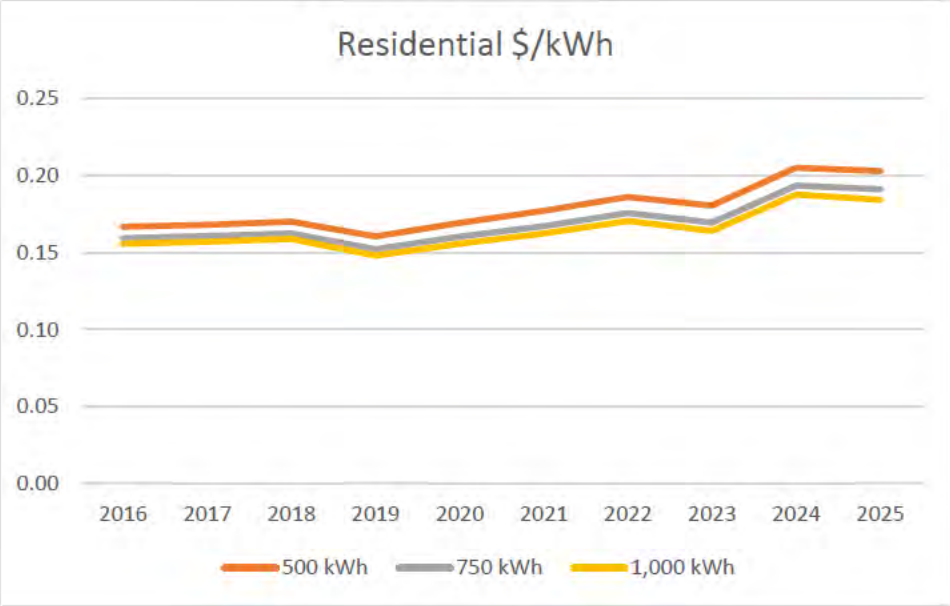
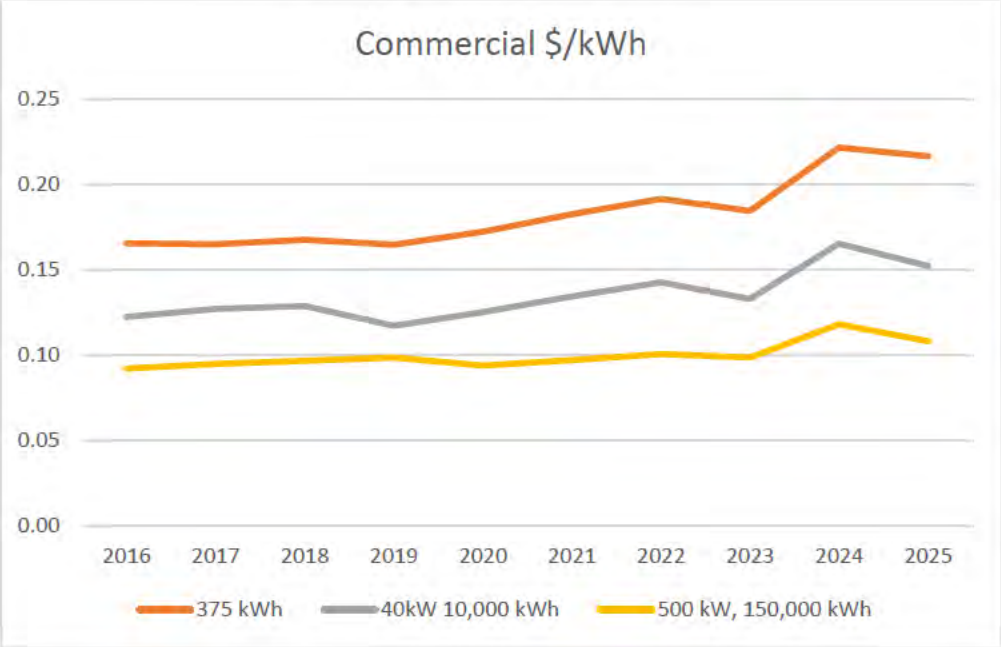
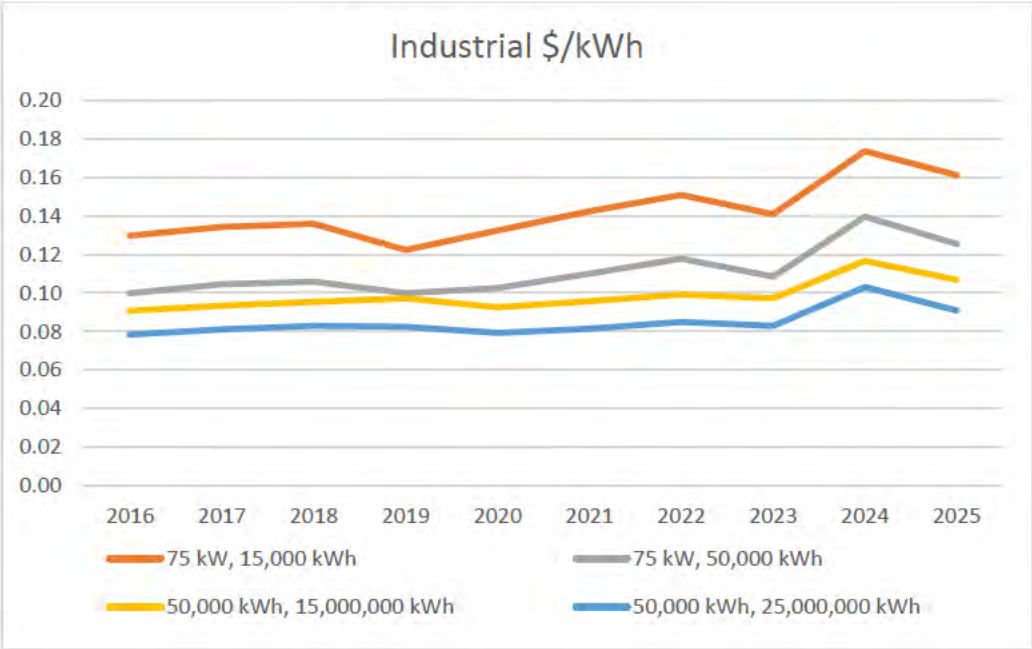


Figure 31: Winter commercial



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	5,236	$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

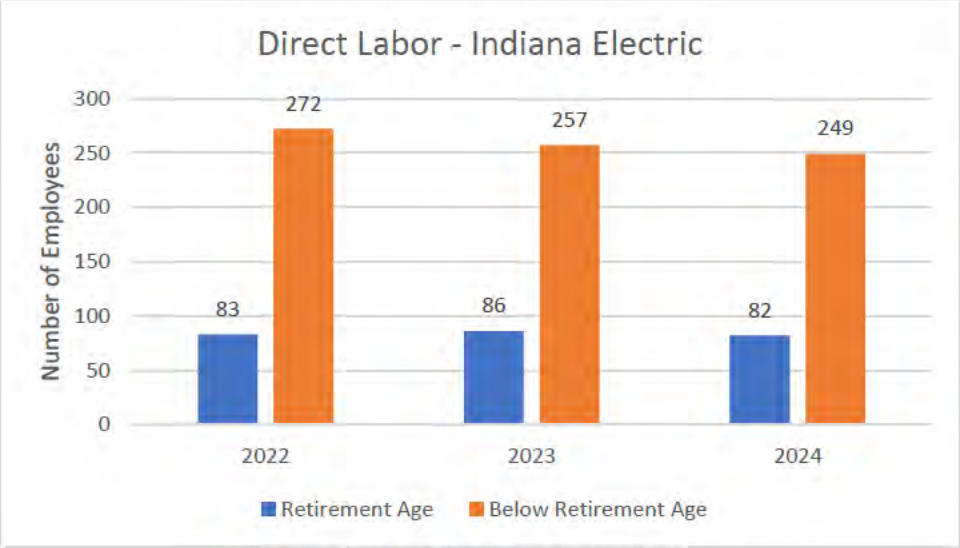
Year/Month	LIHEAP Households		LIHEAP $ Received
2024	**3,244**	**$**	**640,359.67**
Nov	156	$	36,806.94
Dec	3,088	$	603,552.73
2025	**5,832**	**$**	**1,714,422.48**
Jan	2,522	$	850,548.28
Feb	1,599	$	412,463.08
Mar	1,138	$	298,226.17
Apr	552	$	148,121.13
May	21	$	5,063.82
Grand Total	**9,076**	**$**	**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

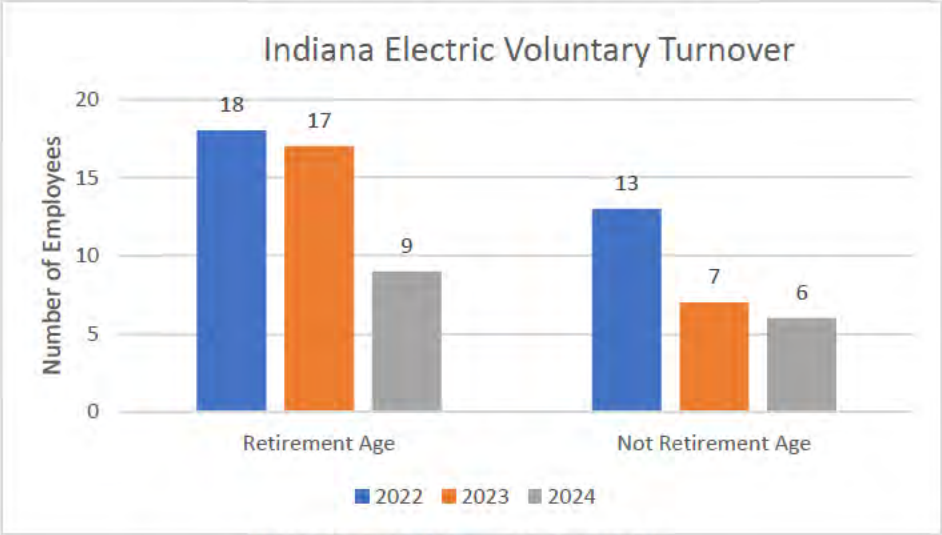
Staffing (Continued)

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. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

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

Exhibit 23
Wayne Games Testimony

SOUTHERN INDIANA GAS AND ELECTRIC COMPANY
d/b/a CENTERPOINT ENERGY INDIANA SOUTH
(CENTERPOINT INDIANA SOUTH)

IURC CAUSE NO. 45501

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. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

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

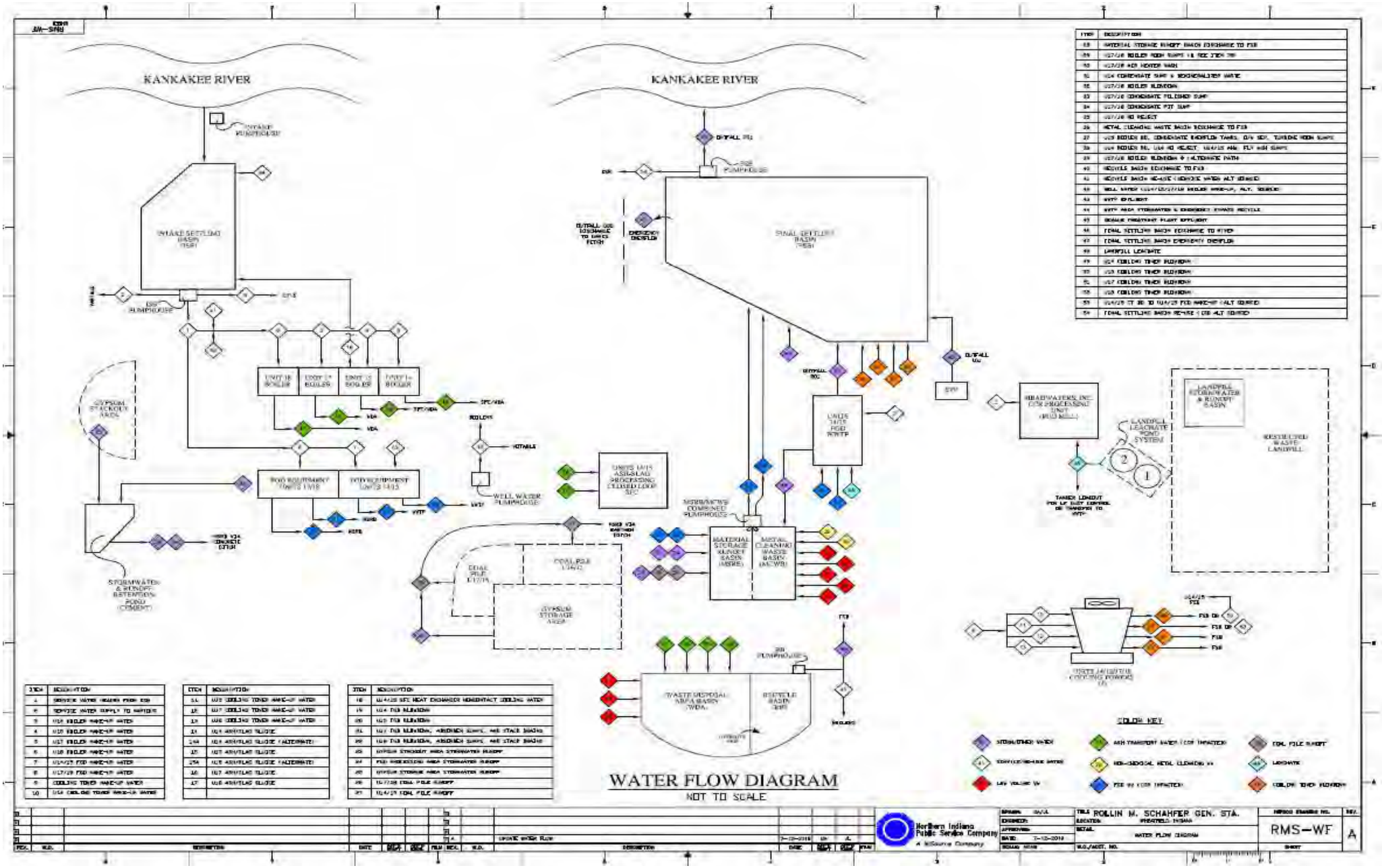
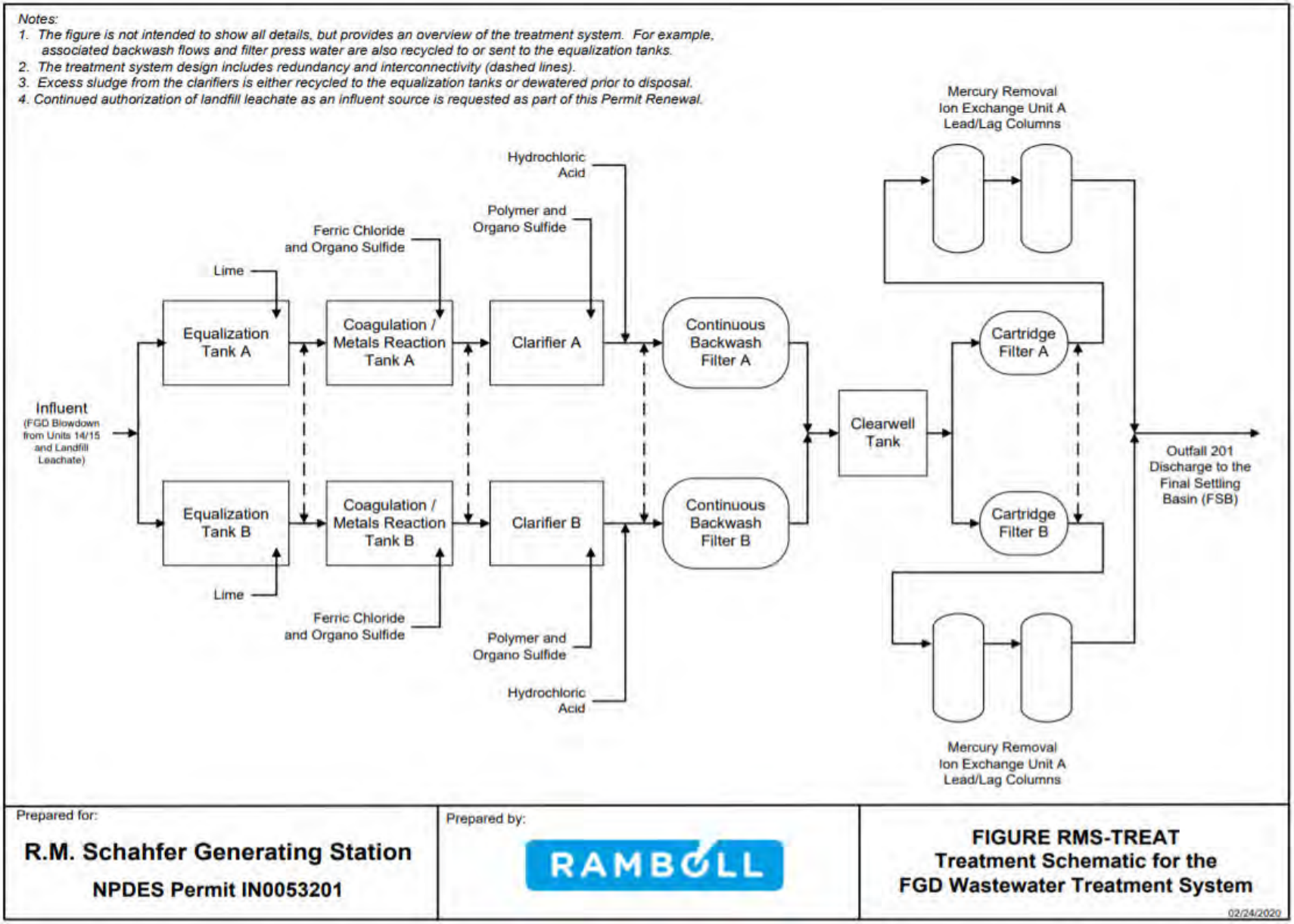


Figure 3. FGD Wastewater Treatment System Flow Diagram



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

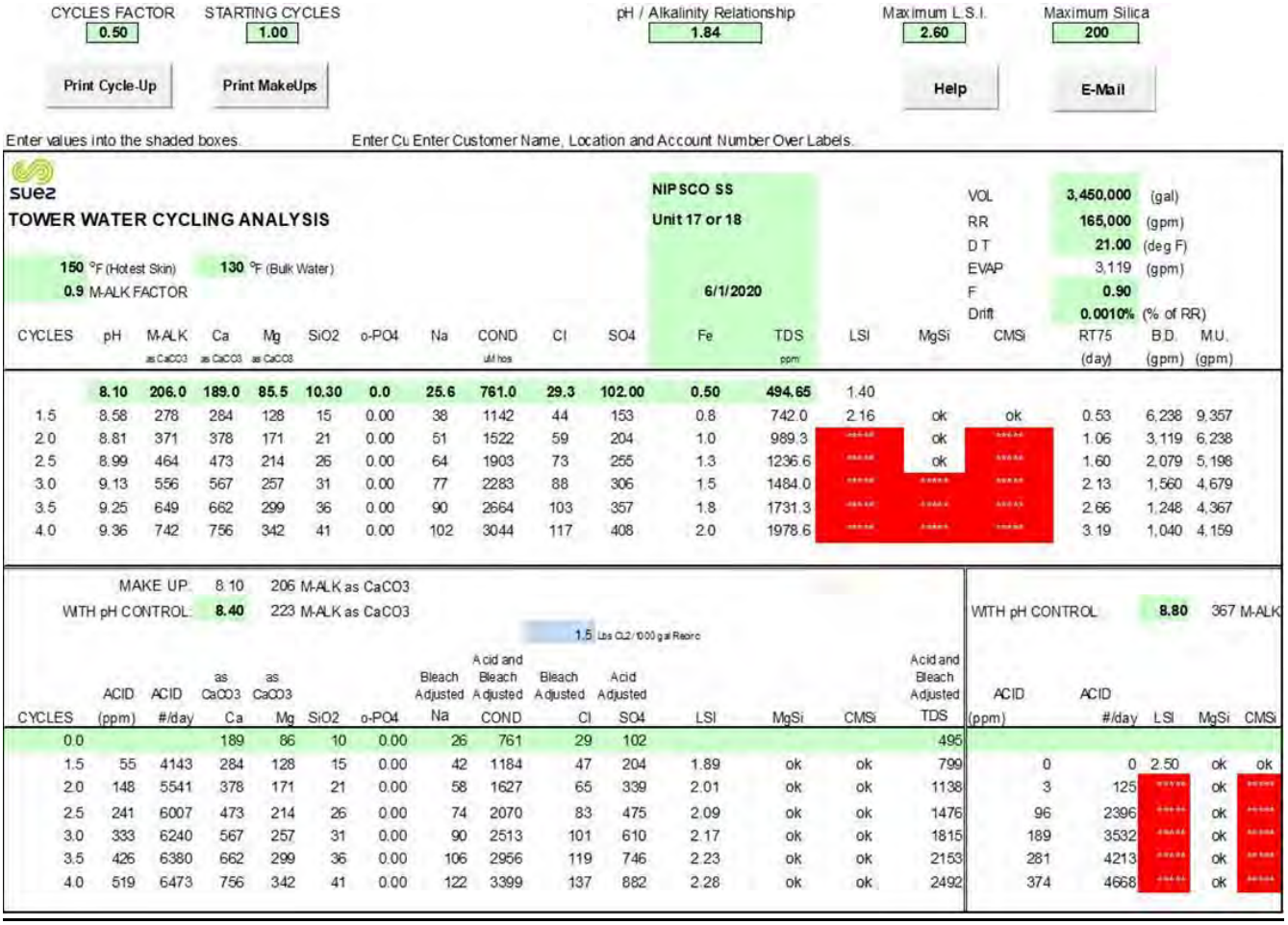
The following is feedback from the permittee's chemical provider (Suez) after discussing the design of our program with respect to potentially increasing cycles of concentration.

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 Reqrd

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

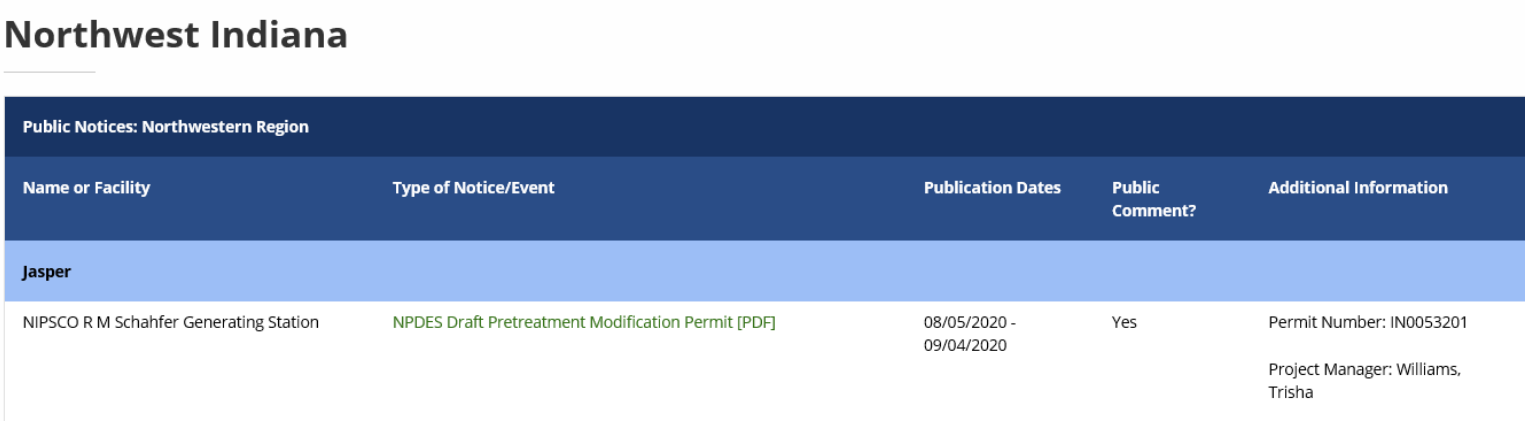
Reporting requirements associated with the Spill Reporting, Containment, and Response requirements of 327 IAC 2-6.1 are included in Part II.B.2.(d), Part II.B.3.(c), and Part II.C.3. of the NPDES permit. Spills from the permitted facility meeting the definition of a spill under 327 IAC 2-6.1-4(15), the 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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	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
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

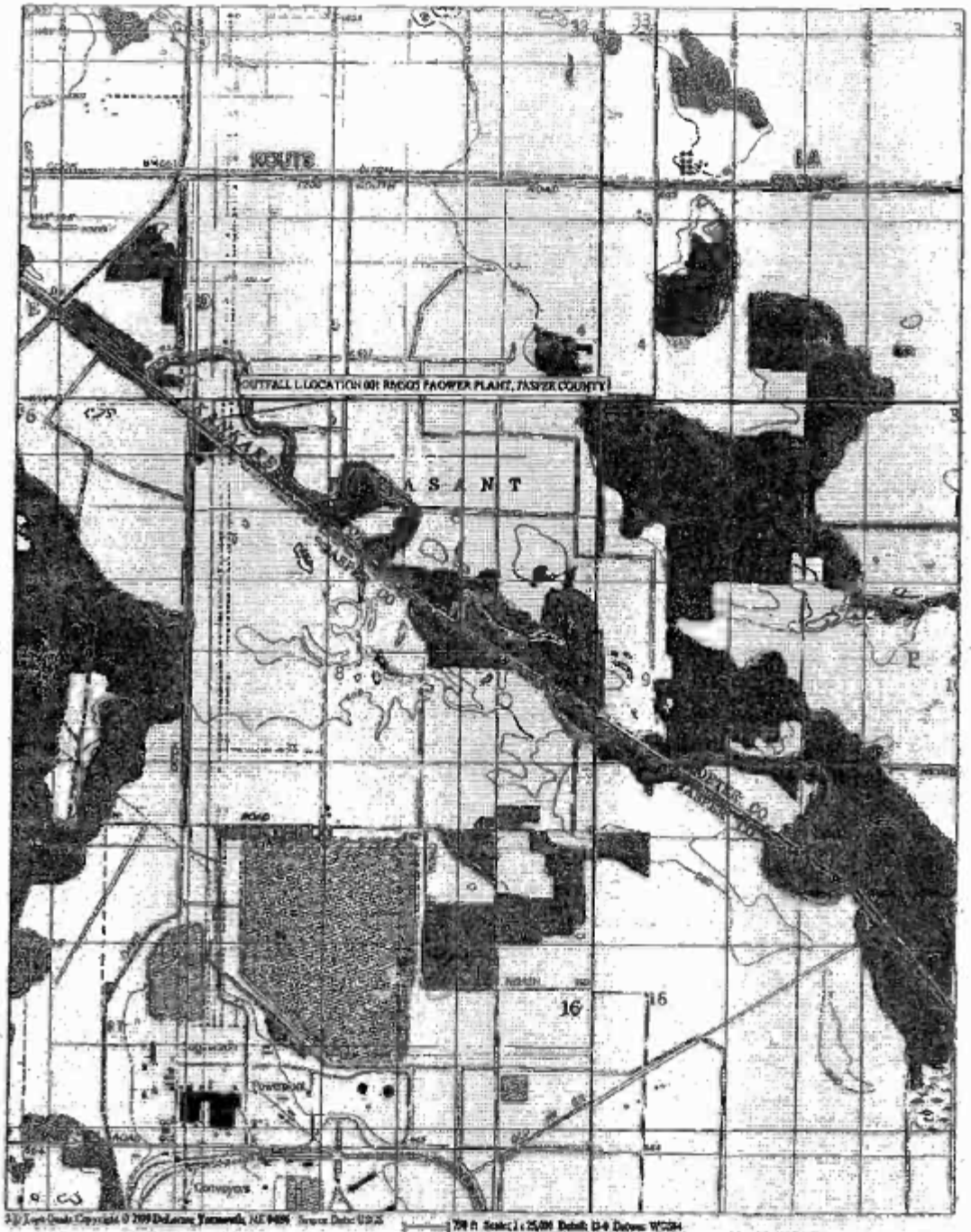
Calculation of Projected Effluent Quality

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.

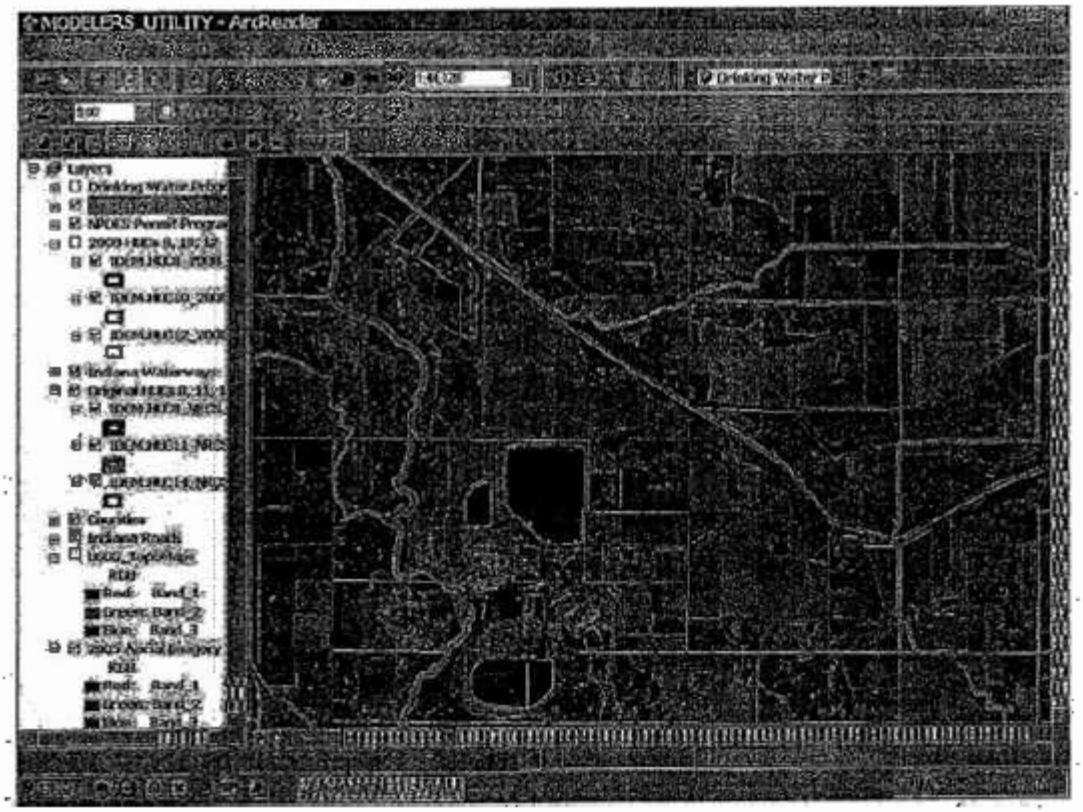
Comparison of PEQs to PELs

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							

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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

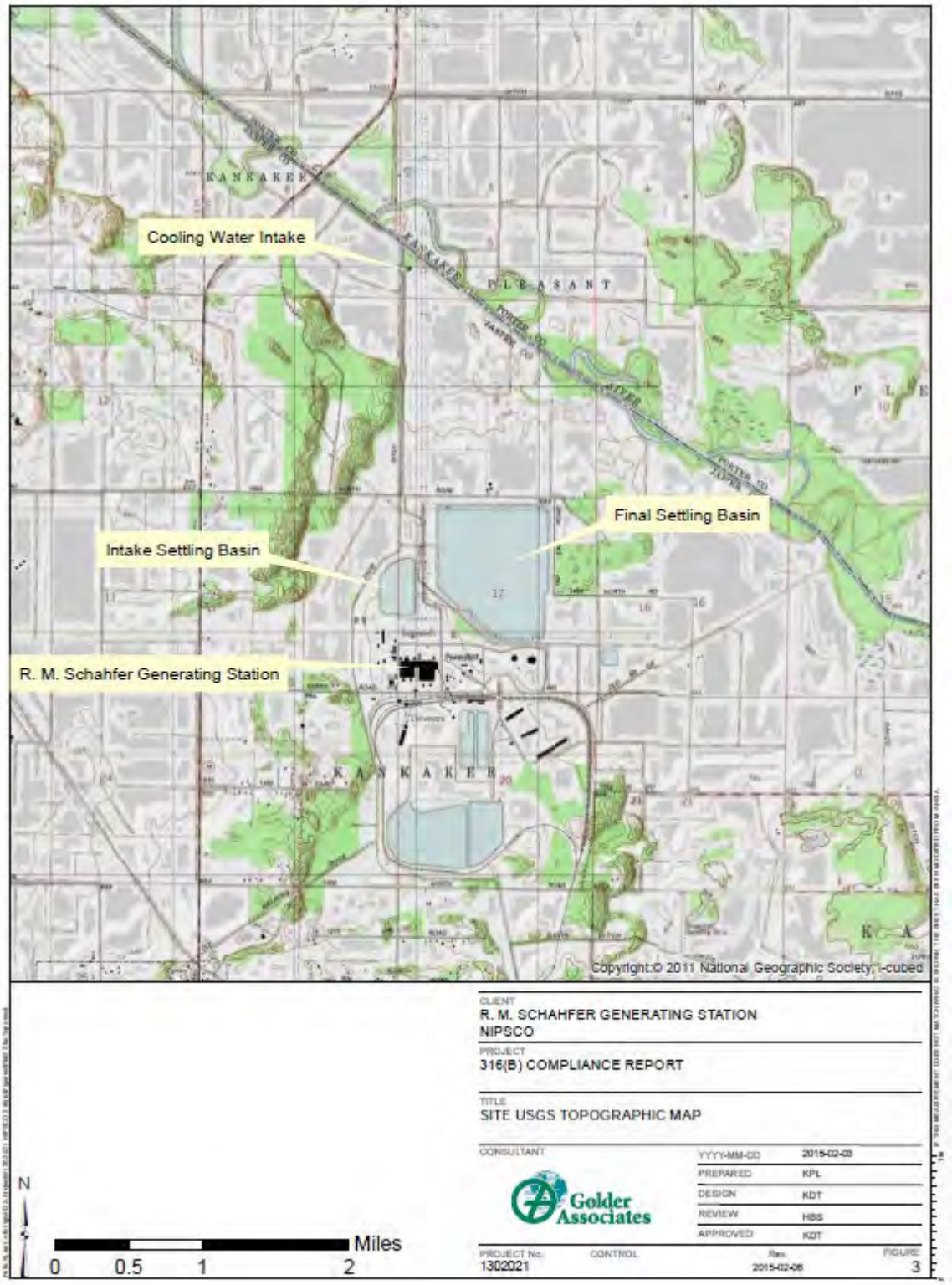
	Unit 14	Unit 15	Unit 17	Unit 18	Unit 16A	Unit 16B
NET Output						
Min (MW)	290	250	125	125	----	----
Max (MW)	431	472	361	361	78	77
Boiler	Babcock & Wilcox	Foster Wheeler	Combustion Engineering	Combustion Engineering	----	----
Burners	10 Cyclone	6 Pulverizers	6 Pulverizers	6 Pulverizers	----	----
Main 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

RECEIVED
SEP 09 2020
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

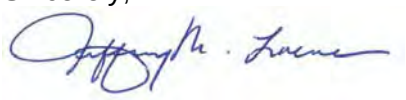
Ms. Nicole Gardner
Indiana Department of Environmental Management
Office of Water Quality / Industrial Permits Section, MC 65-42
100 North Senate Avenue
Indianapolis, IN 46204-2251

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)	
D T	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.

RAMBOLL

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)*

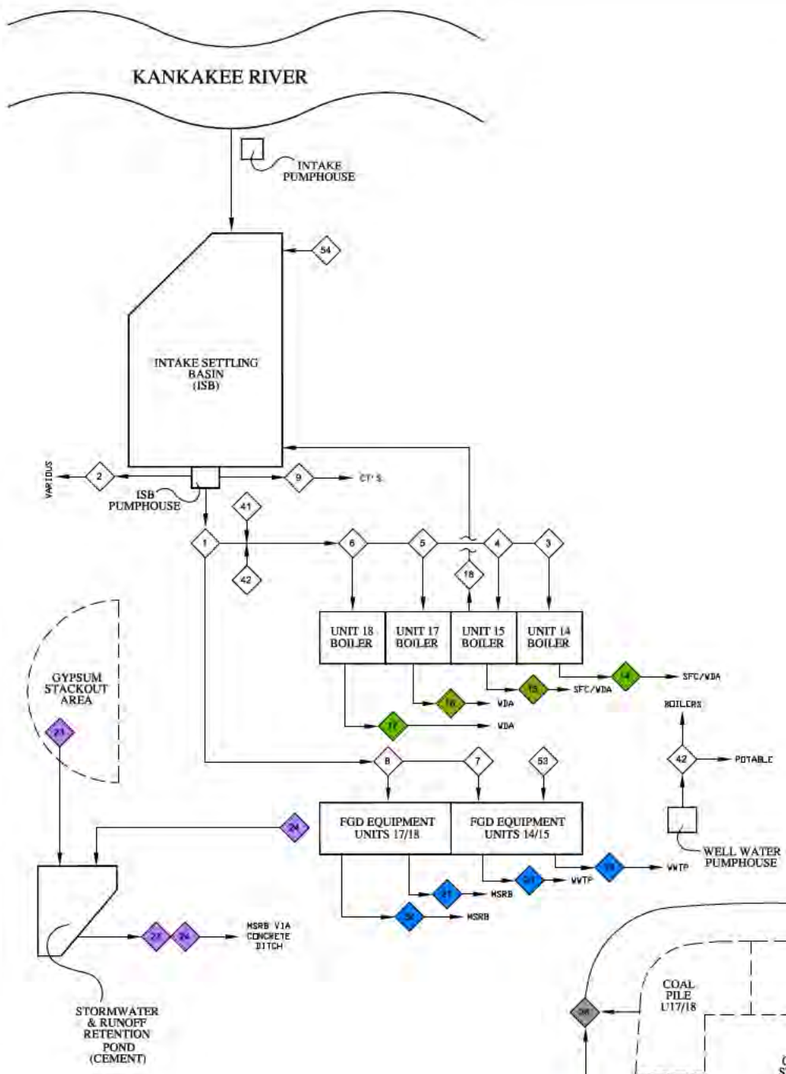
A. NAME	B. ADDRESS	C. TELEPHONE *(area code & no.)*	D. POLLUTANT ANALYZED
Microbac Laboratories	250 West 84th Drive Merrillville, IN 46410	219-769-8378	All parameters, except free cyanide
	158 Starlite Dr Marietta, OH 45750	800-373-4071	
	3323 Gilmore Industrial Blvd Louisville, KY 40213	502-962-6400	
ALS Environmental	3352 128th Ave Holland, MI 49424	616-399-6070	Free Cyanide

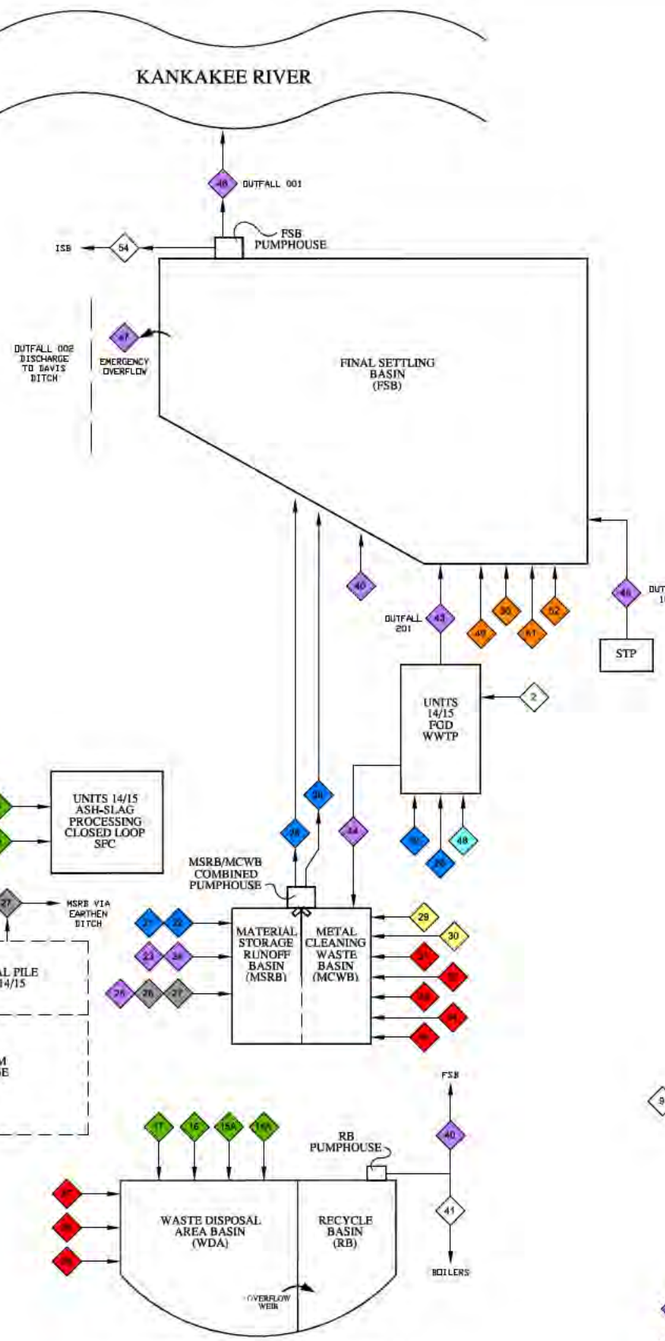
IX. CERTIFICATION

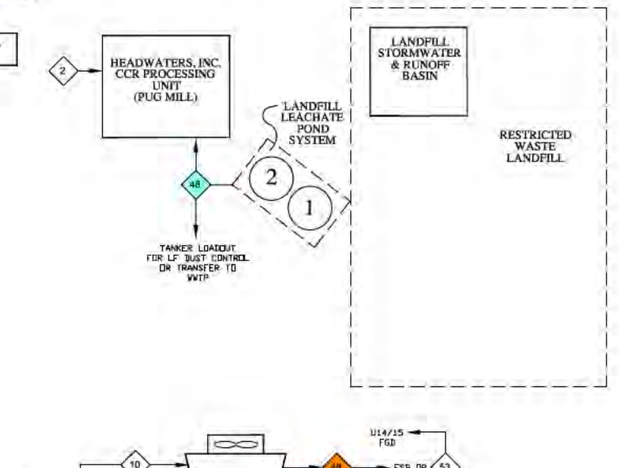
"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the 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."

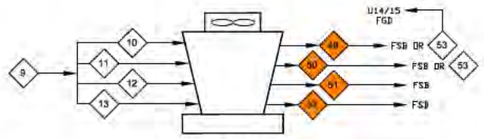
A. NAME & OFFICIAL TITLE *(type or print)*	B. PHONE NO. *(area code & no.)*
Bertil C Valenkamph, Director Station Chemistry & Environmental Compliance	219-256-8403
C. SIGNATURE Bertil Valenkamph	D. DATE SIGNED 3/25/2020

Figure RMS-WF (07-02-2019): Water Flow Diagram – Current









ITEM	DESCRIPTION
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

ITEM	DESCRIPTION
28	MATERIAL STORAGE RUNOFF BASIN DISCHARGE TO FSB
29	U17/18 BOILER ROOM SUMPS (4 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)

COLOR KEY

- STORM/OTHER WATER
- SERVICE/RE-USE WATER
- LOW VOLUME WW
- ASH TRANSPORT WATER (CCR IMPACTED)
- NON-CHEMICAL METAL CLEANING WW
- FGD WW (CCR IMPACTED)
- COAL PILE RUNOFF
- LEACHATE
- COOLING TOWER BLOWDOWN

WATER FLOW DIAGRAM

NOT TO SCALE

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

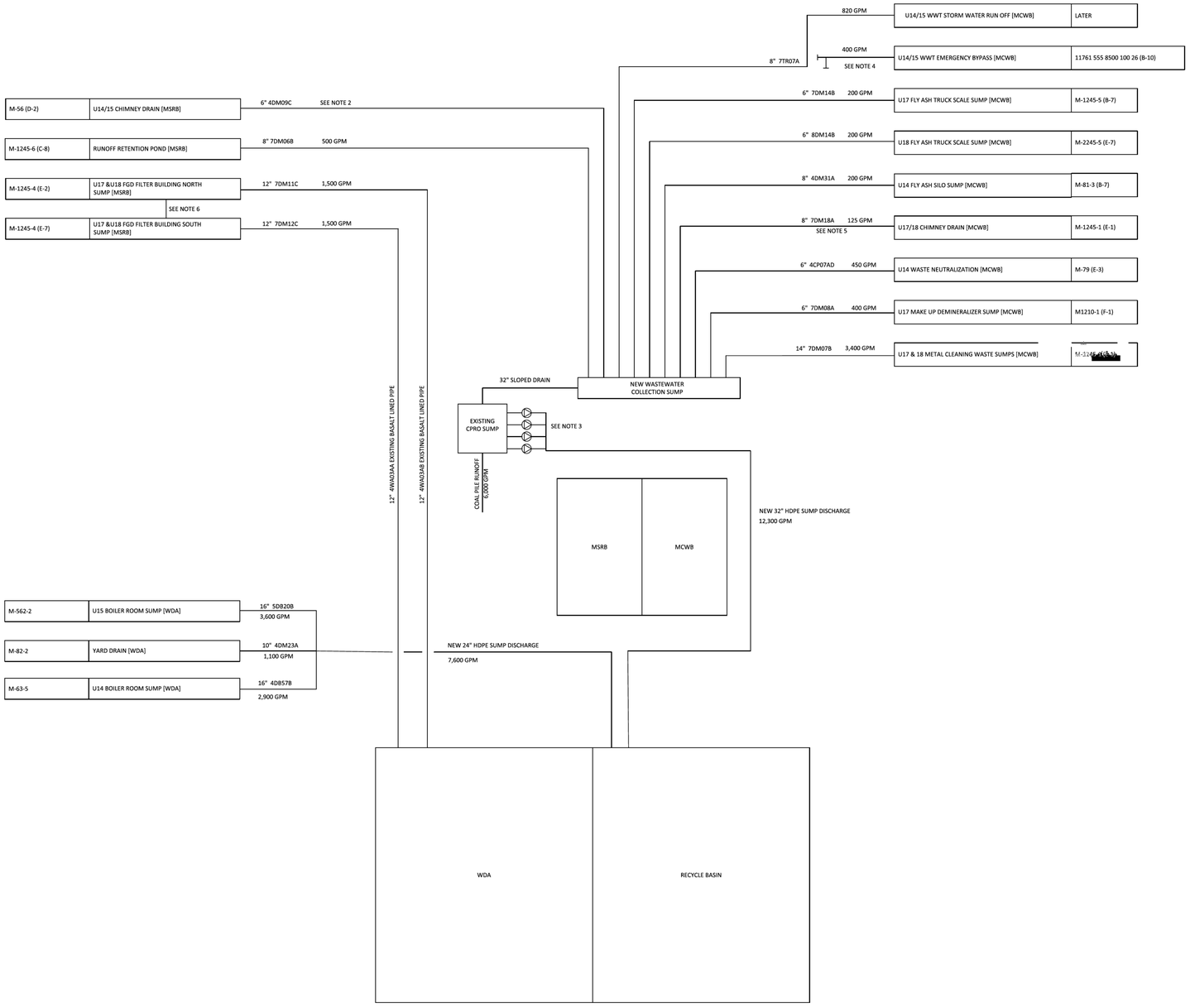
TITLE: ROLLIN M. SCHAHFER GEN. STA.
LOCATION: WHEATFIELD, INDIANA
DETAIL: WATER FLOW DIAGRAM
W.O./ACCT. NO.

NIPSCO DRAWING NO.: RMS-WF
REV.: A
SHEET

Figure RMS-WF (Proposed): Waste Stream Pipe Redirect

SHEET 1
M-1260

P O O DR N



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
8						
7						
6						
5						
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

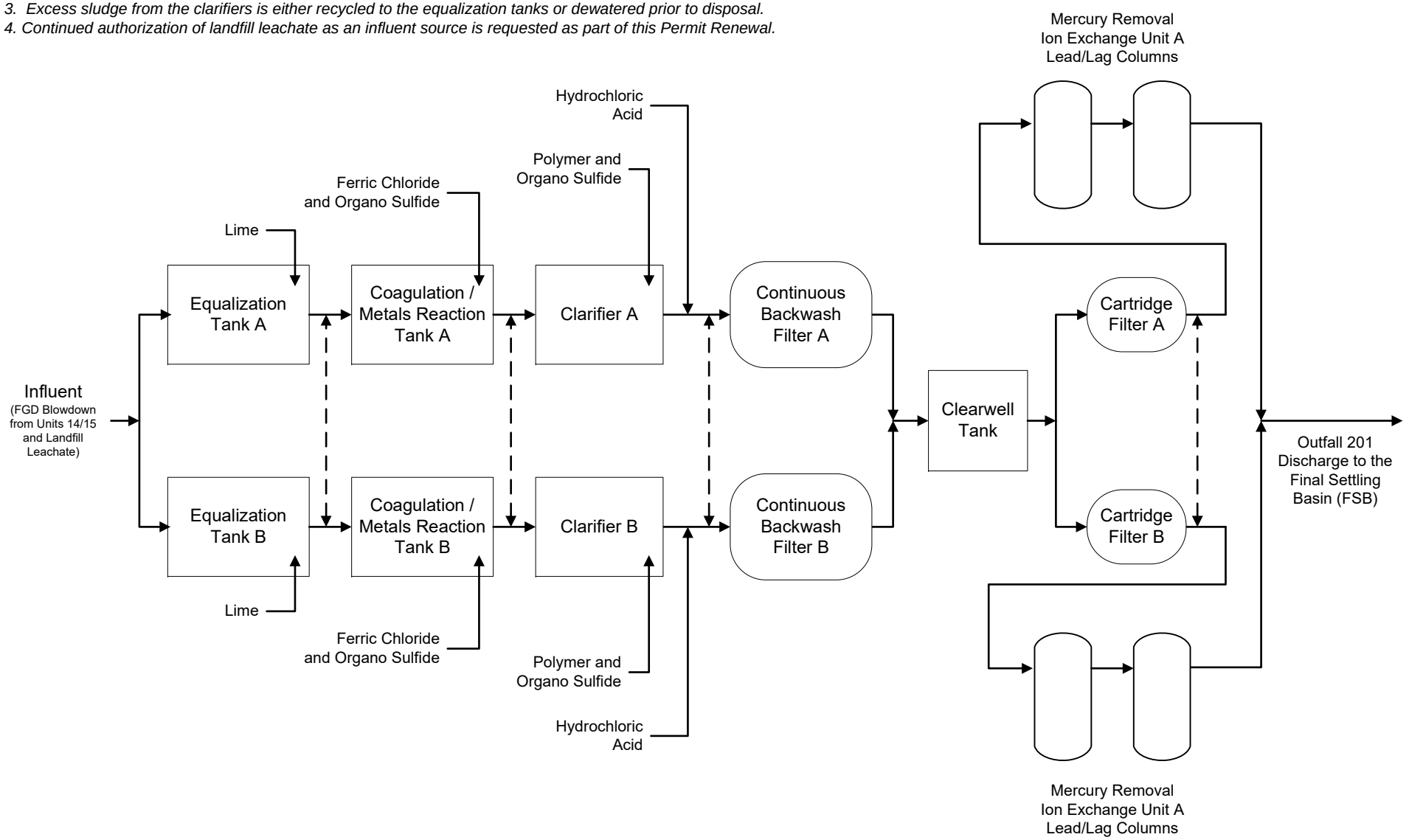
TITLE	ROLLIN M. SCHAHFER GEN. STA.
LOCATION	WHEATFIELD, INDIANA
DETAIL	PIPING REDIRECT PROJECT PROCESS FLOW DIAGRAM
W.O./ACCT. NO.	80156-72

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 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 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) a Testing Required	b Believed Present	c Believed Absent	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
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						
1,1,1-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 Testing Required	b Believed Present	c Believed Absent	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-Dmitro-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						

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
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*)			2. EFFLUENT						d No of Analysis	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		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	< 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						

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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.						

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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	< 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	b 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
	Pre-sent	Ab-sent	(1) Concentration	(2) Mass	(1) Concentration	(2) Mass	(1) Concentration	(2) Mass				(1) Concentration	(2) Mass			
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 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 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 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	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														
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														
1,1,1-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 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	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-Dmitro-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.						

EPA Identification Number *(copy from Item 1 of Form 1)* 110000493706 | Outfall Number 201

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					

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 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 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 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) 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
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						
1,1,1-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-Dmitro-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						

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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
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														

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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
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

Continued from the Front

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	256-842-3 219-~~477~~-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.

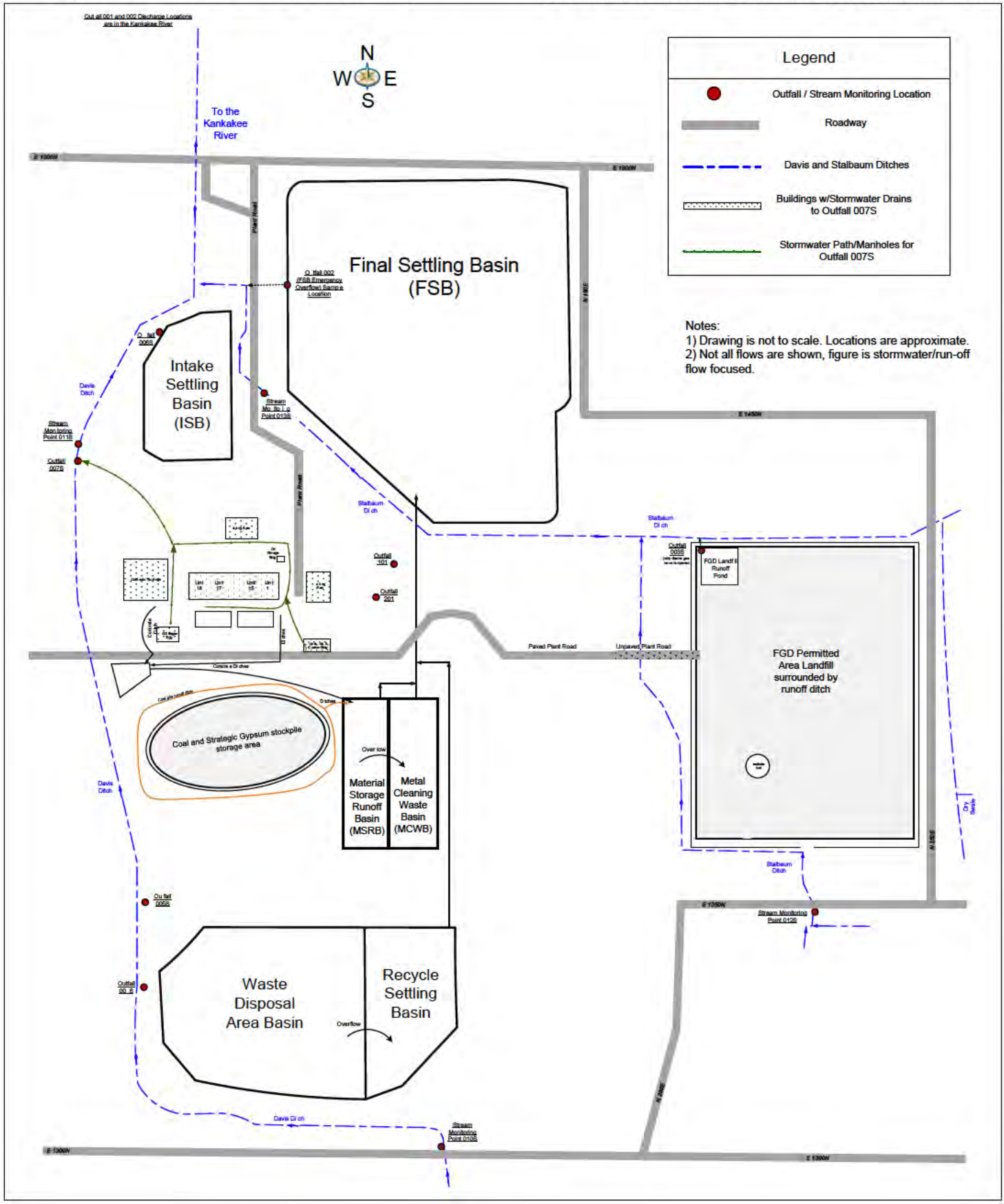
1. Date of Storm Event	2. Duration of Storm *(in minutes)*	3. Total rainfall during storm event *(in inches)*	4. Number of hours between beginning of storm measured and end of previous measurable rain event	6. Total flow from rain event *(gallons or specify units)*
06/15/16	128	0.17	336 hours	0.0976 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 b oc de
Nalco 90005	Nalco	U14, U15, U17, U18 Cooling Tower	Algaecide and b oc de
Sulfuric Acid	Wilson	U14, U15, U17, U18 Cooling Tower	pH control
Mixed Oxidant	MIOX	U14, U15 Cooling Tower	Algaecide and b oc de
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 un ts, 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 corros on 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 Un t 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	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.

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. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

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

Exhibit 25A
Schahfer CCR Part A Demonstration
Addendum, Part 1

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.

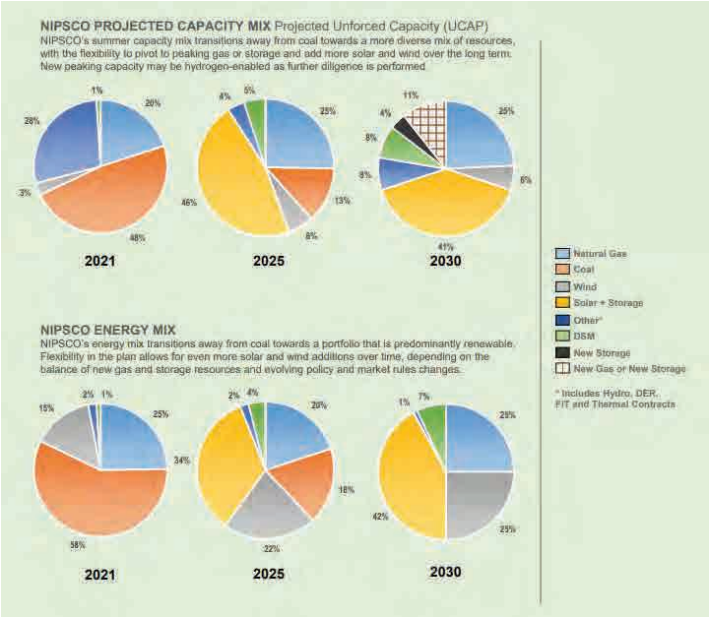
1.2.1 Background On NIPSCO's Generation Transition

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/.

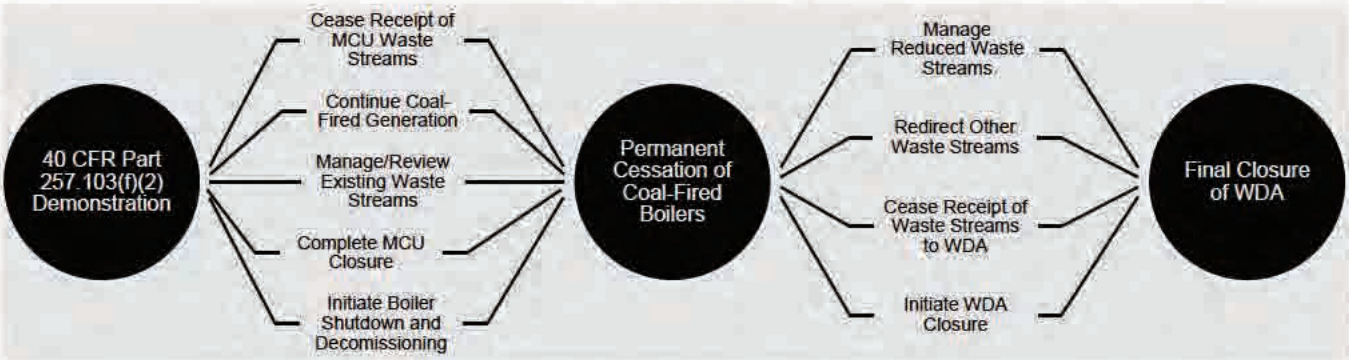
capacity position and its ability to meet its Resource Adequacy obligations to MISO. This challenge becomes acute should the remaining coal units at RMSGS (Units 17 and 18) retire as originally anticipated in May 2023.

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.

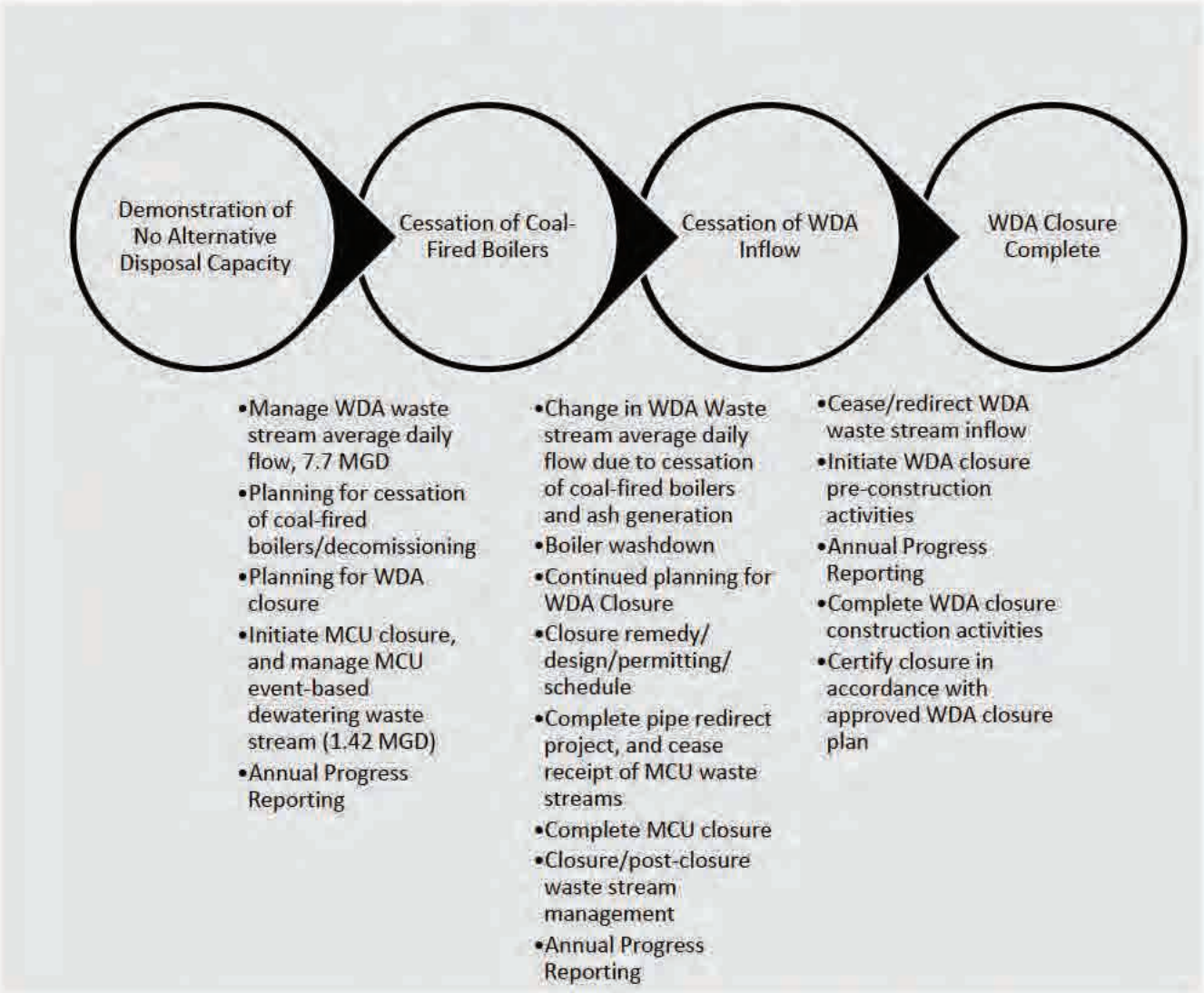
Initiated in October 2021 NIPSCO achieved significant reductions in influent volume (cessation of Units 14 and 15) and current waste materials inventory, and by the end of Q2 2026 ultimately eliminate discharges to the WDA by completing the following actions:

- 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	18.29	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	36.00	667.59	37.81	2" Sch 40 PVC	10.00	26.00	36.00	638.88	633.88	628.88
	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	42.36	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	669.99	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	668.31	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	36.00	667.40	18.22	2" Sch 40 PVC	10.00	26.00	36.00	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	664.81	28.66	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	664.97	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	18.33	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	662.84	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 material

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	8/8/2019	-	
		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	7/26/2018	-	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)(ii), 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

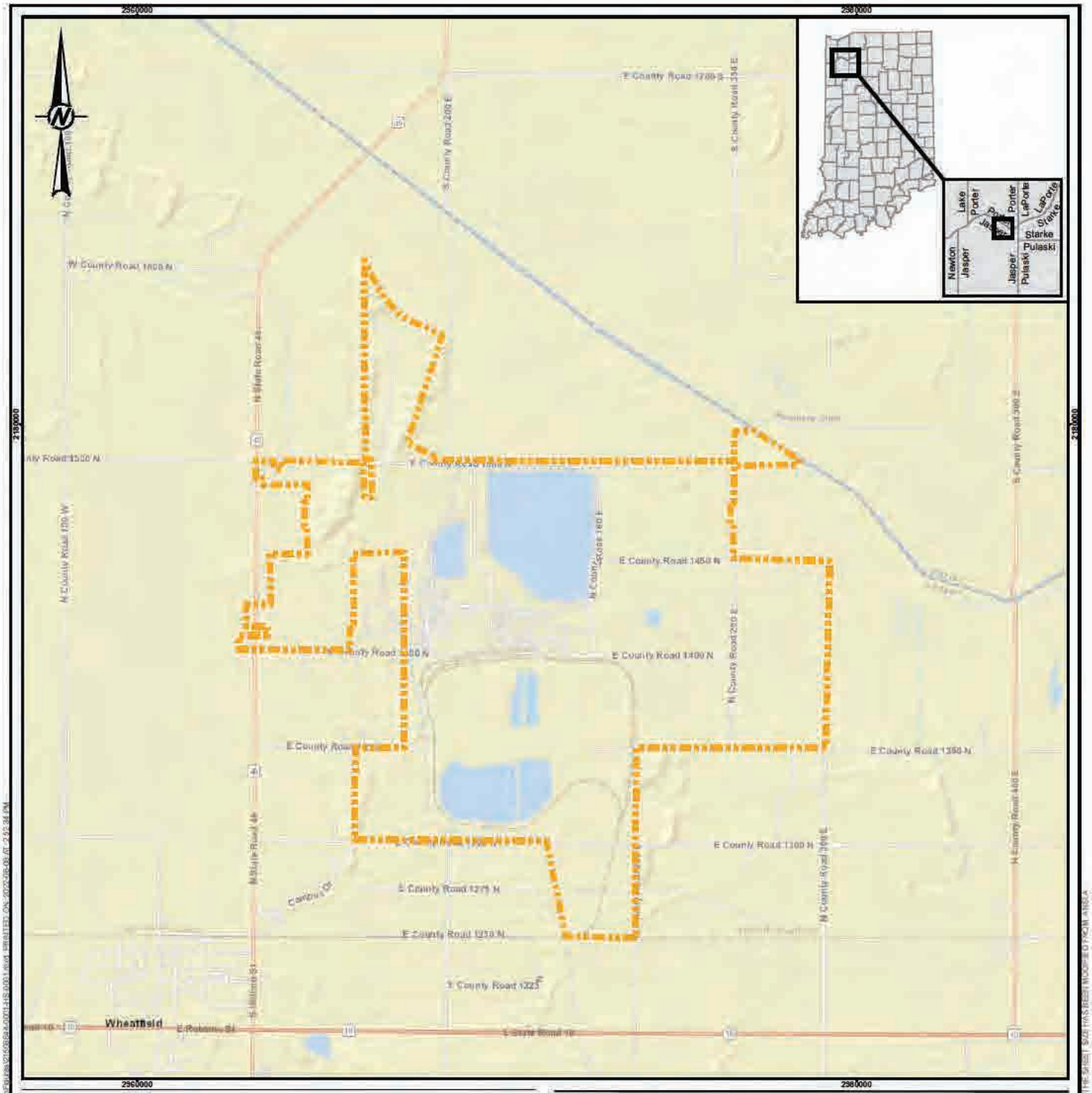
Well Purpose	Monitoring Well ID	Sample Event #15	Sample Event #16	Sample Event #17
Purpose of Sample		Detection Monitoring	Detection Monitoring	Detection Monitoring
Sample Parameters		Appendix III	Appendix III	Appendix III
Landfill Background Monitoring Well	GAMW-20	9/16/2020	4/12/2021	9/13/2021
	GAMW-24	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, NTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CH NA (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

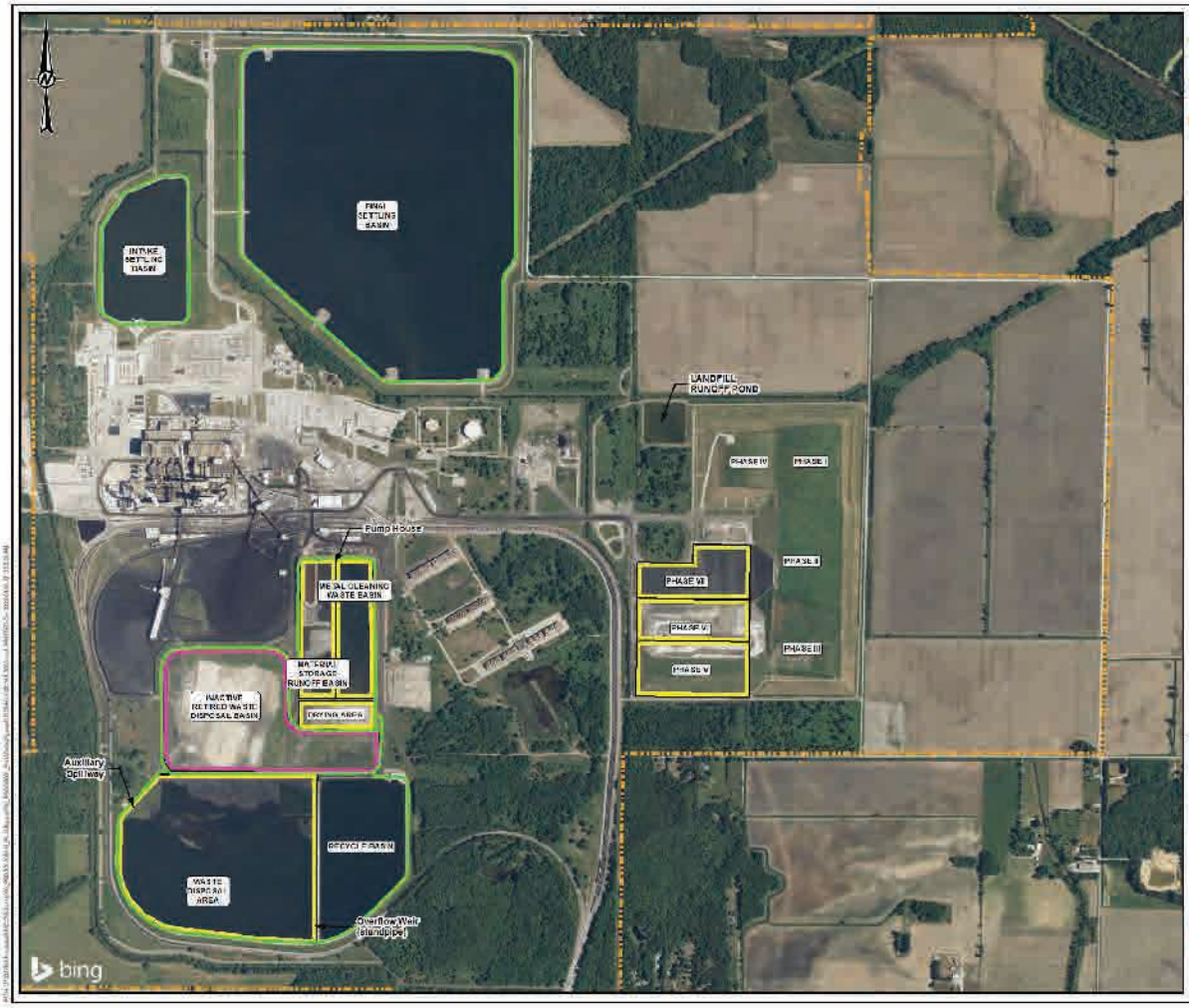
CONSULTANT

WSP GOLDER

YYYY-MM-DD	2022-06-08
DESIGNED	DFS
PREPARED	SHL
REVIEWED	JSP
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
GL21508844	A	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A



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)

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CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

FACILITY SITE PLAN

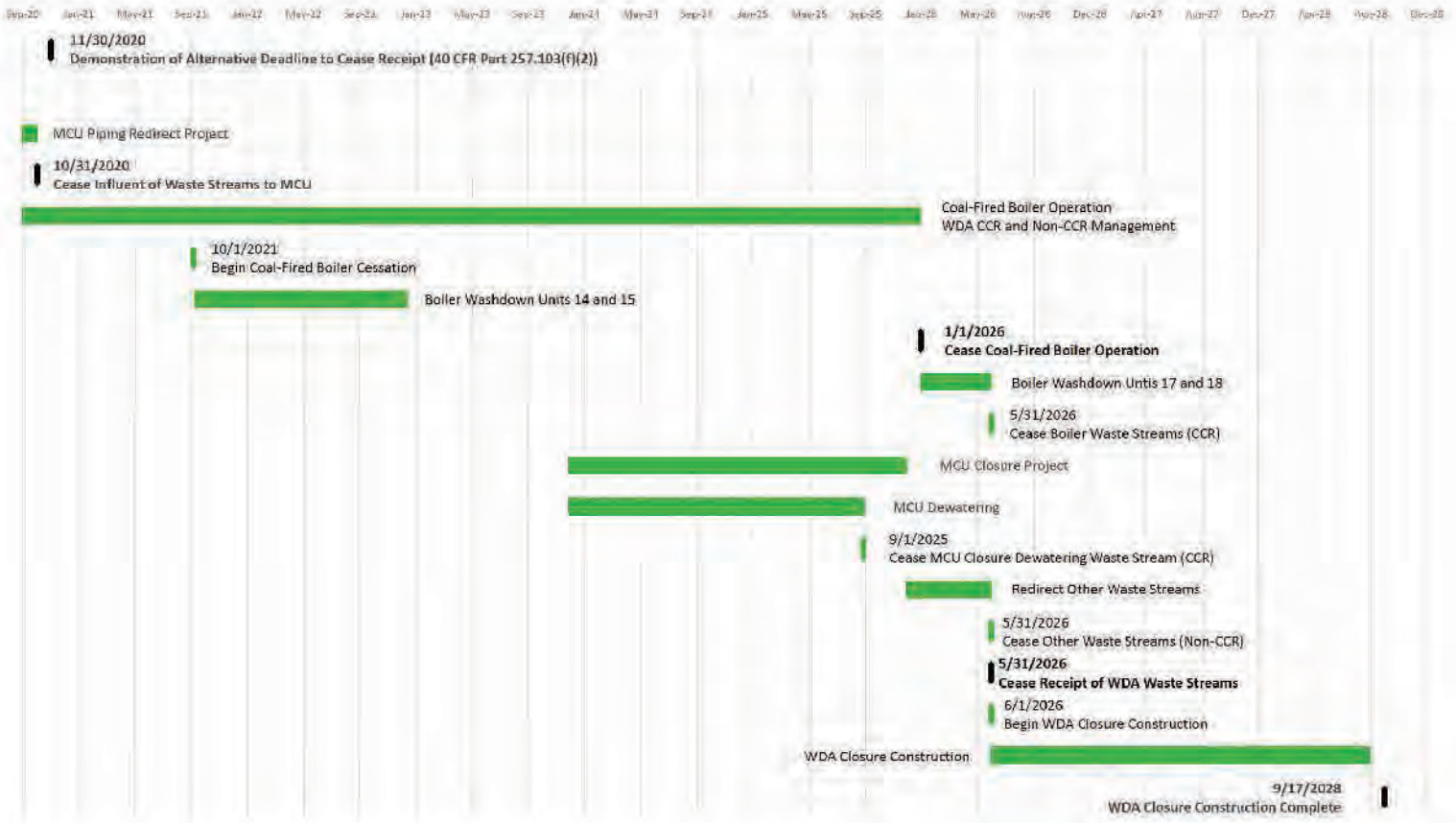
CONSULTANT

wsp GOLDER

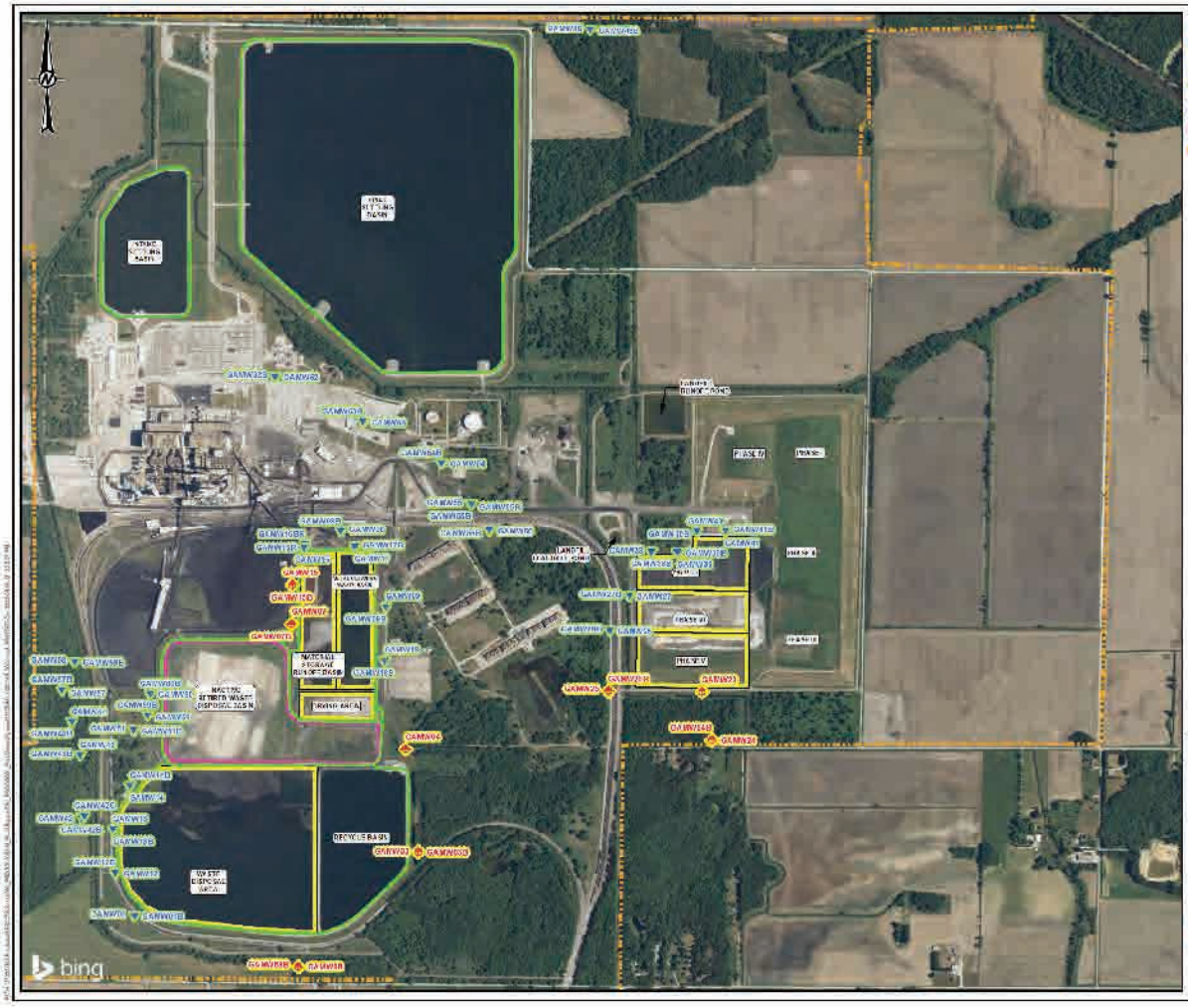
PROJECT NO.	CONTROL
21500044	A
REV.	FIGURE
0	2

DESIGNED	TR
PREPARED	SHL
REVIEWED	BMR
APPROVED	MMH

Figure 3
Operation and Closure Schedule



GOLDER



CLIENT
NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE
MONITORING WELL LOCATION MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2022-05-06
DESIGNED	TH
PREPARED	SHL
REVIEWED	RM
APPROVED	MAR

PROJECTION: GI21500044 | CONTROL: A | REV: 0 | FIGURE: 4

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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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. 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)		Cement-bentonite Grout 0-21 ft bgs
	brown fine SAND, trace coarse sand, trace fine to coarse gravel								
	gray-brown fine to medium 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)		
660.0	dark brown fine SILTY SAND								
	light brown fine to medium SAND, trace coarse sand, trace fine gravel		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)		
655.0			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)		
			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)		
650.0	gray fine to medium SAND, some coarse sand, trace fine to coarse gravel								
	light brown fine to medium SAND, trace coarse sand, trace fine to coarse gravel		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
645.0									

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-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	highly weathered, light gray CLAYEY SHALE		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)		
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. SPTs (1-1-1-1)		Cement-bentonite Grout 2-22.5 ft bgs
	brown to dark brown fine SAND, some silt		2	SS		0.9 / 2	2.0' to 2.9': (SP) SAND, fine, trace coarse sand; light brown, dark brown at 2.9'; non-cohesive, moist, loose. SPTs (4-2-2-4)		
665.0	yellow brown to brown fine to medium SAND		3	SS		1.0 / 2	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. SPTs (1-2-2-2)		
			9	SS		1.6 / 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. SPTs (3-2-4-6)		
			11	SS		1.0 / 2	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

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
	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)		
640.0	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.		#5 Sand Filter Pack 29-44 ft bgs
			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)		
			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)		
630.0			20	SS		1.5 / 2	34.0' to 35.9': (SP) SAND, fine to medium, trace coarse sand; light brown, gray brown from 35.6-36.0'; non-cohesive, wet, compact. SPTs (3-4-7-10)		
			21	SS		1.2 / 2	36.0' to 36.3': (SP) SAND, fine to medium, trace coarse subrounded gravel; light brown to gray brown; non-cohesive, wet, loose. SPTs (4-4-5-7)		
	light gray fine to coarse SAND		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)		
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

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
							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	highly weathered, light gray CLAYEY SHALE and light brown fine to coarse sand		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		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

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 10/26/20

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		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
	light and dark brown fine SAND, trace organics								
	orange and brown fine 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
	light brown to brown fine to medium SAND		3	SS		1.2 / 2			
660.0			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 Sand Filter Pack 6-17 ft bgs 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)		
			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		
655.0			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) 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)		Native sand collapsed to 17 ft bgs
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

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 10/26/20

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	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)		Cement Grout 6-20 ft bgs
			4	SS		1.2 / 2	6-7.2': (SP) SAND, fine to medium, light brown to brown, non cohesive, wet, compact SPTs (4-6-12-16)		
			5	SS		1 / 2	8-9': (SP) SAND, fine to medium, trace coarse, brown, non cohesive, wet, compact SPTs (2-5-8-11)		
655.0			6	SS		1.6 / 2	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 11.3-11.6': (SP) SAND, fine to medium, trace coarse, brown, non cohesive, wet, compact SPTs (4-7-8-11)		
			7	SS		2 / 2	12-14': (SP) SAND, medium, some fine and coarse sand, brown, non cohesive, wet, compact SPTs (3-7-10-12)		
			8	SS		0.7 / 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)		
650.0			9	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)		
			10	SS		2 / 2	18-19.4': (SP) SAND, fine to medium, brown, non cohesive, wet, loose 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)		1/4" Coated Bentonite Pellets 20-22 ft bgs
	brown SILT and fine SAND brown to gray-brown fine to medium SAND, some coarse sand, trace fine gravel		11	SS		1.8 / 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
645.0			12	SS		2 / 2			
			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

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 10/26/20

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

Golder Associates

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 10/26/20

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 es imated 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.
"J" = Indicates the result is estimated.
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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	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 U	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 U	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 U	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

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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
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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
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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.
"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-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

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"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.
"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		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
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"J" = Indicates the result was estimated.
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APPENDIX F

2021 Annual Groundwater Monitoring and Corrective Action Reports - January 2022

GOLDER
MEMBER OF WSP

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

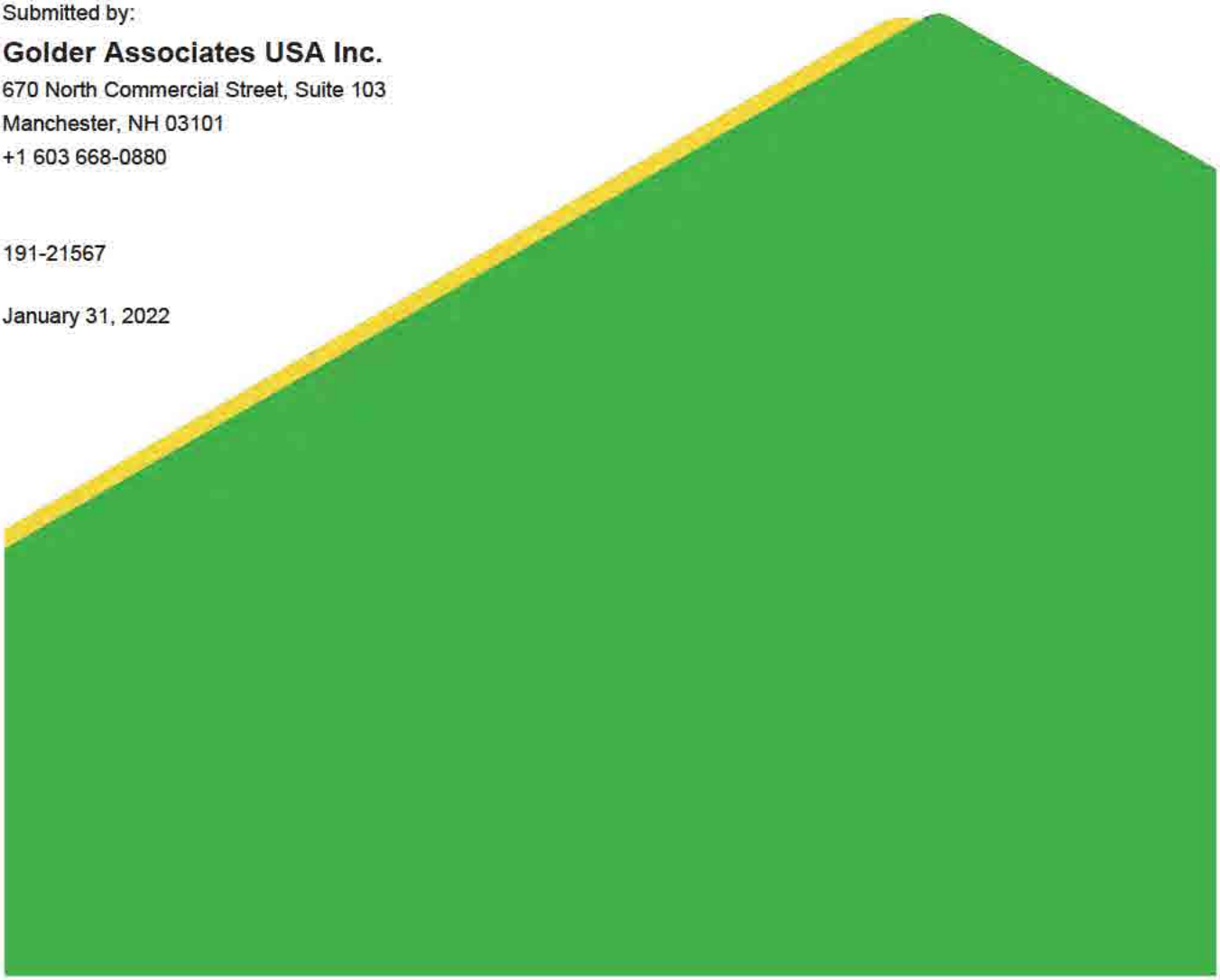


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Waste Disposal Area Alternative Source Demonstration November 2021

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) 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.

Golder Associates, “2019 Annual Groundwater Monitoring and Corrective Action Report - Waste Disposal Area, NIPSCO R. M. Schafer Generating Station”, January 31, 2020.

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	0.26	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	0.8
Calcium	mg/L	86.2	78.7	103	112	90.3	70.2	96.4	102	87	80.7	103	104	107	95.6	71.2	92.7	77.8
Chloride	mg/L	10.1	5.9	20.6	16.6	4.3	4.2	20.1	23.1	2.3	3.2	20.5	20.6	20.6	4.3	10.5	28.3	26
Fluoride	mg/L	0.29	0.36 J-	0.078	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	80.3	97.5	40.2	58	78.6	9.2	24.2	63.5	66.5	57.5	48.6	49.3	146	137
Total Dissolved Solids	mg/L	574	294	450	443	390	258	400	430	336	325	435	433	451	356	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	0.0064	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 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 J	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 J	0.0025	0.0028	0.001 J	0.001 U	0.001 U	0.0012	0.001 J	0.001 U	0.001 U
Fluoride	mg/L	0.29	0.36 J-	0.078	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 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 J	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 J	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 J	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	0.0025	0.0041	0.0012	0.0012	0.0013	0.0096	0.004	0.016	0.016
Radium, Total	pCi/l	0.842 U		2.02		0.152 U		1.58 J		1.1 U		1.85	2.22		1.08 U		0.82 U	
Selenium	mg/l	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 J	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 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 J	0.001 U	0.001 U
Field Parameters																		
Dissolved Oxygen	mg/L	0.6	0.49	0.51	0.5	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	-217.5	-33.4	-225.9	-81.5	-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	560	527	568
Temperature	deg c	9.7	13.22	12.1	14.36	9.5	16.05	11.6	13.22	9.04	18.11		11.67	14.01	9.5	10.94	11.97	14.13
Turbidity	ntu	4.06	0.51	3.19	2.19	5.99	2.0	4.06	3.19	4.70	4.53		3.56	3.64	0.79	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.

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	0.28	0.2	2.8	2.8	2.7	0.1 U	0.1 U	0.1 U	0.1 U	0.89	0.82	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	21.6	20.2
Chloride	mg/L	11.5	10.6	112	108	85.2	4.2	11.4	8.6	10.3	8.3	8.3	0.53	0.63	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	6	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+	22.3	63.0 J+	44.9
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	0.036	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	0.086	0.052
Barium	mg/L	0.051	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	0.01	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	0.01	0.0022	0.0033	0.0029	0.0027	0.0026	0.0021	0.0015	0.002	0.0023	0.0021	0.0021	0.0044	0.004
Radium, Total	pCi/l	0.883 U		1.92	1.85		0 U		0.852 U		0.902 U		0.568 U		0.985 U	0.731 U		0.385 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	0.54		0.51	0.27	1.97	0.83
Oxidation-Reduction Potential	millivolts	-31.7	-234.5		-103.5	-193.7	-80.8	-191	-125.5	-251	-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	6	7.59	7.36	7.22	7.22		8.04	7.64	6.21	6.21
Specific Conductance	uS/cm	577	566		2126	2053	326.1	413	407	414	455.1	475	209	226		282	191	257.8	192
Temperature	deg c	10.2	16.03		12.37	13.96	9.9	14.9	11.0	13.1	11.0	12.7	9.7	17.91		11.4	12.86	11.2	16.11
Turbidity	ntu	4.15	0.05		1.66	1.1	2.56	1.76	4.07	3.98	7.39	5.36	4.3	2.99		2.36	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	2021-04-29	2021-09-15	2021-04-29	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	281	282	3.9	21.8	43.1	47.5	7.3	10.9	37.8	29.2	36.6	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	0.85	1.1	3.6	2.1	4	11.3	21.1
Fluoride	mg/L	0.14	0.10	0.26	0.34	0.34	0.45	0.62	0.05 UJ	0.073	0.13 J-	0.17	0.22 J-	0.35	0.15 J-	0.12	0.18	0.42	0.7
pH	SU	6.22	7.01	7.19		7.04	6.11	7.63	6.22	8.03	7.95	7.33	4.4	5.07	7.92		7.32	7.53	7.28
Sulfate	mg/L	12.3 J+	7.5	156	161	153	1460	1480	38	25.8	10.1	24.4	45	38.0	24.9	32.1	23.6	473	434
Total Dissolved Solids	mg/L	85	113	604	597	600	2180 J	2270	58	101	160	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 J	0.001 U	0.001 U	0.001 J
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 J	0.001 U	0.0012	0.002
Barium	mg/L	0.0084	0.0082	0.1	0.1	0.11	0.072	0.077	0.014	0.0025	0.02	0.022	0.059	0.041	0.015	0.0044	0.015	0.048	0.056
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002	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 J	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 J	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 J	0.001 U	0.001 U	0.001 U
Fluoride	mg/L	0.14	0.10	0.26	0.34	0.34	0.45	0.62	0.05 UJ	0.073	0.13 J-	0.17	0.22 J-	0.35	0.15 J-	0.12	0.18	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 J	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 J	0.008 U	0.012	0.018
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	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	0.0037	0.001 J	0.0041	0.03	0.015
Radium, Total	pCi/l	1.03 U		1.23 U			3.57		0.194 U		0.368 U		1.95		0.705 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 J	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 J	0.001 U	0.001 U	0.001 J
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	0.25
Oxidation-Reduction Potential	millivolts	-125.6	-318	-100.6		0.197	-108.7	0.246	111.6	-237.7	-132.7	-316.7	291	-314	-140.4		-298.9	-105.5	0.232
pH	SU	6.22	7.81	7.19		7.04	6.11	7.63	6.22	8.03	7.95	7.33	4.4	5.87	7.92		7.32	7.53	7.28
Specific Conductance	uS/cm	210.9	156	873		937	3094	303.9	124	136	291	264	110	102	252		213	1035	125.5
Temperature	deg c	11.5	12.16	11.1		13.9	12.4	14.2	10.25	12.45	11.2	11.54	9.27	13.67	10.04		11.37	11.28	22.2
Turbidity	ntu	2.15	1.19	4.2		4.12	1.02	1.43	2.7	2.83	3.04	1.85	0.04	1.27	2.96		2.66	4.0	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		GAMW63		GAMW63B	
	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	69.8	22.6	20.4	19.3	18.4
Fluoride	mg/L	0.45	0.53	0.3	0.51	0.34	1.1	0.16	0.26	0.1	0.2
pH	SU	7.6	7.57	7.05	7.01	7.74	7.76	7.52	7.75	8.35	7.99
Sulfate	mg/L	1180	1180	748	1050	1140	443	68.6	81.3	62.5	63.6
Total Dissolved Solids	mg/L	1960	1960	1300	1540	2710	1440	320	316	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	0.065	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	0.26	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	0.016	0.012	0.015	0.034	0.045	0.006 U	0.0061	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	0.041	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	64.3	0.56	-121.3	0.238	-39.2	0.187	-154.3	0.216
pH	SU	7.6	7.57	7.05	7.01	7.74	7.76	7.52	7.75	8.35	7.99
Specific Conductance	uS/cm	2650	264.7	1747	167.2	2181	209.6	490	515	4[illegible]1	413
Temperature	deg c	10.1	17.4	11.5	20.7	12.2	14.9	9.7	18	11.8	13.5
Turbidity	ntu	1.46	1.50	0.9	1.56	1.04	2.05	2.02	0.99	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: DPSC
Reviewed by: JSD

Table 4: Groundwater Protection Standards
CCR Unit Schahfer Waste Disposal Area
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

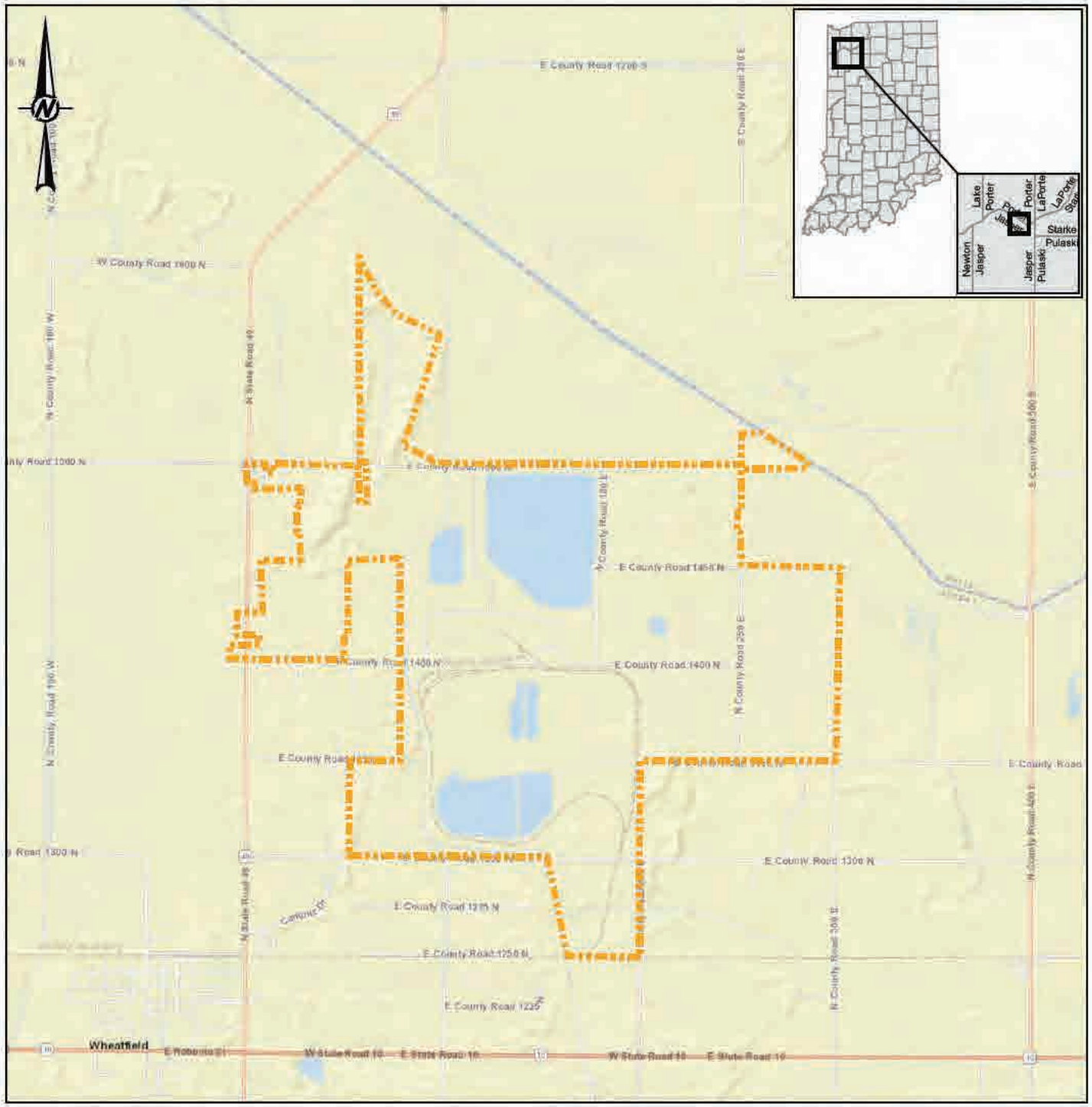
Analyte	MCL (mg/L)	GWPS (mg/L)[2]	GWPS (mg/L)[3]
Antimony	0.006	0.006	0.006
Arsenic	0.01	0.015	0.018
Barium	2	2	2
Beryllium	0.004	0.004	0.004
Cadmium	0.005	0.005	0.005
Chromium	0.1	0.1	0.1
Cobalt[1]	0.006	0.015	0.015
Fluoride	4	4	4
Lead[1]	0.015	0.015	0.015
Lithium[1]	0.04	0.04	0.04
Mercury	0.002	0.002	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, NTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CH NA (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

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A



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

NOTE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, 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

DESIGNED	DFS
PREPARED	TEH
REVIEWED	BKH
APPROVED	MHH

PROJECT NO. 19121567 | CONTROL A | REV. 0 | FIGURE 2

APPENDIX A

Waste Disposal Area Alternative Source Demonstration May 2021

Northern Indiana Public Service Company LLC (NIPSCO LLC)

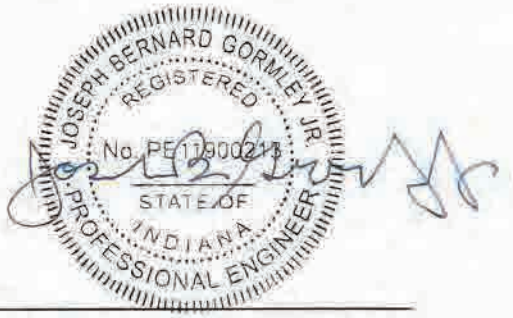
R. M. Schahfer Generating Station – Waste Disposal Area

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.

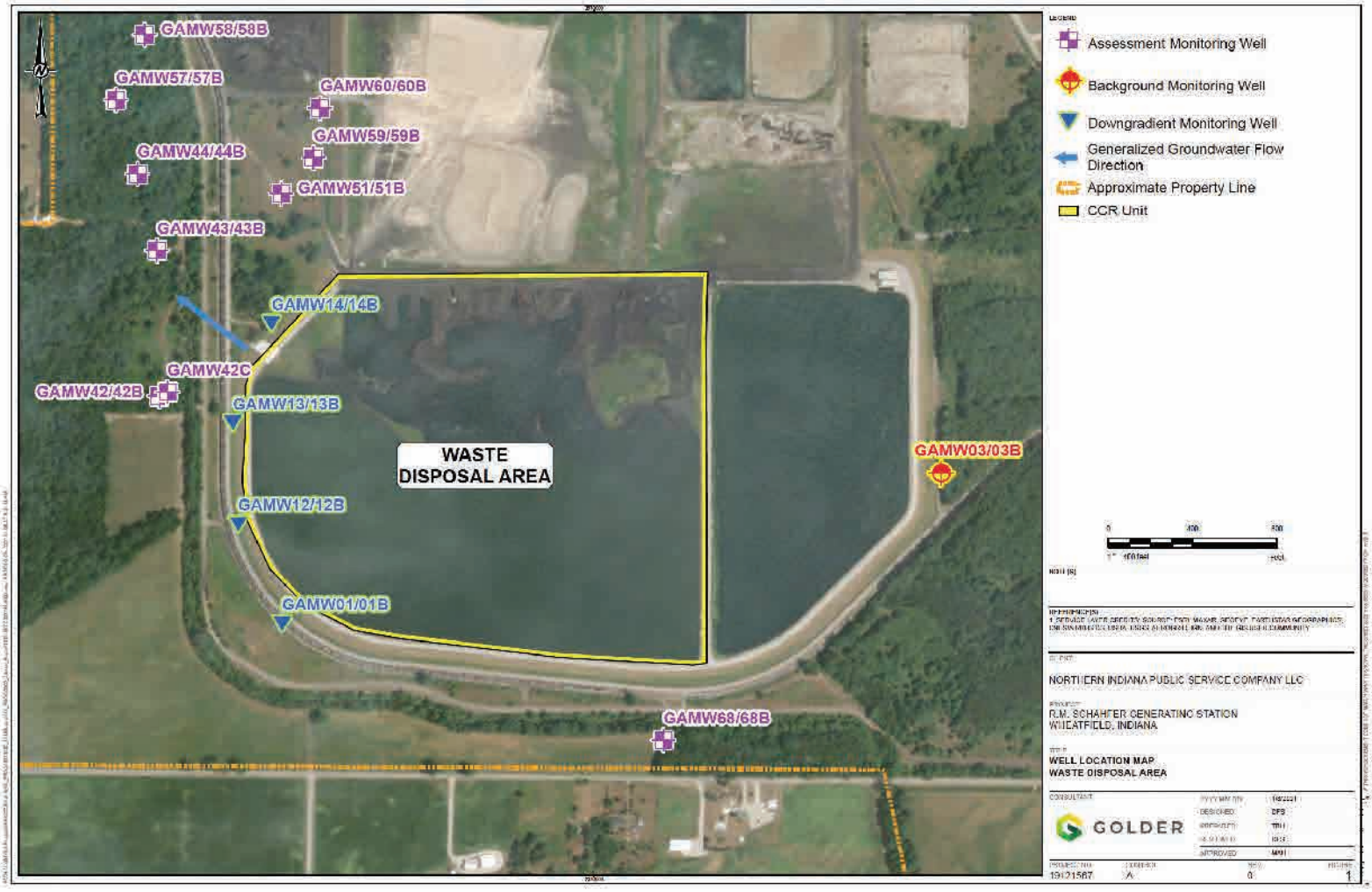
The 2020 WDA ASD discusses three primary lines of evidence: 1) the low concentrations of molybdenum in the WDA source materials and porewater, 2) the relative major ion abundance in groundwater that demonstrates a distinct difference between WDA porewater and downgradient groundwater samples, with no 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.

https://golderassociates.sharepoint com/sites/nipscoccrgwmonitoring/shared documents/rmsgs/reports/wda asd spring 2021/wda recertification 2021-05 docx


GAMW58/58B
GAMW57/57B
GAMW60/60B
GAMW59/59B
GAMW44/44B
GAMW51/51B
GAMW43/43B
GAMW14/14B
GAMW42C
GAMW42/42B
GAMW13/13B
WASTE DISPOSAL AREA
GAMW03/03B
GAMW12/12B
GAMW01/01B
GAMW68/68B
Assessment Monitoring Well
Background Monitoring Well
Downgradient Monitoring Well
Generalized Groundwater Flow Direction
Approximate Property Line
CCR Unit
NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA
WELL LOCATION MAP
WASTE DISPOSAL AREA
GOLDER
DESIGNED
DPS
APPROVED
MW
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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

GOLDER

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.

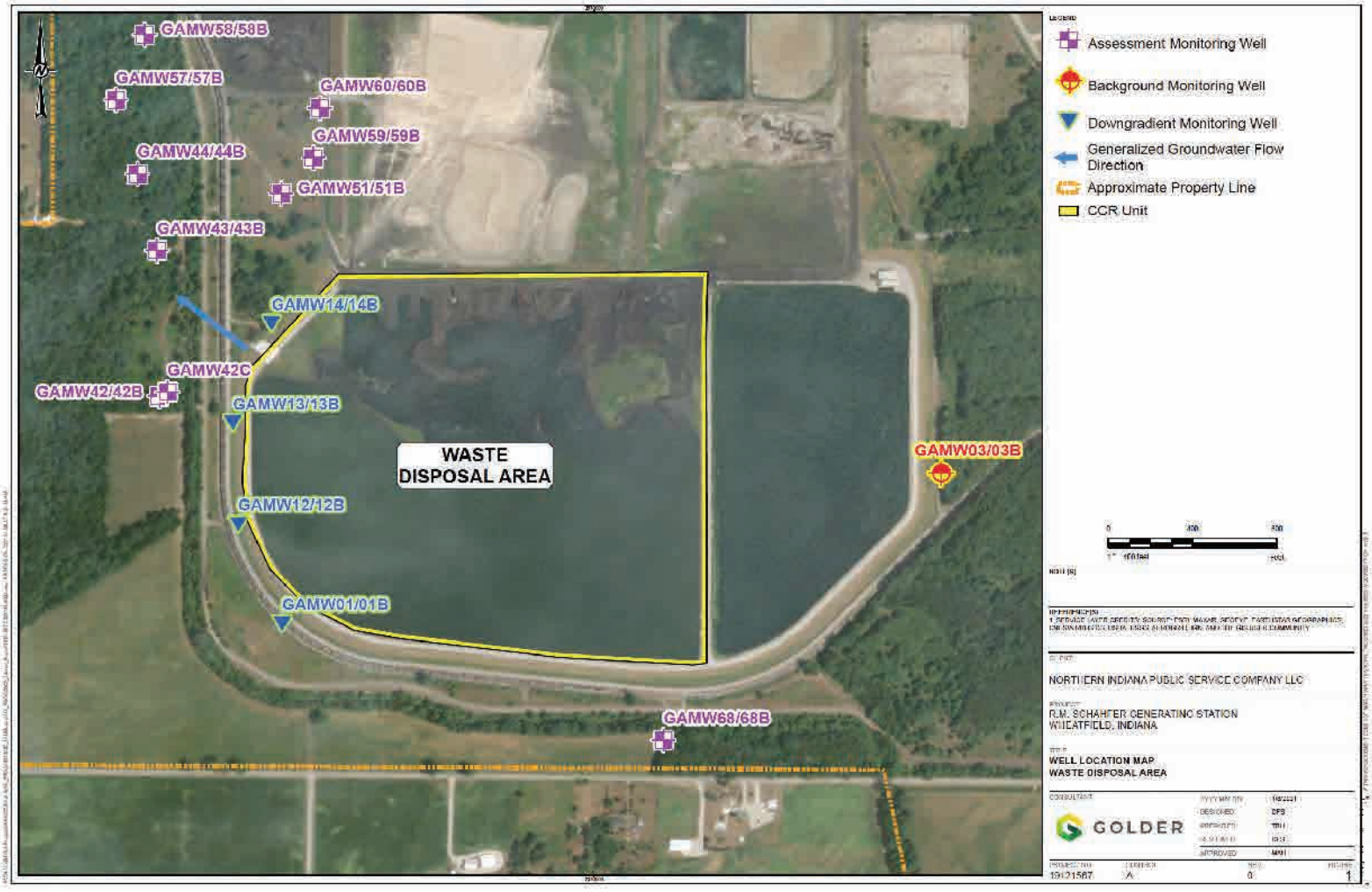
The information presented above confirms the results of the seventh Assessment Monitoring event are consistent with the previous Assessment Monitoring event, and the rationale presented in the June 9, 2020 ASD is still applicable. Golder prepared the current ASD in accordance with 40 CFR 257.95(g)(3) 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.


GAMW58/58B
GAMW57/57B
GAMW60/60B
GAMW59/59B
GAMW44/44B
GAMW51/51B
GAMW43/43B
GAMW14/14B
GAMW42C
GAMW42/42B
GAMW13/13B
WASTE DISPOSAL AREA
GAMW03/03B
GAMW12/12B
GAMW01/01B
GAMW68/68B
Assessment Monitoring Well
Background Monitoring Well
Downgradient Monitoring Well
Generalized Groundwater Flow Direction
Approximate Property Line
CCR Unit
NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA
WELL LOCATION MAP
WASTE DISPOSAL AREA
GOLDER
DESIGNED
DPS
APPROVED
MW
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golder.com

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
Wheatfield, Indiana

Submitted by:

Golder Associates USA Inc.
670 North Commercial Street, Suite 103
Manchester, NH 03101
+1 603 668-0880

191-21567

January 31, 2022

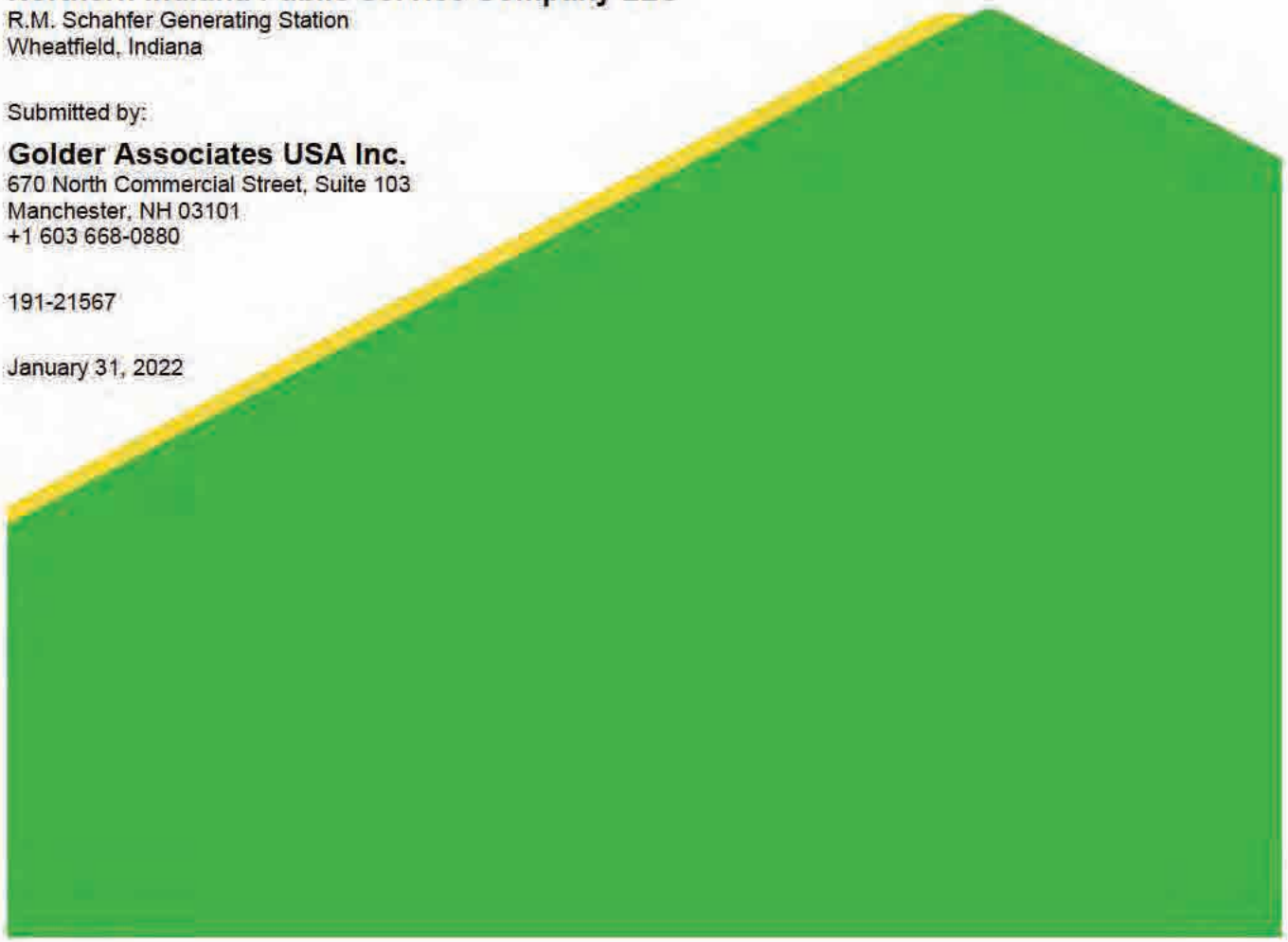


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1.0 INTRODUCTION

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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Golder Associates, “CCR Assessment of Corrective Measures,” April 19, 2019.

Golder Associates, “CCR Groundwater Monitoring Implementation Manual” October 2017.

Golder Associates, “NIPSCO R.M. Schahfer Generating Station, CCR Unit Consisting of MSRB, MCWB, and DA Corrective Measures Selection of Remedy, Semi-Annual Progress Report #19-01” October 16, 2019.

Golder Associates, “NIPSCO R.M. Schahfer Generating Station, CCR Unit Consisting of MSRB, MCWB, and DA Corrective Measures Selection of Remedy, Semi-Annual Progress Report #20-01” April 13, 2020.

Golder Associates, “NIPSCO R.M. Schahfer Generating Station, CCR Unit Consisting of MSRB, MCWB, and DA Corrective Measures Selection of Remedy, Semi-Annual Progress Report #20-02” October 9, 2020.

Golder Associates, “CCR Assessment of Corrective Measures Report – Addendum” November 30, 2020.

Golder Associates, “NIPSCO R.M. Schahfer Generating Station, CCR Unit Consisting of MSRB, MCWB, and DA Corrective Measures Selection of Remedy, Semi-Annual Progress Report #21-01” April 9, 2021.

Golder Associates, “CCR Assessment of Corrective Measures Report- Addendum #2” July 29, 2021.

Golder Associates, “NIPSCO R.M. Schahfer Generating Station, CCR Unit Consisting of MSRB, MCWB, and DA Corrective Measures Selection of Remedy, Semi-Annual Progress Report #21-02” October 11, 2021.

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		CAMW34			CAMW37			CAMW07E		CAMW09		CAMW09E		CAMW09		CAMW09B			CAMW15	
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	8.1	6.2	6.7	8 D	3.5
Calcium	mg/L	173	108	107	198	215	212	327	373	266	260	196	235	166	227	189	177	183	180 D	136
Chloride	mg/L	9.2	3.7	3.6	11.7	11.9	12	38	60.3	50	14.9	175	179	41.8	64.7	102	64	113	99.3 D	49.6
Fluoride	mg/L	0.2	0.35	0.35	0.66	0.85	0.85	0.79	0.85	0.97	0.44	0.9	0.73	0.26	0.54	1.4	1.4	1.3	0.76 D	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 D	7.51		10.49 D	7.56	7.1 D	7.12
Sulfate	mg/l	375	116	121	352	362	358	1010	1060	477	841	751	1060	418	909	582 J	1040 J	773	371 D	265
Total Dissolved Solids	mg/L	720	381	380	840	887	894	1700	1790	1120	2380	1620	2040	959	1040	1030	952	1430	770 D	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 UQ	0.001 U
Arsenic	mg/l	0.0018	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 D	0.09
Barium	mg/L	0.079	0.057	0.056	0.048	0.053	0.052	0.041	0.037	0.07	0.076	0.039	0.046	0.037	0.053	0.039	0.035	0.059	0.038 D	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 UQ	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 UQ	0.0002 U
Chromium	mg/l	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 UQ	0.007 U
Cobalt	mg/L	0.0016	0.001 U	0.001 U	0.0026	0.0061	0.006	0.0011	0.004 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 D	0.0021
Fluoride	mg/L	0.2	0.35	0.35	0.66	0.85	0.85	0.79	0.85	0.97	0.44	0.9	0.73	0.26	0.54	1.4	1.4	1.3	0.76 D	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 UQ	0.001 U
Lithium	mg/l	0.008 U	0.008 U	0.008 U	0.008 U	0.0091	0.0085	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 UQ	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 UQ	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	0.01	0.04	0.058	0.012	0.012	0.015	0.023 D	0.027
Radium, Total	pci/l	0.859 U			1.29 U			2.16		1.87		2.53		0.619 U		0.934 U	1.67 J		0.191 UQ	
Selenium	mg/l	0.0033	0.001 U	0.001 U	0.0068	0.0044	0.0039	0.001 U	0.004 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 D	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	0.002 U	0.001 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 UQ	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		6.2	0.31	0.2	0.26
Oxidation-Reduction Potential	millivolts	-23		0.149	55.3		0.1	-174.1	0.274	22	19.3	-170.1	0.218	-20.8	0.2		-115.1	0.204	-84.1	0.195
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	1452	167.2	2157	286.3	970	138.1		1159	201.2	1153	104.8
Temperature	deg c	9.24		15.9	11.06		17	12.2	14.7	11.2	18.6	13	15.2	10.6	18.7		13.4	16.4	14.33	19.2
Turbidity	ntu	4.87		7.08	5.4		7.85	2.8	4.84	1.89	1.46	2.78	3.9	1.02	2.85		4.28	3.02	9.87	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.

GOLDER

Table 3: Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	CAMW15B			CAMW16R		CAMW16BR		CAMW17		CAMW17B		CAMW18		CAMW18B			CAMW46	
	Sample Date	2021-04-15		2021-09-23	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	21.8 O	25.3	1.3	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	355 O	321 O	352	410 C	275	380 O	265	139	346	164	155	436	466	317	325	323	29	25.3
Chloride	mg/L	372 O	390 O	269	61.1 O	112	331 O	516	79	176	136	105	40.3	97	112	90.8	89.3	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	0.18 J-	0.35	0.6	0.5	0.078	0.11
pH	SU		7.15 O	7.08	7.16 O	7.1	7.21 O	7.5	7.3	7.18	7.84	7.6	10.36 O	7.1	7.51		7.34	8.36	8.16
Sulfate	mg/l	566 O	643 O	900	1060 O	633	723 O	2570	358	964	549	965	1310	1160	1760	1100	1120	33 J+	31.8
Total Dissolved Solids	mg/L	1740 O	1670 O	2030	1850 C	1270	2080 C	3870	800	1890	1200	928	1440	2C20	3340	1830	2010	112	127
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	0.0047 O	0.0086	0.001 UO	0.0042	0.0074	0.0027	0.0012	0.0021	0.001 U	0.001 U	0.0035	0.0028	0.0027	0.001 U	0.001 U
Barium	mg/L	0.18 C	0.18 O	0.17	0.074 O	0.09	0.073 O	0.041	0.059	0.17	0.084	0.053	0.044	0.057	0.041	0.028	0.029	0.025	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 J	0.0002 U	0.0002 J	0.0002 U	0.0002 J	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 J	0.0002 U	0.0002 J	0.0002 U	0.0002 J	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	0.0025	0.002 U	0.002 U	0.002 U	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	0.0036	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	0.18 J-	0.35	0.6	0.5	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	0.028	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	0.026	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	0.013	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	2.99 C	2.15 O		0.868 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		0.36	0.32	0.27	0.29	0.28	0.31	2.52	3.75	0.2	0.29	6.82	5.39	0.25		0.19	1.59	1.26
Oxidation-Reduction Potential	millivolts		-85.7	0.184	-78.9	0.208	-85.1	0.212	29.8	10.2	-117.5	0.215	-84.3	56.6	-104.5		0.182	109.8	-130
pH	SU		7.15	7.08	7.16	7.1	7.21	7.5	7.3	7.18	7.84	7.6	10.36	7.1	7.51		7.34	8.36	8.16
Specific Conductance	uS/cm		2491	2866	2025	1865	2510	7065	1152	2365	1778	1389	1899	2469	2494		2473	2382	235
Temperature	deg c		17.5	17	15.08	25	16.38	16.5	11.85	21.8	15.18	18.7	10.29	21.4	17.15		15.8	10.7	15.1
Turbidity	ntu		1.1	1.7	4.65	1.79	2.82	26.19	1.25	1.47	1.44	4.92	2.84	3.74	4.19		4.58	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.

GOLDER

Table 3: Analytical Data
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	CAMW48B		CAMW52		CAMW52B		CAMW53		CAMW53B		CAMW54		CAMW54B		CAMW55R	
	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	0.61	0.1 U	0.1 U	1.9	2.7	0.5	0.53	3.1	3.1	0.87	1.7
Calcium	mg/L	54.3	51	59.8	62.5	94.9	120	17.5	28.3	142	128	164	114	256	190	237	197
Chloride	mg/L	5.9	5.4	16.7	15.9	131	135	2.4	2.7	84.8	66.4	23.9	24.6	83.9	70.4	51.4	44.1
Fluoride	mg/L	0.077	0.12	0.22	0.3*	0.24	0.38	0.05 U	0.05 U	0.4	0.46	0.2	0.5	0.53	0.52	0.46	0.51
pH	SU	7.69	7.73	7.6	7.6	7.46	7.57	5.76	6.17	7.28	7.48	6.52	6.52	7.3	7.36	7.6	7.27
Sulfate	mg/L	61 B,J+	55.3	55.8	50	181	156	35.7	49.4	904	795	492	191	891	501	867	589
Total Dissolved Solids	mg/L	190	243	269	270	573	667	97	147	746	802	730	503	1120	1030	842	943
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	0.001 U	0.0013	0.0012	0.0017	0.001 U	0.0014	0.0075	0.004	0.0044	0.004	0.001 U	0.001 U
Barium	mg/L	0.026	0.023	0.011	0.014	0.13	0.14	0.027	0.033	0.097	0.051	0.071	0.048	0.033	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	0.3*	0.24	0.38	0.05 U	0.05 U	0.4	0.46	0.2	0.5	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	0.016	0.011	0.011	0.025	0.017	0.025	0.013	0.017
Radium, Total	pci/l	1.66 U		0.29 U		1.05 U		0 U		1.21 U		0.894 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	0.0018	0.001 U	0.001 U	0.0044	0.001 U	0.001 U	0.001 U	0.0029	0.0048
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	0.63	0.29	0.45	0.26	1.19	0.47
Oxidation-Reduction Potential	millivolts	-101.9	-241	-231	0.38	-175.5	0.741	111.7	94.9	-104	-232.6	61.7	-163.5	-135.3	-211.7	32.3	-16.8
pH	SU	7.69	7.73	7.6	7.6	7.46	7.57	5.76	6.17	7.28	7.48	6.52	6.52	7.3	7.36	7.6	7.27
Specific Conductance	uS/cm	351	388	545	601	1159	1104	173	201	1227	1256	1097	782	1626	1494	1319	1391
Temperature	deg c	11.37	12.2	12	20	15.8	18	12	20.4	17.6	20	11.8	20.1	14.3	17.3	11.3	20.6
Turbidity	ntu	4.98	4.5	1.79	1.36	5.9	1.27	4.66	4.5**	3.27	3.67	8.79	3.79	8.74	8.54	2.35	1.58

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	CAMW55B		CAMW56		CAMW56B	
	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	1.8	1.7
Calcium	mg/L	254	235	139	108	157	163
Chloride	mg/L	120	78.4	2.9	1.7	70.9	73.7
Fluoride	mg/L	0.3	0.3	0.35 J	1	0.41	0.46
pH	SU	7.7	7.44	7.05	7.09	7.55	7.34
Sulfate	mg/L	565	435	57.6	64.8	277	265
Total Dissolved Solids	mg/L	1370	1120	480	378	738	602
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	0.0043	0.001 U	0.001 U
Fluoride	mg/L	0.3	0.3	0.35 J	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	0.0053	0.0063	0.011	0.0074	0.0082
Radium, Total	pCi/l	1.69 U		0.222 U		2.97	
Selenium	mg/L	0.001 U	0.001 U	0.001	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	-97.9	-215.9	65.8	-133.7	-110.5	-214.1
pH	SU	7.7	7.44	7.05	7.09	7.55	7.34
Specific Conductance	uS/cm	1596	1823	700	655	1100	1214
Temperature	deg.c	15.3	18.7	9	17.2	12	14.3
Turbidity	ntu	4.78	4.48	2.87	3.68	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
"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.

Prepared by: SLG
Checked by: DFSC
Reviewed by: JSP

GOLDER

Table 4: Groundwater Protection Standards
CCR Unit Schahfer MSRB, MCWB, and Drying Area
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

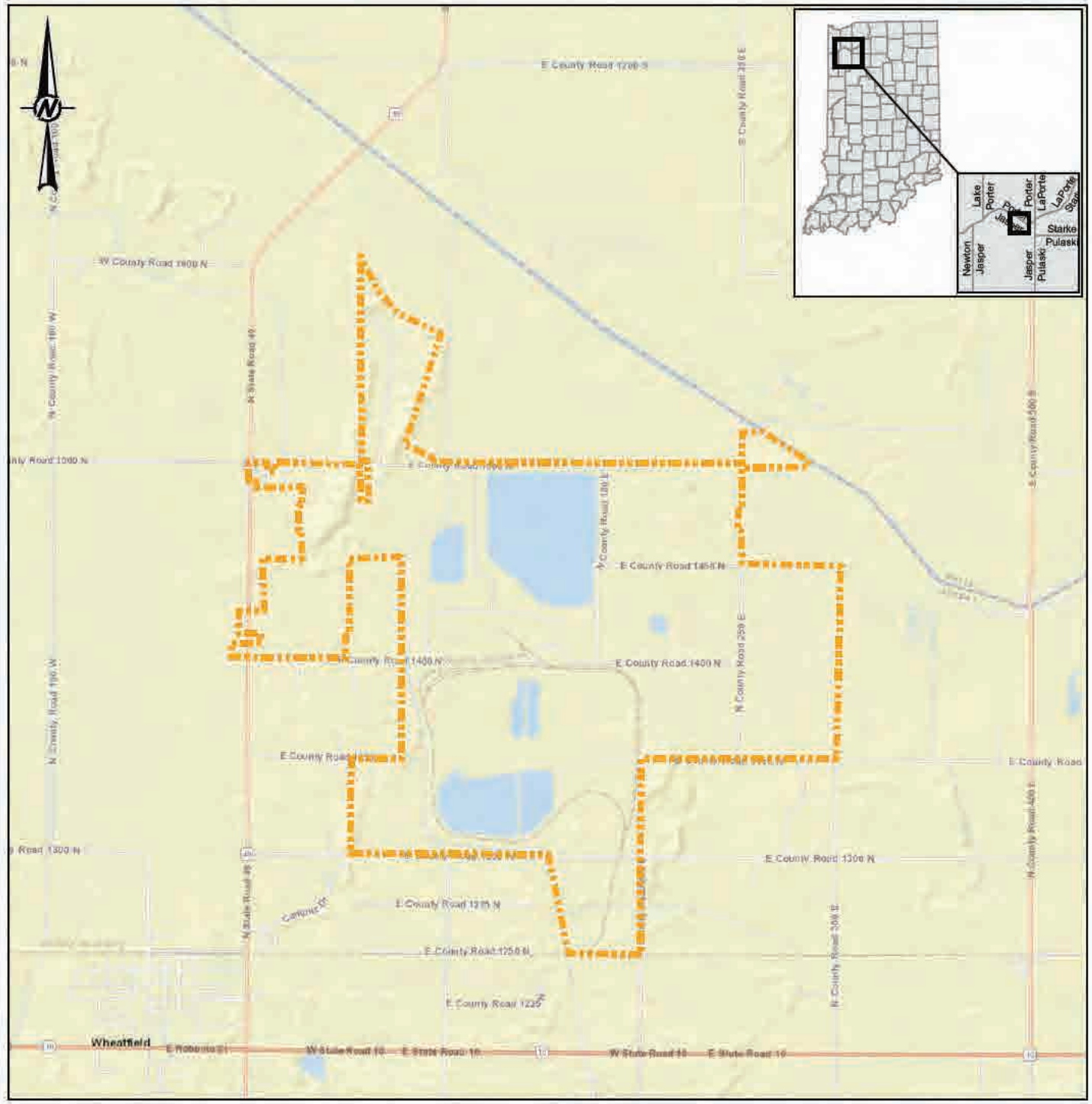
Analyte	MCL (mg/L)	GWPS (mg/L)[2]	GWPS (mg/L)[3]
Antimony	0.006	0.006	0.006
Arsenic	0.01	0.078	0.091
Barium	2	2	2
Beryllium	0.004	0.004	0.004
Cadmium	0.005	0.005	0.005
Chromium	0.1	0.1	0.1
Cobalt[1]	0.006	0.01	0.01
Fluoride	4	4	4
Lead[1]	0.015	0.015	0.015
Lithium[1]	0.04	0.04	0.04
Mercury	0.002	0.002	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, NTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CH NA (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

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A



Assessment Monitoring Well

Background Monitoring Well

Downgradient Monitoring Well

Generalized Groundwater Flow Direction

CCR Units

Approximate Property Line

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

WELL LOCATION MAP
MATERIAL STORAGE RUNOFF BASIN, METAL CLEANING WASTE BASIN, AND DRYING AREA

GOLDER
MEMBER OF WSP

DESIGNED DPS

APPROVED MM

19121567 A 0 2



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GOLDER
MEMBER OF WSP

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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January 31, 2022

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RMSGS Landfill Phases V, VI, and VII Alternative Source Demonstration March 2021

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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.

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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	78.4	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	86.9	59.2	80.2	86.8	189	693	701	756
Total Dissolved Solids	mg/L	1050	1170	316	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	1.85		0.49	0.27	0.68	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	183.7	561		809	912.5	340	472.3	514		599	653	804	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	5.84	1.99	1.9		3	1.88	1.46	4.47	3.86	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	0.67	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	384	367	90.4	77.3	249	274	268	173	162	409	443	273	276	225	195
Chloride	mg/L	406	438	4.7	4.2	35.1	37.4	39.9	10.2	9.7	61.9	65.7	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	9960	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	2913	1968	1933	13408	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	2.78	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	4802	9312	13008	11430
Temperature	deg c	10.15	19.2	13	15.88
Turbidity	ntu	4.43	1.91	3.81	1.8

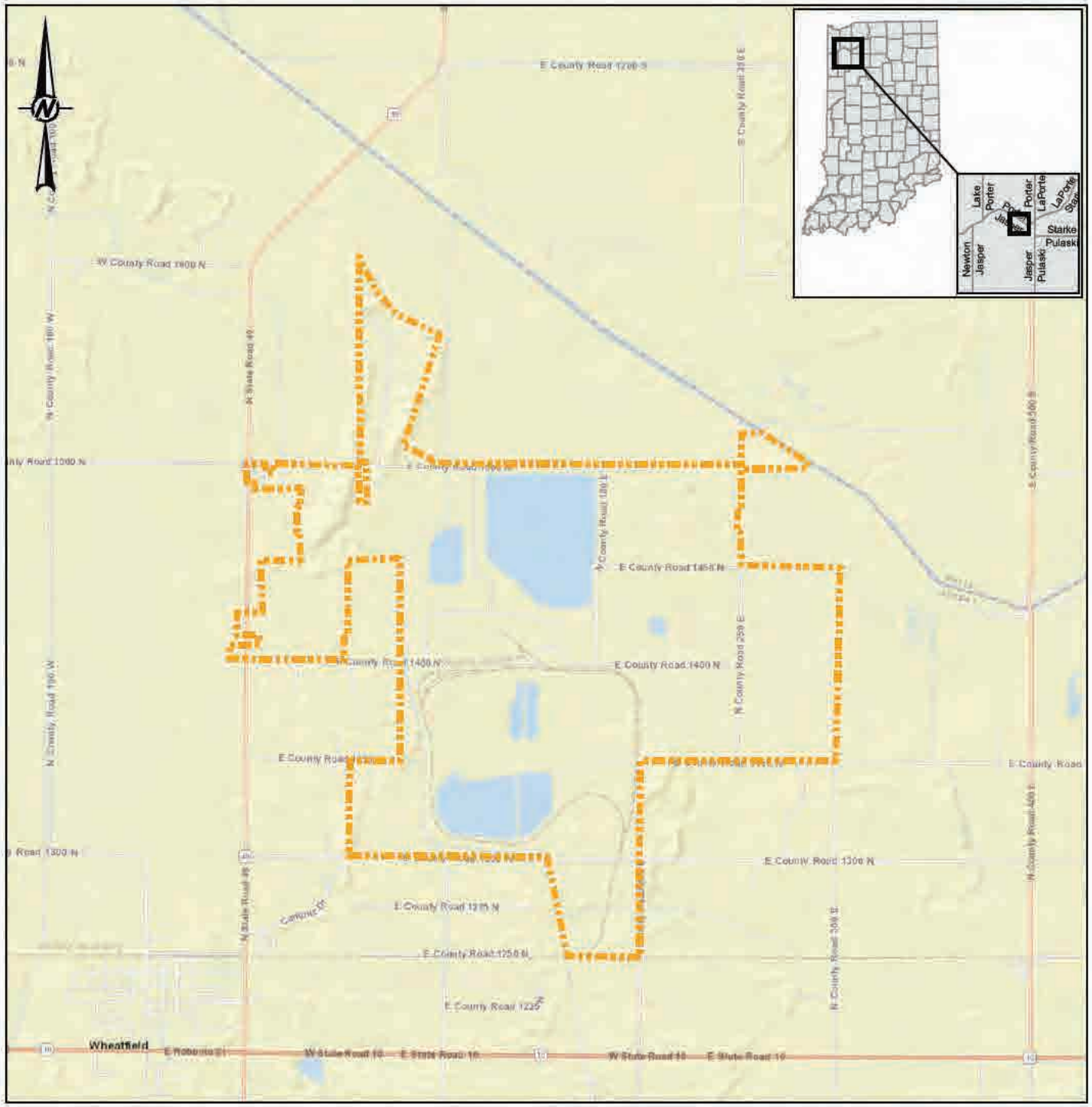
Notes:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
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SU = Standard Units

"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, NTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CH NA (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
19121567	A	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A



LEGEND

- Background Monitoring Well
- Downgradient Monitoring Well
- Generalized Groundwater Flow Direction
- CCR Units
- Approximate Property Line

0 400 800

1" = 400 feet

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

WELL LOCATION MAP
SCHAHFER LANDFILL PHASES V, VI, AND VII

GOLDER
MEMBER OF WSP

DESIGNED DFS
APPROVED MW

PROJECT NO. 19491567 | CONTROL A | REV. 0 | 2

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

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.

https://golderassociates.sharepoint com/sites/nipscoccrgwmonitoring/shared documents/rmsgs/reports/landfill asd recertifications/2021-march/draft/draft landfill asd recertification.docx

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.

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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.

https://golderassociates.sharepoint com/sites/nipscoccrgwmonitoring/shared documents/rmsgs/reports/landfill asd recertifications/2021-october/draft/draft landfill asd recertification docx



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APPENDIX G

Waste Disposal Area Alternative Source Demonstration- December 2020

Northern Indiana Public Service Company LLC (NIPSCO LLC)

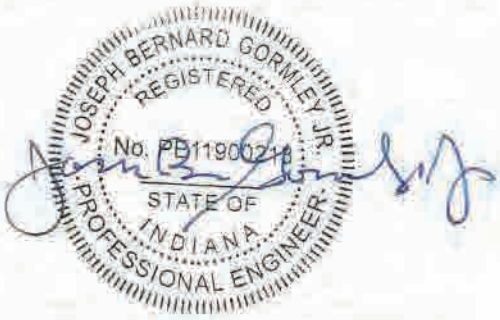
R. M. Schahfer Generating Station – Waste Disposal Area

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.

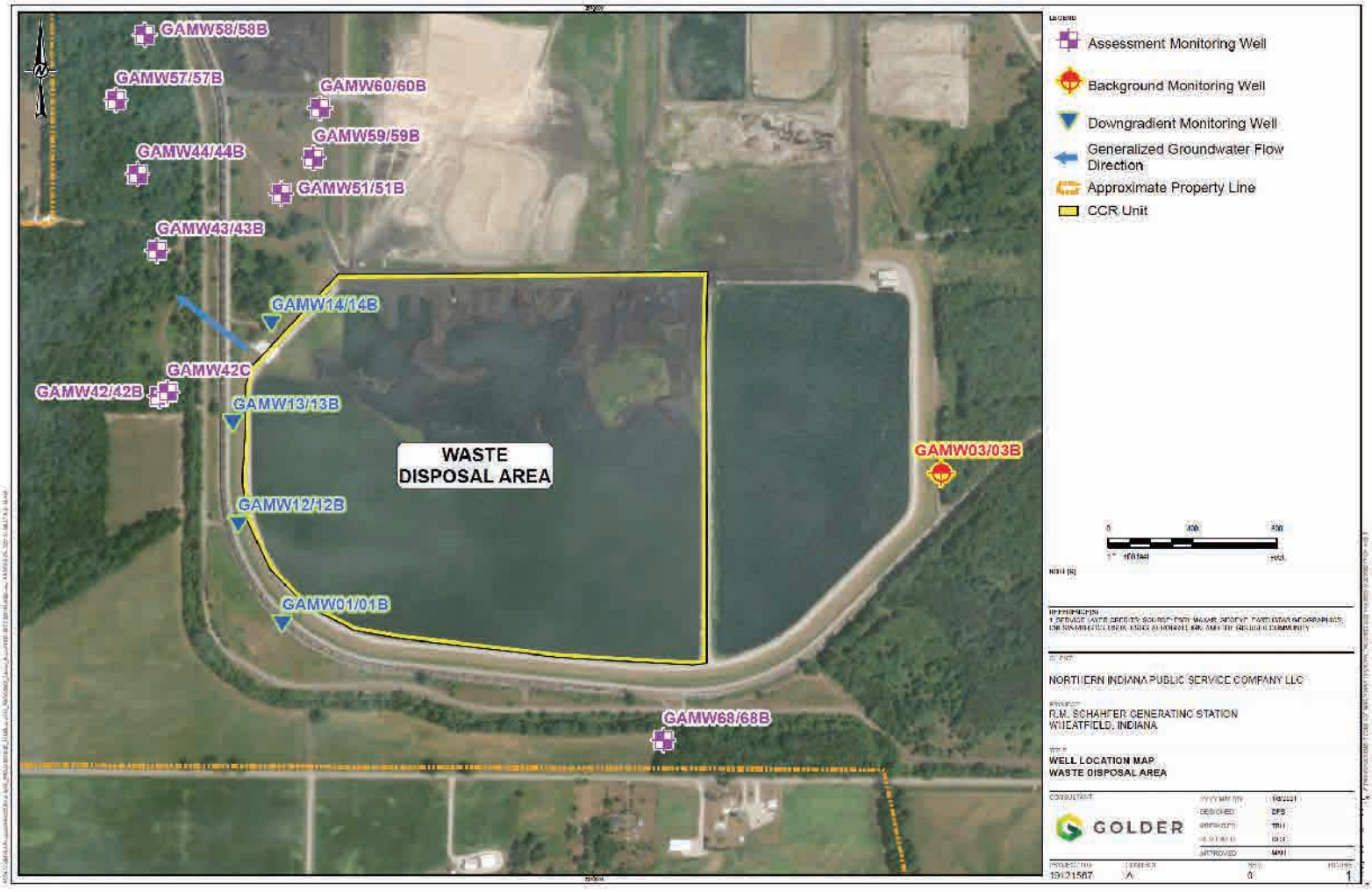
The 2020 WDA ASD discusses three primary lines of evidence: 1) the low concentrations of molybdenum in the WDA source materials and porewater, 2) the relative major ion abundance in groundwater that demonstrates a distinct difference between WDA porewater and downgradient groundwater samples, with no 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.

https://golderassociates.sharepoint com/sites/nipscoccrgwmonitoring/shared documents/rmsgs/reports/wda asd spring 2021/wda recertification 2021-05 docx


GAMW58/58B
GAMW57/57B
GAMW60/60B
GAMW59/59B
GAMW44/44B
GAMW51/51B
GAMW43/43B
GAMW14/14B
GAMW42C
GAMW42/42B
GAMW13/13B
WASTE DISPOSAL AREA
GAMW03/03B
GAMW12/12B
GAMW01/01B
GAMW68/68B
Assessment Monitoring Well
Background Monitoring Well
Downgradient Monitoring Well
Generalized Groundwater Flow Direction
Approximate Property Line
CCR Unit
NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA
WELL LOCATION MAP
WASTE DISPOSAL AREA
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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

GOLDER

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.

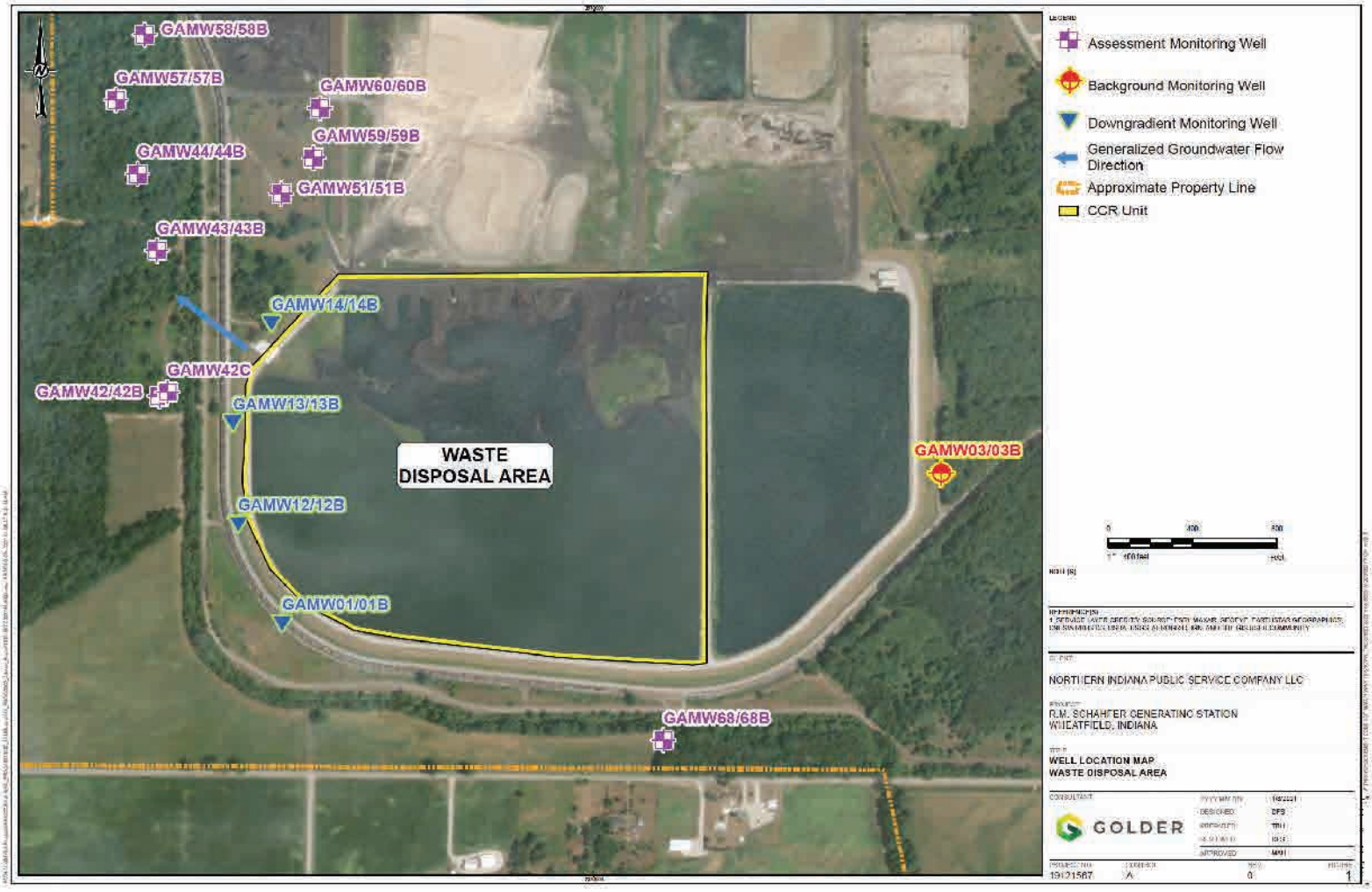
The information presented above confirms the results of the seventh Assessment Monitoring event are consistent with the previous Assessment Monitoring event, and the rationale presented in the June 9, 2020 ASD is still applicable. Golder prepared the current ASD in accordance with 40 CFR 257.95(g)(3) 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.


GAMW58/58B
GAMW57/57B
GAMW60/60B
GAMW59/59B
GAMW44/44B
GAMW51/51B
GAMW43/43B
GAMW14/14B
GAMW42C
GAMW42/42B
GAMW13/13B
WASTE DISPOSAL AREA
GAMW03/03B
GAMW12/12B
GAMW01/01B
GAMW68/68B
Assessment Monitoring Well
Background Monitoring Well
Downgradient Monitoring Well
Generalized Groundwater Flow Direction
Approximate Property Line
CCR Unit
NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA
WELL LOCATION MAP
WASTE DISPOSAL AREA
GOLDER
DESIGNED
DPS
APPROVED
MW
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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.

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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

Daniel Sullivan
Indiana Professional Engineer
License # 19600309



3-31-2021

Date

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. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

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

Exhibit 25B
Schahfer CCR Part A Demonstration
Addendum, Part 2

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.

https://golderassociates.sharepoint com/sites/nipscoccrgwmonitoring/shared documents/rmsgs/reports/landfill asd recertifications/2021-march/draft/draft landfill asd recertification.docx

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.

https://golderassociates.sharepoint com/sites/nipscoccrgwmonitoring/shared documents/rmsgs/reports/landfill asd recertifications/2021-october/draft/draft landfill asd recertification docx

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.

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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

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.

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”, October 26, 2021.

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

Submitted to:

Northern Indiana Public Service Company LLC
801 East 86th Avenue
Merriville, Indiana 46410

Submitted by:

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670 North Commercial Street, Suite 103
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20447130.01

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.
Indiana Professional Engineer
License #: PE11900213

7/29/2021
Date

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Acron ms

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 BAC GROUND

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 Ground ater 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.
- **Relia ilit** - 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 Re uirements** - Potential corrective measures were evaluated based on the time required to initiate, construct, and complete the remedy.
- **Institutional Re uirements** - 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 H draulic 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 H draulic 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 NE T 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.

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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	CAMW04																		
				2016-07-12	2016-09-08	2018-11-05	2017-01-30		2017-03-31	2017-04-25	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 Q	1.1	1	1.2	0.74	0.82	1.2	0.59			0.74	0.72	0.78	0.74	1.3	0.69	0.84
Calcium			mg/L	110	230	300 Q	270	240	230	220	200	200	140			140	140	210	130	290	115	112
Chloride			mg/L	8.6	27	69 Q	13	14	13	5.4	12	13	4.5			7.7 J	9.4	20	3.7	9.5	2	2
Fluoride	4	4	mg/L	0.92 J+	0.27	10 UQ	0.19 J	0.14 J	5 U	5 U	0.19 J	0.21 J	0.24 J	0.19 J	5 U	5 U	0.17 J+	0.26	0.19 J+	0.23	0.25	0.15
pH			SU	7.22	6.83	6.75		6.83	7.01	6.76	6.88	7.21	7.23		6.95		7.2	6.39	7	7.14		7.42
Sulfate			mg/l	140 J	460	188 Q	460	470	480	470	370	440	360			220	210	530	260	490	136	130
Total Dissolved Solids			mg/L	420	950	1400 Q	1000	1000	990	820	680	920	610			580 J	580	980	600	900	411	413
Appendix IV Parameters																						
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.00027 JQ	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	0.00095 J	0.00092 J	0.001 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0059	0.013	0.0052 Q	0.0059	0.0072	0.005 J	0.0059	0.012	0.012		0.004 J	0.005+			0.014	0.0025 J	0.0018 J	0.002	0.002
Barium	2	2	mg/L	0.051	0.027	0.11 Q	0.095	0.079	0.089	0.068	0.084	0.09		0.11	0.077			0.074	0.068	0.069	0.076	0.077
Beryllium	0.004	0.004	mg/L	0.00027 J	0.002 U	0.001 UQ	0.001 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	0.00059 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 UQ	0.001 U	0.001 U	0.001 U	0.001 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 JQ	0.00058 J	0.0057 J	0.002 U	0.002 U	0.002 U	0.002 U		0.0011 J	0.0017 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 JQ	0.0061	0.0058	0.0035	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	0.27	10 UQ	0.19 J	0.17 J	5 U	5 U	0.19 J	0.21 J	0.24 J	0.19 J	5 U	5 U	0.17 J	0.26	0.19 J+	0.23	0.25	0.15
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 UQ	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U	0.001 U			0.001 U	0.001 L	0.001 U	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0018 J	0.006 U	0.003 UQ	0.0021 J	0.0022 J	0.0033 J	0.0035 J	0.0062 J	0.0052 J		0.009 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 UQ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 J	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	0.006 J	0.023	0.003 Q	0.007	0.008	0.008	0.010	0.02	0.004		0.0049 J	0.004			0.009	0.024	0.026	0.022	0.022
Radium 226 + 228	5		pCi/L	1 U	0.583	0.697 Q	0.804	0.515 U	0.362 U	0.376 U	0.364 U	0.352 U		1.35 J+	0.778 J+			0.473	0.591		1.7 U	1.52 U
Radium 226			pCi/L	1 U	0.198 U	0.316 UQ	0.301 U	0.242 U	0.129 U	0.117 U	0.119 U	0.118		0.177	0.0681			0.208	0.311 U		0.78 U	0.613 U
Radium-228			pCi/L	1 U	0.498 U	0.495 UQ	0.677 J+	0.515 U	0.362 U	0.376 U	0.364 U	0.352 U		1.17 J+	0.69 J+			0.462 U	0.425		0.924 U	1.35 U
Selenium	0.05	0.05	mg/l	0.005 U	0.005 U	0.00084 JQ	0.00077 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	0.0059	0.001 U	0.001 U
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 UQ	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	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	7.03	2.05		1.32
Oxidation Reduction Potential			millivolts	59.6	-24	-6.9		-91.7	14	-56.8	-46	-27	-105.8		-181.8		-81.2	-66.1	19	-10.7		-28.6
pH			SU	7.22	6.83	6.75		6.83	7.01	6.76	6.88	7.21	7.23		6.95		7.2	6.39	7	7.14		7.42
Specific Conductivity			uS/cm	695	1345	1681		1109	919	1137	911	1153	813		962		770	1311	549	866		681
Temperature			deg C	13	17.3	16.3		10.5	8.05	13.2	13.1	15.9	16.1		7.55		3.5	15.5	4.2	13.3		9.3
Turbidity			NTU	1.01	1.48	2.91		9.26	1.06	4.04	1.88	1.85	0.51		4.02		3.12	1.69	8.48	1.38		3.57

Notes
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table 4-8 Screening Levels - 2021
Revision
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mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uSiem = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
"U" = Indicates the result was not detected above the method criterion, 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.
"Q" = Indicates a result was identified as an outlier and removed from the data set

GOLDER

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	CRMW07																
				2016-07-12	2016-09-08	2016-11-06	2017-01-10	2017-03-01	2017-04-26	2017-06-29	2017-08-23	2017-10-03		2018-03-15	2018-04-23	2018-06-26	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	0.81	0.91	1	0.98	0.97	0.98	0.71	0.72		1.2	1.1	0.85	0.85	0.87	0.87
Calcium			mg/L	170	180	200	170	170	190	220	190	220	220		210	230	220	180	230	211
Chloride			mg/L	4.8	6.6	6.3	6	6.6	6.8	8.1	8.2 J	8.1	8.1		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	0.86 J	0.66 J	0.76 J	0.79 J	0.56 J	1.1 J	0.93 J	0.58 J	0.57 J	0.73	0.97	0.89	0.69	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	6.71	7.2	7.44		7.3
Sulfate			mg/l	310 J	330	390	320	290	310	360	380	460	450		450	520	500	480	490	390
Total Dissolved Solids			mg/L	720	830	840	750	750	810	970	910	970	1000		900	920	1100	940	840	846
Appendix IV Parameters																				
Antimony	0.006	0.006	mg/L	0.00035 J	0.00035 J	0.00035 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	0.001 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.0013 J	0.0016 J	0.0019 J	0.0028 J	0.002 U	0.0026 J	0.0015 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	0.059	0.042	0.05	0.05	0.059	0.059			0.056		0.054	0.053	0.043	0.041	0.04
Beryllium	0.004	0.004	mg/L	0.00021 J	0.002 U	0.001 U	0.001 U	0.001 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	0.0013 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	0.00017 J	0.00016 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	0.0021 J
Cobalt		0.006	mg/L	0.0056	0.0077	0.0055	0.0038	0.0044	0.0065	0.01	0.0095			0.006		0.01	0.0074	0.0045	0.0053	0.0064
Fluoride	4	4	mg/l	0.72 J	0.91 J	0.8 J	0.86 J	0.66 J	0.76 J	0.79 J	0.56 J	1.1 J	0.93 J	0.58 J	0.57 J	0.73	0.97	0.89	0.69	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	0.036 U	0.036 U	0.0025 J	0.0031 J	0.0041 J	0.0027 J	0.0036 J			0.0024 J		0.0054 J	0.0041 J	0.0031 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 J	0.01 U	0.0085 J	0.0081 J	0.007 J			0.0066 J		0.009 J	0.0057 J	0.0087 J	0.0073	0.0073
Radium 226 + 228	5		pCi/L	1.59	0.696	0.543	0.412 U	0.42 U	0.371 U	0.45	0.588			0.749 J+		0.823 J+	0.37 J		1.62	2.01 U
Radium 226			pCi/L	0.667 U	0.289	0.371	0.237 U	0.186	0.155	0.212 U	0.3			0.163		0.183 U	0.305 U		0.653 U	1.16 U
Radium-228			pCi/L	0.923	0.408	0.462 U	0.413 U	0.42 U	0.371 U	0.262 U	0.453 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 T	0.003 T	0.005 U	0.008	0.0054	0.005			0.0028 T		0.0016 T	0.0045 T	0.0016 T	0.0017	0.0018
Thallium	0.002	0.002	mg/L	0.0001 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		0.0024 J	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																				
Dissolved Oxygen			mg/L	0.6	1.31	0.59	0.52	0.51	1.96	1.02	0.84		0.49	0.6	0.52	2.64	0.81	0.38		0.34
Oxidation Reduction Potential			millivolts	111.2	64.2	-6.9	-71.3	66.3	76.9	291.1	8.5		99.4	-55	-98.7	-233.8	195.1	-131.8		116.2
pH			SU	7.03	7.27	7.04	7.15	7.2	7.17	6.57	7.2		7.1	7.28	7.35	6.71	7.2	7.44		7.3
Specific Conductivity			uS/cm	986	1072	1106	928	832	1121	1151	1157		1273	760	1060	1240	975	829		1223
Temperature			deg C	14.4	15.2	16.7	12.8	10.65	11.8	14.6	16.5		18	10	10	16.95	18.3	15.3		10.5
Turbidity			NTU	1.6	4.53	1.06	3.2	1.76	2.17	3.87	6.9		0.49	1.3	1.75	1.08	2.72	1.58		2.2

Notes
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"U" = Indicates the result was not detected above the method criterion 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.
"R" = Indicates a result was identified as an outlier and removed from the data set

GOLDER

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	2017-06-27	2017-06-29	2017-08-23	2017-10-04	2018-03-14	2018-04-23	2018-10-26	2019-05-02	2019-11-07	2020-04-28
				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	22	28	15	11.1	5.5	3.9	2.2	3.4	1.8	3.2	2.9	2.2	3.7		3.4	1.8	1.4	2.5	3
Calcium			mg/L	370	430	380	400	370	310	290	300	260	270	310	340	270	290		380	220	250	280	309
Chloride			mg/L	10 UD	250	5.6	250	11.3	88	71	89	95	110	86	83	99	87		64	56	49	66	67
Fluoride	4	4	mg/L	10 UD	1.8	1.8	1.6	1.2	1.2 J-	1.2 J	0.78 J	0.87 J	0.94 J	0.52 J	1.3 J	2 J	0.68 J	1.2 J	1.3 J-	1.6	2.2	1.8	1.1 J-
pH			SU	8.39	6.78	7.58	7.13	7.73	6.92	7.03	6.85	7.02	7.09	6.83	7	7.27	6.89	7.41	7.42	6.99	7.37	7.5	7.35
Sulfate			mg/l	10 UD	1600	1500	1400	1260	770 J	690	683	610	830	770	800	690	670		800	460	640	670	710
Total Dissolved Solids			mg/L	2200	2600	920	2300	2_40	1500	1500	1800	1700	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	0.00078 J	0.00065 J	0.0014 J	0.00041 J	0.00048 J	0.002 U	0.00052 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	0.0025 J	0.0019 J	0.0017 J	0.0023	0.0018 J	0.0019 J	0.0016 J	0.0027 J	0.0026 J	0.0021 J	0.0017 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	0.058	0.053	0.048	0.044	0.068	0.065	0.068	0.09	0.056	0.064	0.074	0.077		0.060	0.069	0.052	0.058	0.060	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	0.006	0.004	0.008	0.007	0.05	0.037	0.047	0.02		0.022	0.027	0.011	0.0078	0.011	0.022
Fluoride	4	4	mg/l	10 U	1.8	1.8	1.6	1.2	1.2	1.2 J	0.78 J	0.87 J	0.94 J	0.52 J	1.3 J	2 J	0.68 J	1.2 J	1.3 J	1.6	2.2	1.8	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	0.003 U	0.0086	0.011	0.009	0.0088	0.0063	0.012	0.011	0.012		0.0098	0.009	0.011	0.015	0.0095	0.0057
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	0.029	0.026	0.026	0.004	0.006	0.004	0.02	0.019	0.029	0.049	0.083		0.056	0.058	0.059	0.09	0.069	0.048
Radium 226 + 228	5		pCi/L	3.63	2.62 J-	2.31		1.92 U	1.07	1.08	1.09	0.531	0.777	0.632	1.11	0.762		1.13 J+	0.99	1.1+	0.473		1.25 U
Radium 226			pCi/L	1.86	1.58 U	2.17		0.889 U	0.501 U	0.486	0.557	0.375	0.388	0.383	0.613 U	0.501		0.267	0.497	0.582 U	0.312 U		0.569 U
Radium 228			pCi/L	1.47	1.04	1.14		1.07	1 U	0.605	0.533	0.43 U	0.423 U	0.365 U	0.469	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	0.0045	0.0033 J	0.0014 J	0.0032 J	0.01	0.0058	0.0081		0.004	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	0.83	0.67	0.19	0.2	0.1	1.9	0.38	1.52	1.27	0.95	0.63	1.96	3.93	0.21	3.97	5.09	0.21	0.44	4.2	0.34
Oxidation Reduction Potential			millivolts	-147.6	-230.2	34.9	-196.7	-128.6	156.4	94.6	-8	98.4	49.9	60.4	242.6	61.8	-25.9	110.1	-106.4	22.7	62.2	44.1	92.5
pH			SU	8.39	6.78	7.58	7.13	7.73	6.92	7.03	6.85	7.02	7.09	6.83	7	7.27	6.89	7.41	7.42	6.99	7.37	7.5	7.35
Specific Conductivity			uS/cm	3178	3237	2357	1696	2722	1905	1807	1694	1517	1494	2088	1824	1713	1840	1121	1732	1440	1102	1322	2008
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	10.34	10.5
Turbidity			NTU	1.48	3.01	0.86	1.11	3.48	2.3	3.22	0.58	1.26	1.58	5.1	2.41	0.68	1.38	1.11	1.54	1.4	0.81	0.31	2.5

Notes:
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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 = Nephelometric 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.

"D" = indicates a result was identified as an outlier and removed from the data set.

GOLDER

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	CAMW05S							
				2018-09-07		2018-10-26		2019-05-03	2019-11-07	2020-04-2	
				FD	N	FD	N	N	N	FD	N
Appendix III Parameters											
Boron		4	mg/L		18		15	14	13		20.4
Calcium			mg/L		330		320	320	340		325
Chloride			mg/L		240		180	100	180		220
Fluoride	4	4	mg/L		1.6 J		1.5	1.8	1.7		2.5 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	0.026	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		0.007 U		0.007 U	0.007 U	0.007 U		0.007 U
Cobalt		0.006	mg/L		0.00668 J		0.001 U	0.001 U	0.001 U		0.001 U
Fluoride	4	4	mg/l		1.6 J		1.5	1.8	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		0.0059 J		0.0073 J	0.0063 J	0.0059 J		0.003 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	0.046		0.05
Radium-226 + 228	5		pCi/L		1.67 J+		1.02 J+	0.784			1.67 U
Radium-226			pCi/l		1.09 J+		0.596 J+	0.498			0.709 U
Radium-228			pCi/L		0.579		0.454 U	0.518 U			0.857 U
Selenium	0.05	0.05	mg/L		0.001 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
Field Parameters											
Dissolved Oxygen			mg/L		0.42		0.12	0.33	2.81		0.12
Oxidation Reduction Potential			millivolts		-185.5		-97	79	-67		-142.2
pH			SU		7.7		7.45	7.57	7.85		7.89
Specific Conductivity			uS/cm		2538		2375	2290	1896		3391
Temperature			deg C		14.6		14.5	12.8	8.05		13
Turbidity			NTU		3.4		1.63	1.72	0.86		9.51

Notes:
IDEM RCGs: Indiana Department of Environmental Management
Remediation Closure Guidance Table A-3 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 = Nephelometric 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.
"R" = indicates a result was identified as an outlier and removed from the dataset.

GOLDER

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW05																	
				2016-07-13	2016-09-08	2016-11-05	2017-01-10	2017-03-01		2017-04-25		2017-06-28	2017-08-23	2017-10-03	2018-03-14	2018-04-23	2018-10-25	2019-05-02		2019-11-07	2020-04-29
				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	5.2	5.7	6.0	5.8	6.1	4.8	7.9	7.3		4.8	6.3	6	6	2.7	3.3
Calcium			mg/L	220	240	210	210	200	200	220	240	270	280	220		220	220	200	200	150	170
Chloride			mg/L	63	55	58	58	58	75	73	71	67	63	59	54		56	52	46	36	34.3
Fluoride	4	4	mg/L	0.15 J-	10 U	10 U	0.22 J	0.13 J	0.14 J	0.10 J	0.13 J	0.18 J	0.10	0.21 J	5 U	0.20 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	7.05	7.15
Sulfate			mg/l	610 J	570	360	500	410	430	460	460	600	740	540		510	510 J	530	530	380	390
Total Dissolved Solids			mg/L	1500	1100	880	980	1000	950	1000	960	1300	1400	1,100		950	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 J		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	0.00976 J	0.0021 J	0.005 U	0.005 U	0.0029 J	0.0029 J	0.003 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	0.048	0.039	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	0.00052 J	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00036 J	0.002 U	0.001 U	0.001 U		0.001 UJ		0.00052 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	0.00069 J	0.0015 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	0.001 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	0.10 J	0.13 J	0.18 J	0.10	0.21 J	5 U	0.20 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	0.036 U	0.003 U	0.0016 J	0.0011 J	0.0022 J	0.003 U	0.036 U	0.0047 J	0.0013 J		0.008 U		0.008 U	0.008 U	0.008 U	0.008 U	0.003 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	0.004	0.012	0.004	0.003	0.003	0.003	0.003	0.002	0.003	0.002		0.025	0.006	0.04	0.043	0.043	0.035	0.012
Radium 226 + 228	5		pCi/L	1.5	0.588	0.477 U	0.467 U	0.55	0.459	0.593	0.414	0.707	0.803		1.45 J+	0.396	0.679	0.505	0.427 U		1.47 U
Radium 226			pCi/L	0.906 U	0.291	0.307 U	0.247	0.134	0.156	0.104	0.285	0.255 U	0.357		0.188	0.291	0.446	0.33	0.355 U		0.606 U
Radium-228			pCi/L	0.994	0.349 U	0.472 U	0.467 U	0.427 U	0.432 U	0.393	0.36 U	0.452	0.446		1.26 J+	-0.108	0.361 U	0.428 U	0.427 U		0.277 U
Selenium	0.05	0.05	mg/l	0.011	0.0091	0.0049 J	0.011	0.014	0.014	0.017	0.02	0.013	0.027		0.0082	0.017	0.0098	0.012	0.012	0.0077	0.0026
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	2.09	6.69	1.98	6.1		3.41		3.92	5.27	3.24	5.98	6.71	5.43	0.22		5.02	5.04	3.14
Oxidation Reduction Potential			millivolts	-1.4	75.7	270	230		98.5		154.6	280.8	58.9	138.5	-110.3	-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	7.05	7.15
Specific Conductivity			uS/cm	1671	736	1110	822		1041		1209	702	1542	1331	600	1155	1274		988	685	774
Temperature			deg C	14.4	18.4	16.9	11.8		10.75		11.9	14.7	17.2	18.2	13.2	10.9	17.9		11.4	15.9	10.3
Turbidity			NTU	1.93	3.03	7.15	1.84		3.12		1.88	5.01	0.91	0.36	0.82	2.94	2.47		1.41	1.55	2.37

Notes:
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table 4-6 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 = Nephelometric 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.
"R" = Indicates a result was identified as an outlier and removed from the data set

GOLDER

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	CAMW03B																	
				2016-07-13		2016-05-26	2016-12-09	2017-01-10	2017-03-01	2017-04-26	2017-08-28	2017-08-23		2017-10-05	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	19	11	11	11	12	16	19	19		14	12	12	14	14	8	6.1
Calcium			mg/L	280	280	270	190	200	170	170	180	160	190	150		160	150	160	150	150	150	140
Chloride			mg/L	210	180	190	130	110	120	130	150	170	160	140		150	130	150	240	140	110	110
Fluoride	4	4	mg/L	0.68 J+	0.62 J+	0.67 J	0.68 J	0.1 J	1.8 J	1.2 J	1.4 J	1.2 J	0.87 J	1.5 J	1.4 J	1.6 J	1.8 J	1.6	2.6	1.6	1.5	1.3
pH			SU		7.08	7.15	5.96	7.36	7.44	7.29	7.36		7.46	7.36	7.56	7.43	7.32	7.46		7.46	7.56	7.65
Sulfate			mg/l	670 J	1000 J	980	740	620 J+	550	570	610	630	650	650		430	570	580	610	570	440	387
Total Dissolved Solids			mg/L	2100	2000	2100	1700	1330	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	0.0011 U
Arsenic	0.01	0.01	mg/L	0.0024 J	0.0026 J	0.003 J	0.0014 J	0.0027 J	0.005 U	0.004 J	0.004 J	0.0031 J	0.0031 J		0.005+	0.0054	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	0.065	0.062	0.068		0.045	0.04	0.049	0.047	0.042	0.041	0.028	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	0.001 U
Cobalt		0.006	mg/L	0.001 U	0.001 U	0.00069 J	0.00026 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	0.00322 J	0.00025 J	0.001 U	0.001 U
Fluoride	4	4	mg/l	0.67 J	0.65 J	0.67 J	0.68 J	0.1 J	1.5 J	1.2 J	1.4 J	1.3 J	0.87 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	0.006 U	0.006 U	0.0046 J	0.0045 J	0.0058 J	0.0054 J	0.0047 J	0.0042 J		0.0051 J		0.0037 J	0.0052 J	0.0053 J	0.0052 J	0.0033 J	0.0016 U
Mercury	0.002	0.002	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 J	0.0002 U	0.0002 U	0.0002 J	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 J	0.0002 U
Molybdenum		0.1	mg/L	0.01 U	0.01 U	0.01 U	0.0097 J	0.003	0.005	0.005	0.01 U	0.0094 J	0.01		0.014	0.022	0.01	0.01	0.012	0.012	0.0096 J	0.013
Radium 226 + 228	5		pCi/L	1.42	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		1.25 U
Radium 226			pCi/L	0.809 U	0.952 U	0.902	0.579	0.176	0.585	0.316	0.781 U	0.585	0.706		0.482	0.301	0.653	0.69 U	0.585	0.449		0.556 U
Radium-228			pCi/L	1 U	0.913	0.743	0.559	0.42 U	0.538	0.458	1.07	0.421	0.563		0.699 J+	0.567	0.338	0.546	0.491 U	0.584		0.838
Selenium	0.05	0.05	mg/l	0.005 U	0.005 U	0.005 U	0.005 U	0.002 U	0.005 U	0.0014 J	0.001 U	0.0015 J	0.0016 J		0.005 U		0.002 U	0.0019 J	0.005 U	0.005 U	0.001+ U	0.001 U
Thallium	0.002	0.002	mg/L	0.0035 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	3.43	0.38	0.44	0.51	0.71		0.57	0.45	0.1	0.04	0.61	0.28		0.04	0.35	0.17
Oxidation Reduction Potential			millivolts		-67.7	97.3	-76.4	-100.1	-80.6	-102.6	68.2		19.7	-46.8	-121.6	-136.6	-209.5	-101.1		-16.8	-141.8	-130
pH			SU		7.08	7.15	5.96	7.36	7.44	7.29	7.36		7.46	7.36	7.56	7.43	7.32	7.46		7.46	7.56	7.65
Specific Conductivity			uS/cm		2356	2435	2088	1559	1352	1592	1561		1922	1722	1053	1391	1553	1693		1165	9.24	1418
Temperature			deg C		14.1	14.7	15.1	13.6	13.45	14.5	14.8		15.5	15	14	14.4	15.1	16		14.2	14.4	13.3
Turbidity			NTU		3.48	4.29	2.17	0.99	0.58	1.88	1.80		2.91	1.96	4.18	0.17	2.05	1.39		1.7	3.36	4.8

Notes
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table 4-8 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 = Nephelometric Turbidity Units
"U" = indicates the result was not detected above the method criterion 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.
"R" = indicates a result was identified as an outlier and removed from the data set

GOLDER

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	CAMW15														
				2016-07-13	2016-09-08		2016-11-05	2017-01-11	2017-03-02	2017-04-27	2017-06-29	2017-08-23	2017-10-13	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	0.76	0.45 J	1	1.1	0.6	0.44	0.45	0.87	0.91	0.66		0.72	0.79	0.71	0.75	0.68
Calcium			mg/L	130	130	120	100	82	91	95	150	150	77		170	120	140	100	120
Chloride			mg/L	28	31	31	27	28	27	27	27	25	14		24	21	22	28	25.2
Fluoride	4	4	mg/L	1.2 J+	0.85 J	0.89 J	0.74 J	0.8 J	0.77 J	0.74 J	0.82 J	0.82 J	0.88 J	0.67 J	0.76 J	0.69	0.92	0.75	0.9
pH			SU	6.83		6.98	6.83	6.86	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	250	150	240	140	160	330	330	260		110	240	380	260	227
Total Dissolved Solids			mg/L	570	660	630	520	400	400	420	730	750	650		790	5800 D	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	0.055	0.072	0.069	0.078	0.075	0.054	0.062	0.059	0.066			0.058		0.091	0.061	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	0.048			0.047		0.049	0.047	0.037	0.038
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	0.0012 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 U	0.001 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	0.0012 U
Chromium	0.1	0.1	mg/L	0.002 U	0.002 U	0.002 J	0.00027 J	0.00078 J	0.00059 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	0.89 J	0.74 J	0.8 J	0.77 J	0.74 J	0.82 J	0.82 J	0.88 J	0.67 J	0.76 J	0.69	0.92	0.75	0.9
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	0.036 U	0.008 U	0.009 U	0.004 J	0.0054 J	0.004 J	0.0058 J	0.005 J			0.0023 J		0.0054 J	0.0033 J	0.0027 J	0.005 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	0.0003 JB			0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002			0.002		0.002	0.002	0.002	0.001
Radium 226 + 228	5		pCi/L	1 U	0.479	0.513	0.546 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	0.282	0.145	0.337 U	0.38	0.177 U	0.1	0.0965 U	0.161			0.681 J		0.597 U	0.28 U		1.02 U
Radium-228			pCi/L	1 U	0.397 U	0.382 U	0.546 U	0.401 U	0.339 U	0.463 U	0.278 U	0.342 U			0.376 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	0.43		0.48	0.14	0.22	0.18	0.19	1	0.32	0.39	0.05	0.02	1.67	0.15	0.12	0.09
Oxidation Reduction Potential			millivolts	-79.2		-60.1	-111	-114.3	-124.5	-108.4	-46.9	-43.7	-358	-568	-99.1	-254.7	-27.6	-103	-103.9
pH			SU	6.83		6.98	6.83	6.86	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	790	598	950
Temperature			deg C	15.3		23.3	19.9	14.6	12.1	11.6	14.6	16.6	13.5	10.3	10.6	17.1	9.3	15.8	11.5
Turbidity			NTU	4.48		8.06	3.91	3.98	4.4	4.92	5.2	3.1	1.57	3.08	1.29	3.1	4.9	6.9	0.51

Notes:
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table 4-8 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 = Nephelometric Turbidity Units

"U" = indicates the result was not detected above the method criterion 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.

"non" = indicates the result was not detected above the MDL; the estimated RL is provided.
"D" = indicates a result was identified as an outlier and removed from the data set.

GOLDER

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	2016-11-05	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	N	FD	N	N	N	FD	N	N
Appendix III Parameters																						
Boron		4	mg/L	1.1	1.2	2	1.7	1.3	1.6	1.5	2.1	2.1		4.4	4.1		4.9	10		9.2	7.9
Calcium			mg/L	160	160	160	180	160	170	190	170	73		230	200		210	260		280	270
Chloride			mg/L	52	55	62	81	64	65	72	64	64		87	89		90	120		80	104
Fluoride	4	4	mg/L	0.69 J+	0.62 J	0.76 J	0.74 J	0.77 J	0.78 J	0.72 J	0.82 J	0.65 J	0.68 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	7.3		6.74	7.43		7.57	7.56
Sulfate			mg/l	980 J	960	840	900	890	930	930	920	500		790	720		770	1300		910	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	0.0051 J	0.0014 J	0.0022 J	0.0011 J	0.00093 J	0.00084 J	0.00081 J		0.005 U		0.005 U		0.005 U	0.00098 J		0.005 U	0.001 U
Barium	2	2	mg/L	0.054	0.053	0.059	0.056	0.051	0.062	0.064	0.069		0.068		0.07		0.064	0.081		0.064	0.064
Beryllium	0.004	0.004	mg/L	7.6E-05 J	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.002 U		0.001 U		0.001 U	0.001 U		0.001 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.002 U		0.001 U		0.001 U	0.001 U		0.001 U	0.0002 U
Chromium	0.1	0.1	mg/L	0.00065 J	0.002 U	0.002 U	0.00053 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	0.002 U	0.001 U	0.001 U	0.00016 J	0.001 U	0.001 U	0.001 U		0.002 U		0.001 U		0.001 U	0.001 U		0.001 U	0.001 U
Fluoride	4	4	mg/l	0.69 J	0.62 J	0.76 J	0.74 J	0.77 J	0.78 J	0.72 J	0.82 J	0.65 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	0.002 U	0.00023 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.002 U		0.001 U		0.001 U	0.001 U		0.001 U	0.001 U
Lithium		0.04	mg/L	0.0038 J	0.036 U	0.003 U	0.0077 J	0.0023 J	0.0062	0.0063	0.0077 J		0.027 J		0.006		0.0066	0.012		0.0062	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 J		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	0.011	0.014	0.014	0.012		0.012		0.01		0.011	0.012		0.01	0.012
Radium 226 + 228	5		pCi/L	1.25	0.534	0.81	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	0.807 U	0.412	0.361 U	0.785	0.491	0.443	0.493 U	0.517		0.752		0.711		0.837 U	1.03			0.668 U
Radium-228			pCi/L	1 U	0.389 U	0.469 U	0.363 U	0.435	0.378 U	0.329 U	0.363 U		0.94 J+		0.803		0.678	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	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.002 U		0.001 U		0.001 U	0.00083 J		0.001 U	0.001 U
Field Parameters																						
Dissolved Oxygen			mg/L	0.22	0.91	0.56	0.22	0.48	0.3	0.43	0.54	0.23	0.09	0.04	0.29		2.66	0.23		0.16	0.16
Oxidation Reduction Potential			millivolts	-129.2	-21.6	-94.6	-152.6	-81.7	-49.6	-21.9	-36.5	-42.6	-64	-103.4	-92.2		-26.1	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	7.3		6.74	7.43		7.57	7.56
Specific Conductivity			uS/cm	834	1049	1060	1237	940	1096	1099	1110	1295	1255	1612	2757		2889	1798		1384	2359
Temperature			deg C	17.71	15.9	16.1	13.8	13.6	13	13.8	14.2	14.5	13.3	13	14.13		13.6	9.1		13.8	13.9
Turbidity			NTU	1.93	1.58	1.46	3.6	2.23	8.65	3.16	1.78	0.4	4.59	4.85	3.59		1.35	3.56		1.49	4.3

Notes:
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table 4-6 Screening Levels - 2021
Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
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pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units.

"U" = Indicates the result was not detected above the method criterion 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.
"R" = Indicates a result was identified as an outlier and removed from the data set.

GOLDER

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GANW16																	
				2016-07-13	2016-09-08	2016-11-06	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		2019-05-08	2019-11-08		2020-04-13
				N	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	0.85	1.3	1	1.4	1.1		1.3	1.4	1.4	1.6		1.8	1.1	
Calcium			mg/L	230	160	230	120	160	210	220	240	57		220	160	160	210		210	202	
Chloride			mg/L	53	37	50	28	24	25	29	31	42		58	36	36	26		59	25.9	
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	7.13	7.48	7.5	7.58	7.17	7.36	7.36	7.62	7.41	7.67			7.28		7.8	7.79	
Sulfate			mg/l	530	400	500	470	300	530	580	680	520		530	340		350		530	757	
Total Dissolved Solids			mg/L	1100	810	790	570	570	930	1000	1100	950		1100	740		730		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	0.0064	0.0078	0.006	0.006	0.0096		0.0021 J	0.0095	0.01	0.0069	0.005		0.0092	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	0.044		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	0.00065 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	0.00052 J	0.00094 J	0.001 U		0.001 U		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	0.039 U	0.039 U	0.00623 J	0.003 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 U	0.0002 U		0.0002 U	0.0002 U	
Molybdenum		0.1	mg/L	0.024	0.036	0.043	0.044	0.03	0.027	0.023	0.024		0.027	0.021	0.035	0.031	0.027		0.028	0.022	
Radium 226 + 228	5		pCi/L	1.68	0.543	0.527 U	0.626 U	0.648	0.392 U	0.339 U	0.429		0.852 J+	0.29	0.863 J+	1.32 J+	0.685 U			1.69 J	
Radium 226			pCi/L	0.532 U	0.249	0.363 U	0.256 U	0.120 U	0.091	0.106 U	0.216		0.1	0.0822	0.214 U	0.238 U	0.227 U			0.641 U	
Radium-228			pCi/L	1.14	0.335 U	0.527 U	0.626 U	0.528	0.392 U	0.339 U	0.322 U		0.752 J+	0.208	0.648 J+	1.04 J+	0.685 U			1.05 J	
Selenium	0.05	0.05	mg/l	0.005 U	0.005 U	0.0005 J	0.00053 J	0.003 U	0.0012 J	0.005 U	0.005 U		0.005 U		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	0.46	0.31	0.36	0.14	0.5	0.14	0.05	0.22	0.22		1.27	0.29		4.02	0.19	
Oxidation Reduction Potential			millivolts	-13.06	71.6	-124.8	-78.8	-126.9	-63.6	-114.2	9.5	-138.4	-55.8	-106.5		-216.8	8		-2	-124.8	
pH			SU	7.92	7.13	7.48	7.5	7.58	7.17	7.36	7.36	7.62	7.41	7.67		7.28	7.46		7.8	7.79	
Specific Conductivity			uS/cm	1331	1112	807	751	921	1257	1123	1406	1254	1029	1239		1046	1001		2014	1880	
Temperature			deg C	15.02	16.8	18.15	12.1	9.72	13.6	15.41	18	17.3	8.71	9.3		17.81	10.5		27.52	10.3	
Turbidity			NTU	8.80	2.16	1.68	3.16	1.14	8.05	4.83	2.45	4.05	4.62	12.51		3.64	1.65		4.68	8.11	

Notes:
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Remediation Closure Guidance Table 4-6 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 = Nephelometric 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.
"FD" = indicates the result was not detected above the MDL; the estimated RL is provided.
"R" = Indicates a result was identified as an outlier and removed from the data set

GOLDER

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GMW183																
				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	2018-08-07	2018-10-29	2019-05-06	2018-11-08	2020-04-14
				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	1.6	1.6	1.4	1.4	1.4	1.4	1.1	1.4	1.5	1.9		1.1	1.0	0.7	1.2	1.1	1.0	0.2
Calcium			mg/L	230	190	190	180	210	210	270	220	260	190		250	310	350	350	280	200	230
Chloride			mg/L	93	96	97	99	97	97	71	71	120	78		140	160	150	190	120	210	122
Fluoride	4	4	mg/L	1.1 J+	1.1 J	0.84 J	0.83 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	7.75	7.47		7.41	7.57	7.55	7.3	7.51	7.28	7.54	7.6	7.55	7.67	7.02	7.49		7.85	7.73
Sulfate			mg/l	580 J	480	500	440	58 C	490	730	720	540	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 JD	1600	1800	2400	2400	1860
Appendix IV Parameters																					
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.00957 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	0.0058	0.0064	0.011	0.011	0.012	0.0097	0.012	0.0056	0.0081		0.0099	0.0097	0.011	0.0088	0.0071	0.0079	0.0078	0.008
Barium	2	2	mg/L	0.072	0.04	0.039	0.035	0.038	0.039	0.056	0.043	0.046		0.053	0.088	0.068	0.043	0.079	0.055	0.064	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	0.00199 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		0.00033 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	0.83 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	0.036 U	0.0032 J	0.0022 J	0.0058 J	0.0035 J	0.0072 J	0.006 J	0.0051 J		0.007 J		0.0059 J	0.0038 J	0.007 J	0.0054 J	0.0055 J	0.003 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	0.0003 JD		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	0.028	0.016	0.013		0.016	0.015	0.012	0.011	0.014	0.02	0.029	0.017
Radium 226 + 228	5		pCi/L	1.31	1.05	0.866	0.794	0.993 J+	0.577	1.23	0.795	1.21		1.11 J+	0.99	1.17 J-	1.64 J+	0.584			1.5 U
Radium 226			pCi/L	0.651 U	0.458	0.427	0.413 U	0.502	0.348	0.835	0.54 U	0.559		0.448	0.535	0.591 U	0.719 U	0.783			0.673 U
Radium-228			pCi/L	0.68	0.59	0.467 U	0.435 U	0.491 J+	0.369 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	0.23	0.25	1.02	4.21	0.33		3.42	0.14
Oxidation Reduction Potential			millivolts	-122.6	-89		-126.3	-148.5	-132.2	-139.2	-123.1	-32.7	-136.8	-75.5	-127.6	-101.5	-106.8	81.2		-99.5	-129.6
pH			SU	7.75	7.47		7.41	7.57	7.55	7.3	7.51	7.28	7.54	7.6	7.55	7.67	7.02	7.49		7.85	7.73
Specific Conductivity			uS/cm	1147	1297		1158	1230	1192	1645	1353	1665	1485	1142	1653	3104	2098	1692		2540	2595
Temperature			deg C	13.04	14.44		15.27	14.3	13.37	12.3	13.48	14.3	15	12.5	12.3	15	13.7	11.2		14.65	13
Turbidity			NTU	0.1	3.09		1.8	2.76	4.21	4.58	3.22	3.48	3.8	4.08	4.2	4.69	3.48	3.22		0.8	6.61

Notes
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table 4-6 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 = Nephelometric 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.
"D" = indicates a result was identified as an outlier and removed from the data set

GOLDER

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GANW17															
				2016-02-14	2016-09-08	2016-11-06	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
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	130	120	150	64			110	110	200	130	120	160
Chloride			mg/L	110	100	130	150	140	81	100	160	100			60	58	150	90	92	100
Fluoride	4	4	mg/L	1.8 J+	2.0 J	2.0	1.9 J	1.6 J	1.6 J	0.79 J	1.8 J	2.4 J	5.0	1.7 J	1.9 J	1.9 J+	1.7	1.6	1.7	1.8 J+
pH			SU	7.56	7.27	7.21	7.33	7.54	7.23	7.4	7.16	7.12		7.62		7.82	6.85	7.53	7.75	7.54
Sulfate			mg/l	230 J	330	360	380	390	390	520	250	350			240	220	210	300	290	260
Total Dissolved Solids			mg/L	940	920	940	1000	1100	950	1400	890	1000			630	620	1100	800	880	1120
Appendix IV Parameters																				
Antimony	0.006	0.006	mg/L	0.00054 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	0.002 U
Arsenic	0.01	0.01	mg/L	0.0054	0.0056	0.0042 J	0.0069	0.0059	0.0054	0.0015 J	0.0026 J		0.005 U	0.0027 J			0.0041 J	0.0021 J	0.0029 J	0.0023
Barium	2	2	mg/L	0.057	0.056	0.054	0.05	0.054	0.048	0.044	0.06		0.042	0.058		0.029	0.073	0.041	0.052	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	0.00076 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	0.0017 J	0.0011 J	0.0017 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
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	2.0 J	2.1	1.9 J	1.6 J	1.6 J	0.79 J	1.9 J	2.4 J	5.0	1.7 J	1.9 J	1.9 J	1.7	1.6	1.7	1.8 J
Lead	0.015	0.015	mg/L	0.00038 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	0.006 U	0.0038 J	0.0047 J	0.0014 J	0.0045 J	0.0058 J	0.0076 J		0.006 U	0.0035 J			0.0066 J	0.0035 J	0.0052 J	0.006 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
Molybdenum		0.1	mg/L	0.015	0.012	0.011	0.01 J	0.01	0.011	0.016	0.024		0.024	0.024		0.02	0.017	0.017	0.02	0.03
Radium 226 + 228	5		pCi/L	0.559	0.451 U	0.447 U	0.553 U	0.428	0.477	0.403 U	0.72		0.816 J+	0.384 U		0.205	1.1 J+	0.518 U		1.53 U
Radium 226			pCi/l	0.17	0.331	0.415 U	0.246 U	0.202	0.23	0.191 U	0.515		0.282	0.112		0.0399	0.315 U	0.26 U		0.783 U
Radium-228			pCi/L	1 U	0.451 U	0.447 U	0.553 U	0.402 U	0.408 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	0.026	0.026	0.0081	0.0032 J		0.0074	0.031		0.015	0.022	0.0041	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	0.00083 J	0.001 U	0.001 U
Field Parameters																				
Dissolved Oxygen			mg/L	2.79	1.7	1.8	1.01	2.35	7.33	0.18	4.33	3.2		4.96		9	1.78	5.75	6.47	3.15
Oxidation Reduction Potential			millivolts	45.8	826.9	6.1	82.3	6.6	67.9	23.3	8	66.9		-90.2		-98.2	-23	53.1	65	25.2
pH			SU	7.56	7.27	7.21	7.33	7.54	7.23	7.4	7.16	7.12		7.62		7.82	6.85	7.53	7.75	7.54
Specific Conductivity			uS/cm	1059	1237	1141	1272	1541	1290	902	1152	1357		832		675	1523	894	798	1017
Temperature			deg C	17.23	20.6	13.63	13.6	10.55	11.8	17.71	14.4	22.3		10.5		11.4	20	12.1	12.23	9.31
Turbidity			NTU	1.56	1.09	0.58	2.58	2.41	2.21	1.02	1.5	2.51		0.51		1.19	0.45	0.11	0.86	0.73

Notes:
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table 4-8 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 = Nephelometric Turbidity Units

"U" = Indicates the result was not detected above the method criterion, 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.
"R" = Indicates a result was identified as an outlier and removed from the data set.

GOLDER

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMWL7E															
				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	2019-05-05	2019-11-08	2020-04-24
				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		160	150	150	160	150	141
Chloride			mg/L	180	170	180	190	200	200	71	99	140		140	120	110	130	110	111
Fluoride	4	4	mg/L	0.9 J+	0.88 J	0.98 J	0.98 J	0.9 J	0.8 J	2.1 J	1.8 J	1.1 J	0.55 J	0.58 J	0.84 J	0.71	0.82	0.67	0.68 J+
pH			SU	7.43	7.37	7.1	7.24	7.44	7.03	7.25	7.19	7.38	7.48	7.39	7.53	7.4	7.15	7.66	7.22
Sulfate			mg/l	710 J	680	710	740	710	680	800	380	170		570	850	850	770	850	811
Total Dissolved Solids			mg/L	1500	1400	1400	1600	1700	1500	660	1000	950		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	0.0025 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	0.078	0.086	0.092	0.1	0.089	0.065	0.06		0.085	0.069	0.069	0.079	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	0.000033 J	0.001 U	0.0002 U
Cadmium	0.005	0.005	mg/L	0.001 U	0.001 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
Chromium	0.1	0.1	mg/L	0.002 U	0.002 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		0.006	mg/L	0.001 U	0.001 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.001 U		0.0033 J	0.001 U	0.001 U	0.001 U	0.001 U
Fluoride	4	4	mg/l	0.9 J	0.88 J	0.98 J	0.98 J	0.9 J	0.8 J	2.1 J	1.8 J	1.1 J	0.55 J	0.58 J	0.84 J	0.71	0.82	0.67	0.68 J
Lead	0.015	0.015	mg/L	0.001 U	0.001 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		0.04	mg/L	0.0017 J	0.008 J	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 U		0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum		0.1	mg/L	0.004	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	1.35	1.94	1.08	2.4		1.64 J+	1.21	1.47	2.43 J-	1.71		1.74
Radium 226			pCi/l	0.882 U	0.861	1.28	1.3	1.01	1.06	0.833 U	1.867		0.799	0.618	0.975	1.45 J-	0.966		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+	0.596	0.524	1.53 J-	0.748		1.12
Selenium	0.05	0.05	mg/l	0.005 U	0.005 J	0.005 U	0.00053 J	0.0051 J	0.005 U	0.005 U	0.005 U		0.005 U		0.001 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 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	0.00022 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	3.14	0.09	0.16	0.11	0.2	0.83	0.22	4.2	0.2
Oxidation Reduction Potential			millivolts	-115	664	-100.8	-119.6	-91.8	102.8	-93.6	-51.1	-129.4	-95.2	-191.9	-83.9	-244.5	11.8	-5.9	-95.1
pH			SU	7.43	7.37	7.1	7.24	7.44	7.03	7.25	7.19	7.38	7.48	7.39	7.53	7.4	7.15	7.66	7.22
Specific Conductivity			uS/cm	1525	1734	1568	171.9	2251	1950	488	1244	1537	1235	1453	2072	1380	1060	890	920
Temperature			deg C	15.23	15.16	15.77	15	14.3	14.4	15.62	16.5	16.6	15.2	15.2	16.55	16.1	13.6	15.05	13.12
Turbidity			NTU	1.09	2.48	6.62	0.92	0.58	2.11	2.35	1.86	3.45	3.76	3.88	8.55	4.85	3.81	2.68	4.58

Notes:
IDEM RCGs= Indiana Department of Environmental Management
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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 = Nephelometric 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.
"R" = indicates a result was identified as an outlier and removed from the data set.

GOLDER

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	N
Appendix I I I 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																						
Ant mony	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
Bar um	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
Cadm um	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

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 Un ts

"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 resu t 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.

GOLDER
MEMBER OF WSP

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	CAMW13B						CAMW45								
				2018-09-10	2018-12-05		2019-04-25	2019-11-07	2020-04-23	2018-06-13	2018-09-12	2018-12-07	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	10.8	0.065 J0	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	190	299	56 O	14	28	15 J-	35	35	23	27	24.5
Chloride			mg/L	150	140	140	170	140	217	8.4 O	2.4	1.9		1.6	1.6	1.6	1.6	1.6
Fluoride	4	4	mg/L	0.77 J	0.74	0.73	0.89	0.89	0.91	0.052 J0	0.008	0.063		0.095	0.09	0.079 J+	0.082	0.082
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	1230	65 O	31	50		28	26	30	27	24.7
Total Dissolved Solids			mg/L	2100	2000	2200	2100	1500	2060	280 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 J	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	0.0028 J	0.0026 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	0.002 U	0.001 U
Barium	2	2	mg/L	0.048	0.035	0.038	0.049	0.024	0.041	0.027 O	0.0028 J	0.00159	0.0065	0.0064	0.0064	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 J	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 J	0.002 U	0.002 U	0.002 U	0.002 UO	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.0024 J	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.00927 J	0.00926 J	0.00838 J	0.00924 J	0.00924 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	0.89	0.91	0.052 JO	0.008	0.063		0.095	0.09	0.079 J+	0.082	0.082
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	0.009 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	0.014	0.014	0.015	0.016	0.011	0.019	0.0051 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	0.488 U	0.33 U		0.427 U	0.535 U	0.568		1.7 J
Radium 226			pCi/l	0.773 U	0.717	0.748	0.41		0.882 U	0.244 UO	0.103 U	0.0708 U		0.214 U	0.0925 U	0.179 U		0.741 U
Radium-228			pCi/L	0.928	0.562	0.708	0.945		0.821 U	0.384 UO	0.488 U	0.33 U		0.427 U	0.535 U	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 UO	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 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	2.12	1.85	4.18	6.44	6.59	4.03	2.44	3.36	3.42
Oxidation Reduction Potential			millivolts	-148.2		-103.4	109.2	-144.8	-77.7	-171.4	1.9	67	169.6	256	40.6	9.10	-141.1	125.0
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	11.5	13.2	14.2	14.8	11.7	8.3
Turbidity			NTU	3.78		8.58	3.21	8.14	2.35	3.96	1.91	1.33	0.5	0.8	0.69	0.89	0.66	2.18

Notes
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table 4-6 Screening Levels - 2021
Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uSiem = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units

"U" = indicates the result was not detected above the method criterion, 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.
"R" = indicates a result was identified as an outlier and removed from the data set

GOLDER

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW4B										GAMW5S					
				2018-05-15	2019-03-04	2019-04-17	2019-06-07	2019-07-18	2019-08-26	2019-10-04	2019-11-19	2020-04-21	2018-10-10	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	0.027 J	0.049 J	0.03 J	0.05 J	0.047 J	0.046 J	0.1 U	0.39		0.14	0.077 J		0.15	0.1 U
Calcium			mg/L	55 D	58	59	56	52	59	48	56	53.9	55		59	52		72	48.3
Chloride			mg/L	8 D	7.9	7.8		7.2	8	7.1	6.8	6.6	34		9.2	6.8		37	32
Fluoride	4	4	mg/L	0.048 JD	0.066	0.076		0.062	0.069	0.073 J+	0.072	0.084	0.39 J		0.3	0.29 J+		0.3	0.25
pH			SU	8.3	7.11	7.59	7.58	8.16	7.62	7.44	7.47	8.03	7.5		7.06	7.17		7.59	7.98
Sulfate			mg/l	59 D	61	61		61	68	65	67	58.8	86		39	34		67	71.8
Total Dissolved Solids			mg/L	150 D	280	290		240	320 J	250	240	209	400		250	240		350	295
Appendix IV Parameters																			
Antimony	0.006	0.006	mg/L	0.002 UD	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	0.00976 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	0.0096 O	0.027	0.029	0.025	0.025	0.024	0.021	0.025	0.026	0.039		0.015	0.015		0.02	0.015
Beryllium	0.004	0.004	mg/L	0.001 UD	0.0011	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0011	0.00052 U	0.002 U		0.001 U	0.002 U		0.001 U	0.00052 J
Cadmium	0.005	0.005	mg/L	0.001 UD	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 J
Chromium	0.1	0.1	mg/l	0.007 D	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	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 JD	0.066	0.076		0.062	0.069	0.073 J+	0.072	0.084	0.39 J		0.3	0.29 J+		0.3	0.25
Lead	0.015	0.015	mg/L	0.001 UD	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	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	0.009 UD	0.0017 J	0.003 U	0.008 U	0.002 J	0.008 U	0.008 U	0.003 J	0.008 U	0.0027 J		0.008 U	0.008 U		0.0025 J	0.008 U
Mercury	0.002	0.002	mg/L	0.0002 UD	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U		0.0002 U	0.0002 U		0.0002 U	0.0002 J
Molybdenum		0.1	mg/L	0.0018 JO	0.0024 J	0.0022 J	0.0025 J	0.00228 J	0.0026 J	0.0025 J	0.003 J	0.0021	0.005 J		0.0035 J	0.0026 J		0.0017 J	0.0012
Radium 226 + 228	5		pCi/L	0.392 UD	0.402 U	0.308 U		0.427 U	0.609 U	0.408 U		1.68 U	0.796		1 U	0.53 U			1.64 J
Radium 226			pCi/l	0.273 UD	0.286	0.108		0.332 U	0.205 U	0.192 U		0.881 U	0.796 U		0.296 U	0.056			0.736 U
Radium-228			pCi/L	0.392 UD	0.402 U	0.308 U		0.427 U	0.609 U	0.408 U		1.15	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	0.003 U	0.005 U	0.005 U	0.005 U	0.001 U	0.005 U		0.0014 J	0.0014 J		0.0011 J	0.001 U
Thallium	0.002	0.002	mg/L	0.001 UD	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	2.09	0.09	1.8	0.2	1.4	1.25	0.31	0.3	0.17	0.49		0.21	6.42		2.2	5.9
Oxidation Reduction Potential			millivolts	-29.4	111.9	-111.1	-135.1	-93.9	-119.9	33.7	-229.6	-137.4	-30.3		35.1	108.2		-43.8	166.6
pH			SU	8.3	7.11	7.59	7.58	8.16	7.62	7.44	7.47	8.03	7.5		7.06	7.17		7.59	7.98
Specific Conductivity			uS/cm	211	268	294	282	274	284	260	242	405	0.396		448	368		320	389
Temperature			deg C	11.3	8.6	10.8	11	11.5	12.3	12.3	11.3	10	19.37		17.6	14.2		15.5	10.8
Turbidity			NTU	8.45	3.26	4.9	3.25	3.11	1.75	1.16	2.84	8.02	0.45		0.83	0.42		0.71	1.57

Notes:
IDEM RCGs= 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 = Nephelometric Turbidity Units

"U" = indicates the result was not detected above the method criterion 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 a result was identified as an outlier and removed from the data set.

GOLDER

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	2019-05-06	2019-11-14	2020-04-30	2018-09-12	2018-10-31	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
Appendix III Parameters																		
Boron		4	mg/L	0.76	0.8	1	1.5	0.77	0.19	0.25	0.056 J	0.13	0.1 U	2.5		3.1	2.2	0.73	3.4
Calcium			mg/L	160	160	140	130	129	45	53	47	25	32	100		100	150	140	103
Chloride			mg/L	330	470	380	370	390	6.9	6.6	6.9	3.6	4.8	88		86	81	74	107
Fluoride	4	4	mg/L	0.18 U	0.18	0.21 J+	0.23	0.26	0.27 J	0.17	0.05 U	0.05 U	0.05 U	0.52 J		0.49	0.52	0.7	0.48
pH			SU	8.3	7.1	7.42	7.34	7.6	8	6.47	5.93	6.21	6.42	7.3		7.35	7.45	7.52	7.48
Sulfate			mg/l	210	160	220	280	216	51	56	32	38	32.5	430		510	340	320	488
Total Dissolved Solids			mg/L	1500	1200	1100	1100	1260	240	250	130	160	161	1100		1100	900	770	1050
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 J	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	0.012	0.00097 J	0.0018 J	0.0015	0.00379 J		0.00083 J	0.001 J	0.0016 J	0.0028
Barium	2	2	mg/L	0.32	0.31	0.26	0.28	0.29	0.027	0.028	0.029	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 J	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	0.00167	0.0018 J	0.0015 J	0.002 U	0.002 U	0.002 U		0.002 U	0.002 J	0.002 U	0.002 U
Cobalt		0.006	mg/L	0.001 U	0.00032 J	0.001 U	0.001 U	0.0011	0.00084 J	0.00098 J	0.0005 J	0.001 U	0.001 U	0.001 U		0.001 U	0.001 J	0.001 U	0.001 U
Fluoride	4	4	mg/l	0.18 U	0.18	0.21 J+	0.23	0.26	0.27 J	0.17	0.05 U	0.05 U	0.05 U	0.52 J		0.49	0.52	0.7	0.48
Lead	0.015	0.015	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0014	0.00085 J	0.00057 J	0.00063 J	0.001 U	0.001 U		0.001 U	0.001 J	0.001 U	0.001 U
Lithium		0.04	mg/L	0.0042 J	0.0031 J	0.0033 J	0.0071 J	0.0035	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.0042 J		0.0052 J	0.005 J	0.0056 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	0.019	0.014	0.015	0.0051 J	0.012	0.0068	0.0089 J		0.0075 J	0.0098 J	0.02	0.016
Radium 226 + 228	5		pCi/L	5.52	5.35 J+	2.83		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	3.11	2.78 J+	2.0		1.76	0.257	0.795 J+	0.316 U		1.08 U	0.789		0.338 J+	0.514		0.845
Radium-228			pCi/L	1.41	2.78 J+	1.44		0.885 U	0.547 U	0.658 J+	0.344 U		0.832 U	0.897		0.342 U	0.75		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 J	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	2.09	0.53	0.98	2.12	0.04	1.39	0.26		0.8	0.36	0.09	0.12
Oxidation Reduction Potential			millivolts	-214.9	-198.5	6.31	-102.9	-104.2	-24.0	-199.5	43.7	-24.8	168	-183.2		-198	27.7	-76.5	-128.9
pH			SU	8.3	7.1	7.42	7.34	7.6	8	6.47	5.93	6.21	6.42	7.3		7.35	7.45	7.52	7.48
Specific Conductivity			uS/cm	1934	2005	1662	1353	2424	307	400	125	155	260	1354		1620	1160	870	1634
Temperature			deg C	17.25	16.5	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	0.35	1.01	1.42	0.93	5.17	1.26	4.6	4.8	2.43		3	3.45	2.5	7.86

Notes:
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"FD" = indicates the result was not detected above the MDL; the estimated RL is provided.
"R" = indicates a result was identified as an outlier and removed from the data set

GOLDER

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW5R					GAMW54S							GAMW55				GAMW55I	
				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	0.85	0.77	0.39	0.57	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	91	86	93	81	131	210		220	200	240		214	260	250	270	260	160	168
Chloride			mg/L	15	10	10	4	12.3	100		95	110	120		68.3	59	59	65	70	61	40.3
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	5.74	6.95		8.72	7.27	7.2		7.43		8.77		7.04	7.81	7.51
Sulfate			mg/l	190	150	190	76	284	750		730	710	770		176	590	600	630	620	480	375
Total Dissolved Solids			mg/L	500	400	470	350	648	1900		1400	1500	1400		1000	1200	1300	1300	1300	859	845
Appendix IV Parameters																					
Antimony	0.006	0.006	mg/L	0.0011 J	0.000074 J	0.00078 J	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 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		0.0031 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	0.049	0.039	0.021	0.031	0.052	0.098		0.083	0.08	0.089		0.06	0.099	0.097	0.088	0.089	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	0.007 U		0.007 U	0.0037 U	0.007 U		0.005 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.005 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 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
Lithium		0.04	mg/L	0.009 U	0.036 U	0.009 U	0.0023 J	0.003 U	0.0046 J		0.0036 J	0.0049 J	0.0074 J		0.009 U	0.0021 J	0.0027 J	0.002 U	0.002 U	0.0035 J	0.009 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 J	0.0002 J	0.0002 U	0.0002 U	0.0002 J	0.0002 U
Molybdenum		0.1	mg/L	0.005	0.004	0.025	0.03	0.014	0.018		0.059	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	0.832	0.922 J+	1.24 J+		1.58 U
Radium 226			pCi/L	0.386 U	0.737 U	0.337 U		0.73 U	1.18 J+		1.35 J+	0.956			0.854 U	0.574 U	0.471 U	0.383 U	0.847 U		0.387 U
Radium-228			pCi/L	0.385 U	0.343 J+	0.393 U		0.783 U	0.849		1.35 J+	0.865			0.754 U	0.824	0.433 U	0.559 J+	0.796 J+		1.34
Selenium	0.05	0.05	mg/l	0.0017 U	0.0022 U	0.0033 U	0.00357	0.0073	0.005 U		0.005 U	0.005 U	0.005 U		0.001 U	0.0037 U	0.0031 U	0.0022 U	0.0022 U	0.0046 U	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	0.001 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	2.65	0.42		2.12	0.42	0.31		0.1		1.73		0.33	0.72	1.35
Oxidation Reduction Potential			millivolts	107.8	-294.7	48.4	-69.5	24.5	-323.4		-315.7	-23.1	-43.3		-114.5		21.6		-68.4	-28.8	148.6
pH			SU	6.24	7.92	6.82	7.08	5.74	6.95		8.72	7.27	7.2		7.43		8.77		7.04	7.81	7.51
Specific Conductivity			uS/cm	675	630	493	374	960	1816		1983	1635	2010		0.63		1493		1574	1017	1270
Temperature			deg C	21.2	16.53	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	3.09	1	9.91	2.31	1.9	1.2		1.61	4.29	5.67		1.31		1.71		3.66	0.26	0.1

Notes
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Revision

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"R" = Indicates a result was identified as an outlier and removed from the data set

GOLDER

Table 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW55B							GAMW55						GAMW56B				
				2018-09-11		2018-10-29	2019-05-01	2019-11-15	2020-05-05		2013-09-11	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	9.21 J	10.9 J	0.26	0.28	0.21	0.2		0.22	1.2	1.2	1.3	1.2	1.1
Calcium			mg/L	250	253	260	210	210	116 J	219 J	130	110	95	123		115	140	140	150	150	141
Chloride			mg/L	220	220	190	170	190	119	215	3.1	2.4	3.2	2.1		2.8	50	50	55	64	50.8
Fluoride	4	4	mg/L	0.29 J	0.3 U	0.25	0.32	0.31	0.32	0.32	1.4 J	0.59	0.53	0.67		0.66	0.41 J	0.33	0.4	0.44	0.55
pH			SU		7.07	7.19	7.31	7.45		7.48	5.83	7.17	5.83	7.06		7.05	6.95	6.91	7.08	7.21	7.52
Sulfate			mg/l	820	830	810	790	760	678	674	57	63	54	56		56.3	170	190	260	280	280
Total Dissolved Solids			mg/L	1800	1930	1830	1700	1403	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	0.079	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	0.0064	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	0.3 U	0.25	0.32	0.31	0.32	0.32	1.4 J	0.59	0.53	0.67		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	0.003 U	0.013	0.0024 J	0.0029 J	0.0023 J	0.0053 J		0.002 U	0.0051 J	0.0035 J	0.0044	0.0062 J	0.0032
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	0.0056 J	0.0065 J	0.0046 J	0.005 J	0.0049 J	0.0053 J	0.0019	0.0044 J	0.00472 J	0.00459 J		0.0068	0.0094 J	0.009 J	0.0092	0.0084 J	0.0065
Radium 226 + 228	5		pCi/L	5.35	3.18	3.55 J+	3.08		3.06	3.02	0.738	0.693 J+				1.24 U	1.26	1.23 J+			2.11
Radium 226			pCi/L	1.72	1.25	1.85 U	1.15		1.29	1.66	0.565	0.357 U	0.331 U			0.509 U	0.763	0.578 U	0.506		0.966
Radium-228			pCi/L	1.63	1.43	1.79 J+	0.926		1.83	1.36	0.371 U	0.429 U	0.373 U			0.735 U	0.493	0.598 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		0.17	0.17	0.12	0.17		0.1	0.96	0.28	1.3	0.34		0.21	0.29	0.25	0.79	0.19	0.09
Oxidation Reduction Potential			millivolts		-129.6	-126.9	-57.6	-137.8		-101.9	-97.4	-95.4	34	-86.6		-42.1	-102.8	-44.4	91.9	-105.7	-106.5
pH			SU		7.07	7.19	7.31	7.45		7.45	6.82	7.17	5.83	7.06		7.05	6.95	6.91	7.08	7.21	7.52
Specific Conductivity			uS/cm		2199	2231	1967	1491		2016	749	835	460	465		782	928	1036	855	741	1179
Temperature			deg C		19.2	18.5	18.1	17.9		17.1	17	15.7	8.7	14		9.6	13.8	13.8	11.6	12.9	11.8
Turbidity			NTU		4.38	1.24	0.77	3.02		1.11	2.81	2.99	2.31	2.05		2.4	2.06	1.45	4.27	1.1	4.56

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"UJ" = Indicates the result was not detected above the MDL; the estimated RL is provided.
"R" = Indicates a result was identified as an outlier and removed from the data set.

Prepared by: KMC
Checked by:
Reviewed by:

GOLDER

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 Ac ion	Institutional Controls	Permitting and Notices	Administra ive 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 degrada ion/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 poten ial for plume migration.	Yes	NA
Removal	Extraction	Extraction Wells	Use of extraction wells to extract contaminated groundwater and control groundwater movement within capture zone.	Poten ially 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.	Poten ially 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 he 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 *x 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 *x 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 *x 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

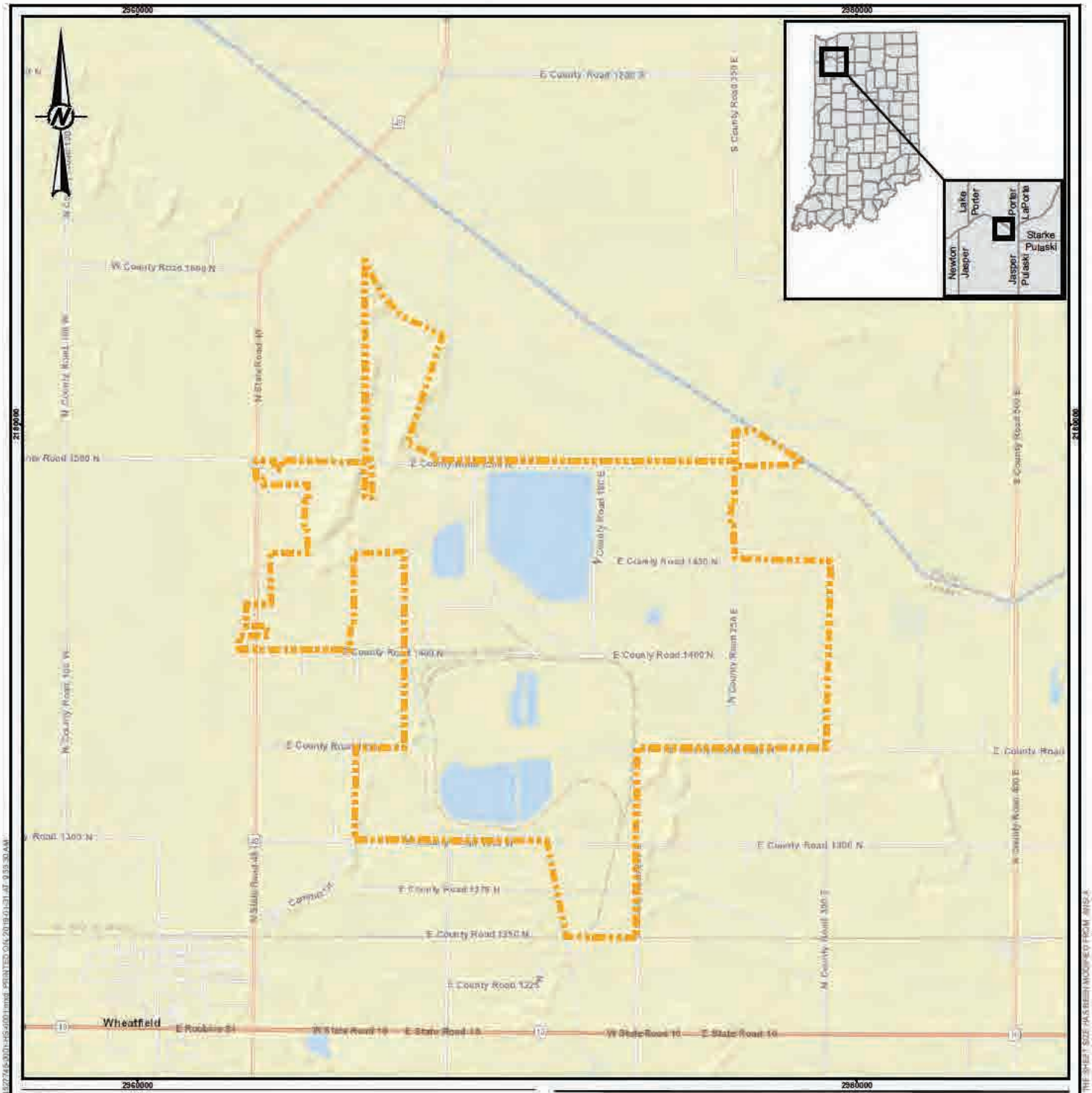
Table : valuation of Groundwater Corrective Measure Alternatives
For Multi-Cell Unit (MSRB, MCWB, and DA)
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

	Corrective Measure Alternatives			
	Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
valuation Criteria	**Monitored natural attenuation**	**ertical barrier hydraulic controls and monitored natural attenuation**	**Pump-and-treat and monitored natural attenuation**	**ertical barrier hydraulic controls, pump-and- treat, and monitored natural attenuation**
Performance	Initial review of site conditions indicates plume stability and confirmation of attenuation and immobili ation, therefore, monitored natural attenuation could be effective in reducing the C C 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 C Cs and potential for plume migration. Minimally effective short-term.	ydraulic 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 C Cs in groundwater. Relatively effective both short-term and long-term.	ydraulic 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 C Cs in groundwater. Relatively effective both short-term and long-term.
Reliability	Moderate to igh. No M re uired, but long-term changes to geochemistry may impact attenuation.	Moderate. Some M re uired and potential treatment replacement.	Moderate, some M re uired and potential treatment replacement.	Moderate, some M re uired and potential treatment replacement.
ase of Implementation	Already occurring.	echnology is common some installation challenges expected based on existing slurry walls and proposed cap.	echnology is common, some installation and drilling challenges expected.	echnology 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.	ydraulic 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 .	ydraulic 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 Re uirements	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 Re uirements	Low permitting re uirements	May re uire NPDES permit modifications or UIC permit, overall low permitting re uirements	May re uire NPDES permit modifications or UIC permit, overall low permitting re uirements	May re uire NPDES permit modifications or UIC permit, overall low permitting re uirements
Relative Costs	Low Capital, Low M and Replacement	Moderate Capital, Moderate M and Replacement	Moderate Capital, Moderate M and Replacement	Moderate Capital, igh M and Replacement

Prepared by: JBG
Checked by: CMJ
Reviewed by: JBG

GOLDER
MEMBER OF WSP

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, NTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CH NA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTR BUTORS, 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

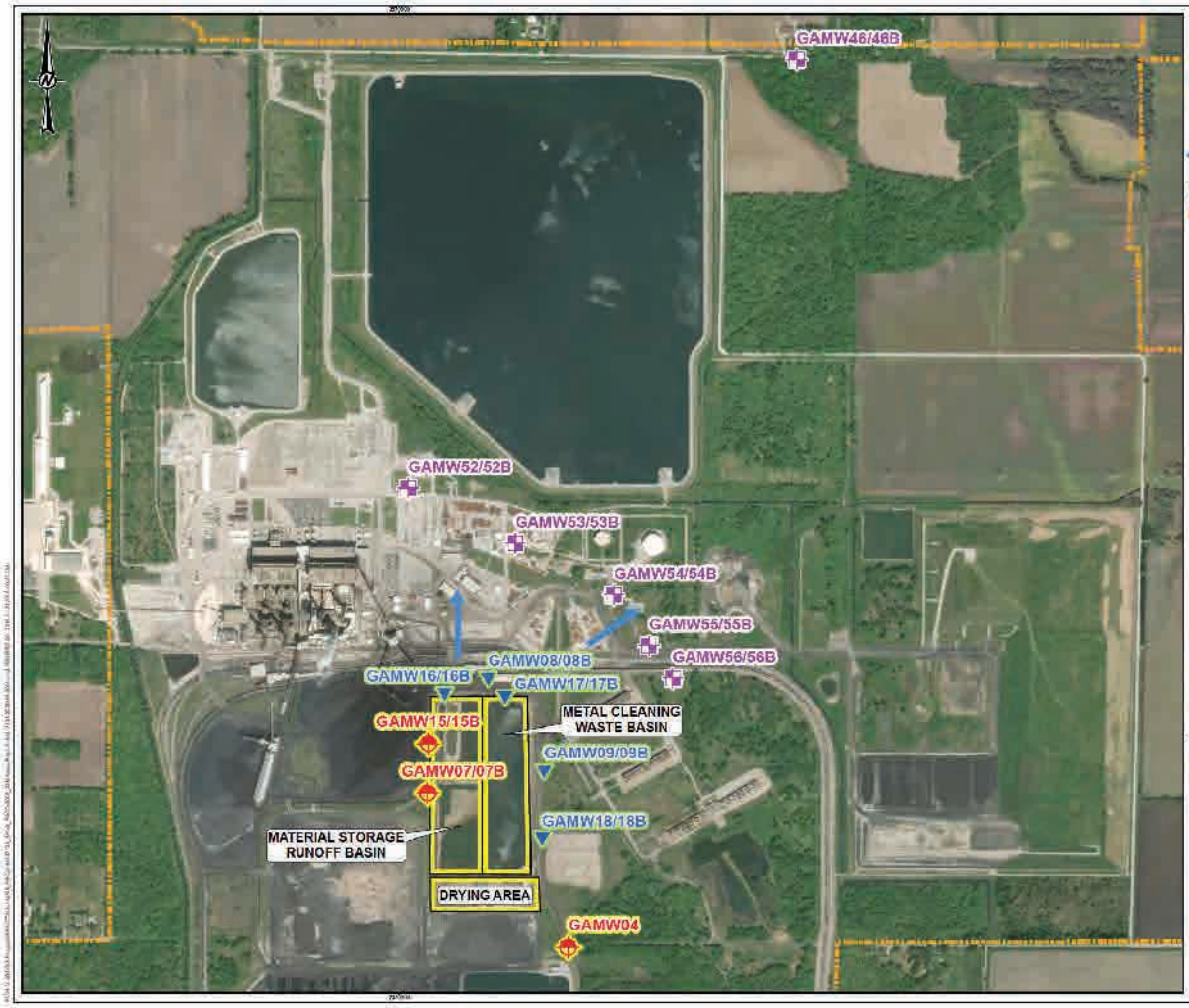
CONSULTANT

GOLDER

YYYY-MM-DD	1/31/2019
DESIGNED	DFS
PREPARED	SHL
REV EWED	JSP
APPROVED	MAH

PROJECT NO	CONTROL	REV.	FIGURE
164817101	A	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A



Assessment Monitoring Well
Background Monitoring Well
Downgradient Monitoring Well
Generalized Groundwater Flow Direction
CCR Units
Approximate Property Line

NOTE(S)
1. THIS FIGURE DEPICTS THE GENERALIZED GROUNDWATER FLOW DIRECTION WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER.

REFERENCE(S)
1. SOURCE: AERIAL IMAGERY, ESRI ONLINE, ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, AND THE GIS USER COMMUNITY

NORTHERN INDIANA PUBLIC SERVICE COMPANY

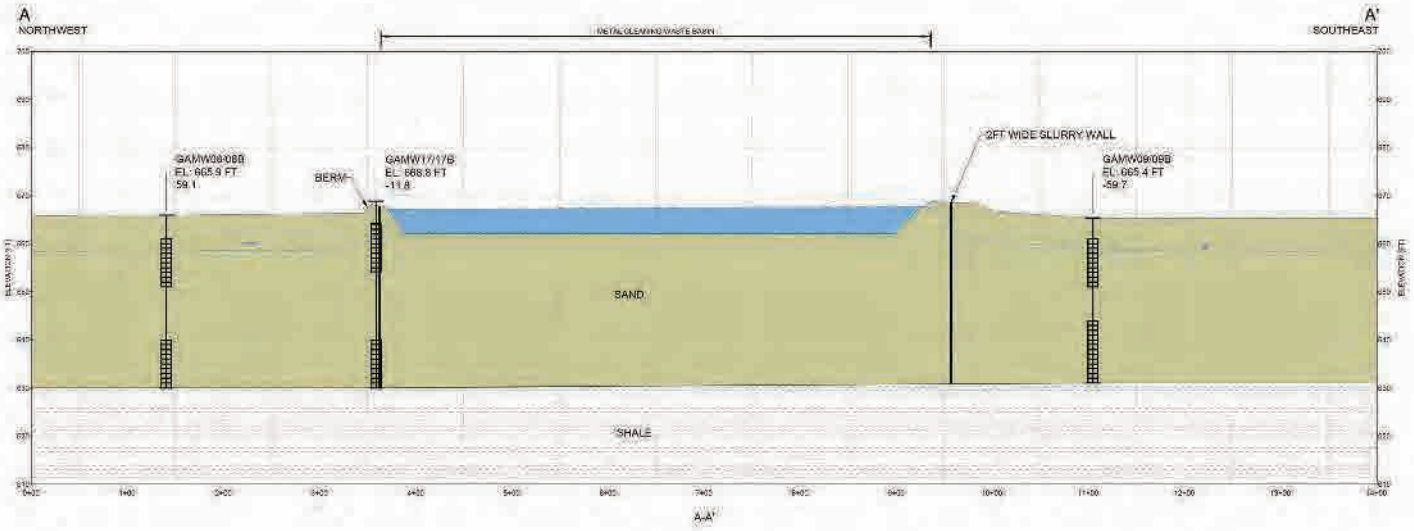
NORTHERN INDIANA PUBLIC SERVICE COMPANY
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

MONITORING WELL LOCATIONS
DRYING AREA, MSRB, AND MCWB

CONSULTANT: GOLDER

DESIGNED	DPS
PREPARED	SIE
REVIEWED	MAH
APPROVED	MWT

PROJECT NO. 164017101 | CONTROL A | REV. 0 | FIGURE 2





VERTICAL SCALE: 1" = 10' (FEET)

HORIZONTAL SCALE: 1" = 50' (FEET)

LEGEND

GAMW-25/25B
EL 663.8
59.1'

- WELL ID
- 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

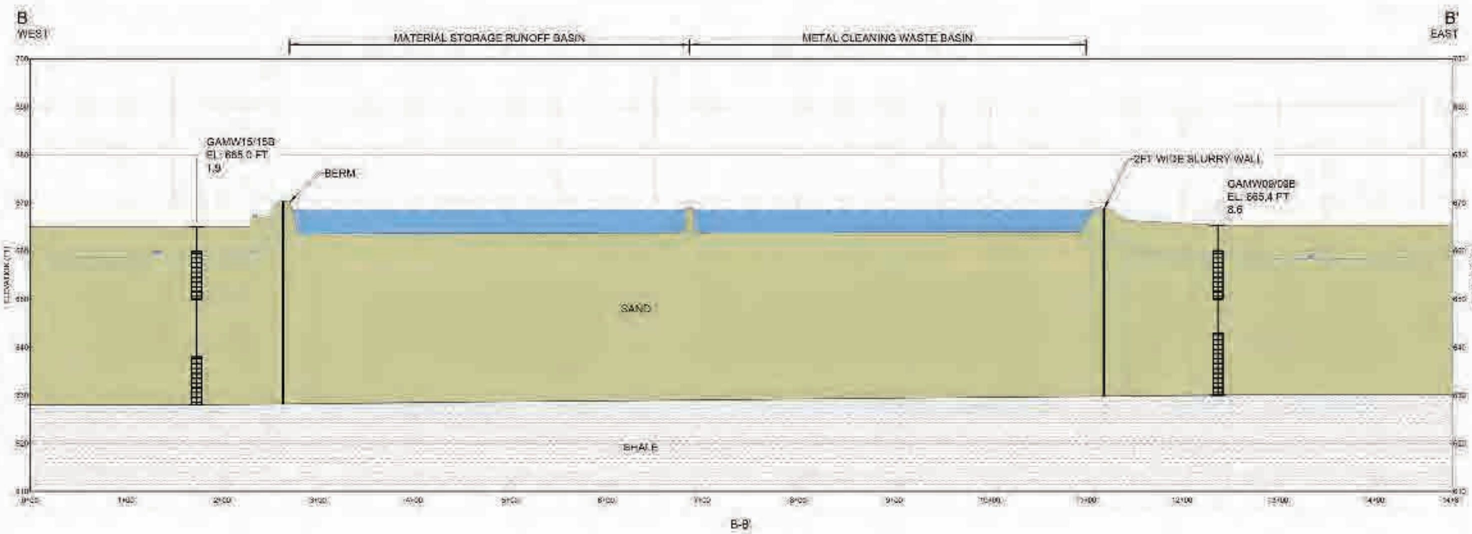
CONSULTANT
GOLDER

YYYY-MM-DD	2019-03-26
DESIGNED	RWC
PREPARED	RWC
REVIEWED	JEG
APPROVED	MAR

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
1648171	03	0	3



VERTICAL SCALE

HORIZONTAL SCALE



LEGEND

- WELL ID
- 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	2019-03-08
DESIGNED	RWO
PREPARED	RWO
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



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

0 800 1,600
1" = 800 feet Feet

NOTE(S)
1. NS INDICATES LOCATION WAS NOT SAMPLED.
2. ( ) INDICATES NOT USED IN CONTOURING.

REFERENCE(S)
1. SURFACE WATER FEATURES SOURCED FROM MAKER ARGYLE CARTOGRAPHICS, UNLESS NOTED OTHERWISE.

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

TYPED/MAP	2021-07-26
DESIGNED	DPS
PREPARED	TRH
REVIEWED	BMH
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
19431567	A	0	5



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

FIGURE NARRATIVE

NOTE(S)

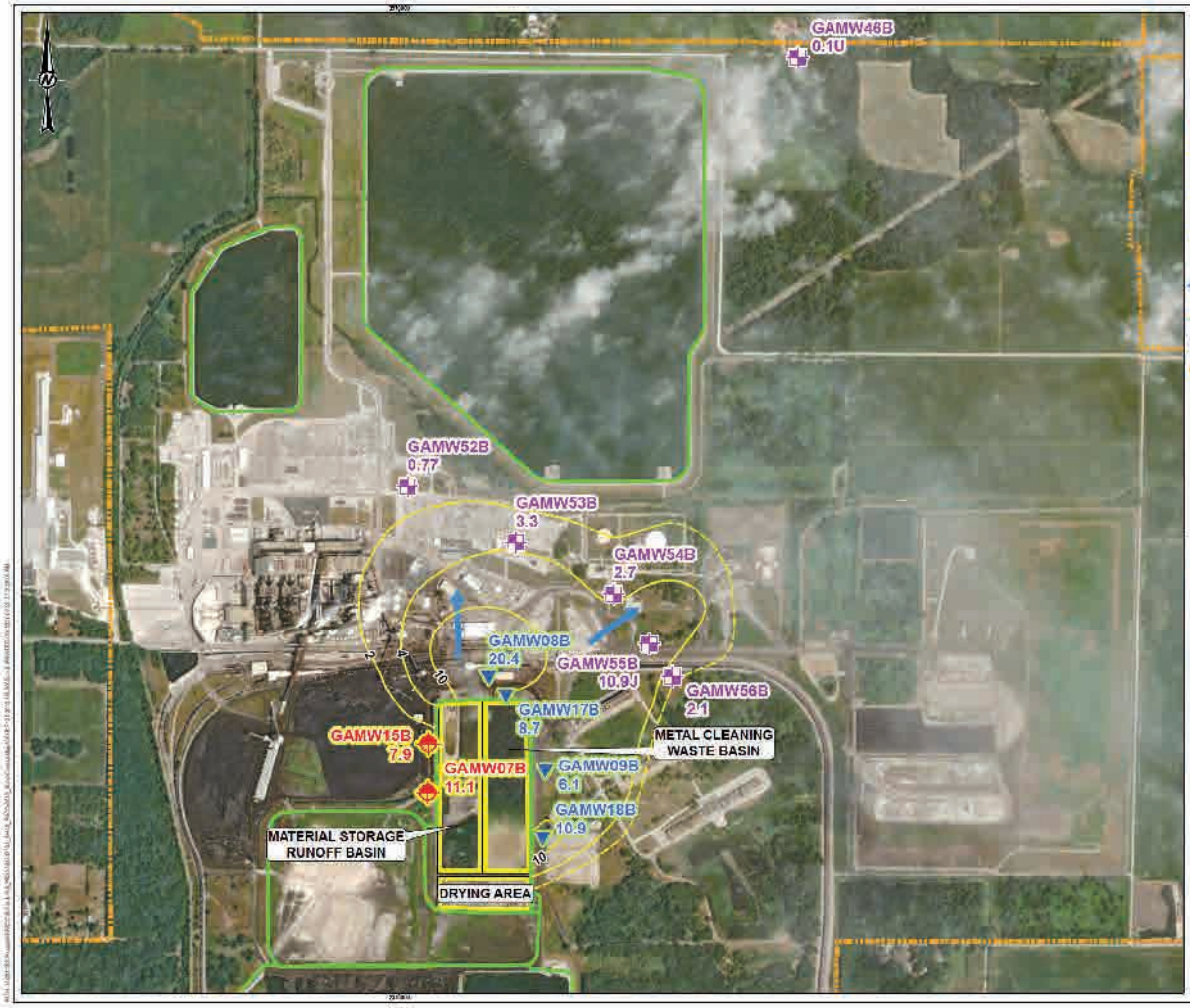
NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

ASSESSMENT OF CORRECTIVE MEASURES
BORON ISOCONCENTRATION CONTOUR MAP
APRIL - MAY 2020 (SHALLOW)

GOLDER

PROJECT NO. 20447130 | REV. 0 | FIGURE 6



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

0 500 1,000

1" = 500 feet 1 km

FIGURE NARRATIVE

THIS FIGURE SHOWS THE INTERPRETED BORON ISOCONCENTRATION CONTOURS BASED ON GROUNDWATER ANALYTICAL DATA FROM THE APRIL AND MAY 2020 SAMPLING EVENTS FOR SITE-WIDE ASSESSMENT WITHIN 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. IN SOME LOCATIONS ARE POSSIBLE BORON DISTRIBUTION IN GROUNDWATER IS UNKNOWN WITH THE MONITORING NETWORK.

NOTE(S)

1. THE FIGURE DEPICTS THE GENERALIZED GROUNDWATER FLOW DIRECTION WITHIN THE DEEPER PORTION OF THE SURFICIAL AQUIFER.
2. ALL VALUES SHOWN ARE IN MILLIGRAMS PER LITER (MG/L).

REFERENCE(S)

1. ESRI 2021. ARCGIS ONLINE: WORLD IMAGERY. ACCESSED: [DATE]. SOURCES OF IMAGERY AND DATA INCLUDE MAXAR, [REDACTED], 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

DESIGNED	KC
PREPARED	TBH
REVIEWED	DEA
APPROVED	MW

PROJECT NO. 20447130 | CONTROL A | REV. 0 | FIGURE 7

APPENDIX A

Volume Calculations

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.

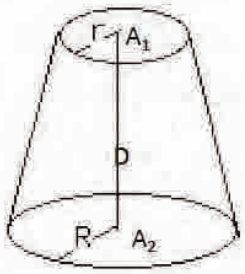
Shallow plume area	21.75	acre		
	9.474E+05	ft^2	(A1)	
Deep plume area	87.40	acre		
	3.807E+06	ft^2	(A2)	
Saturated depth	32	feet	(D)	(Golder 2017)
Assumed effective porosity	0.3		(n)	(Golder 2017)

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



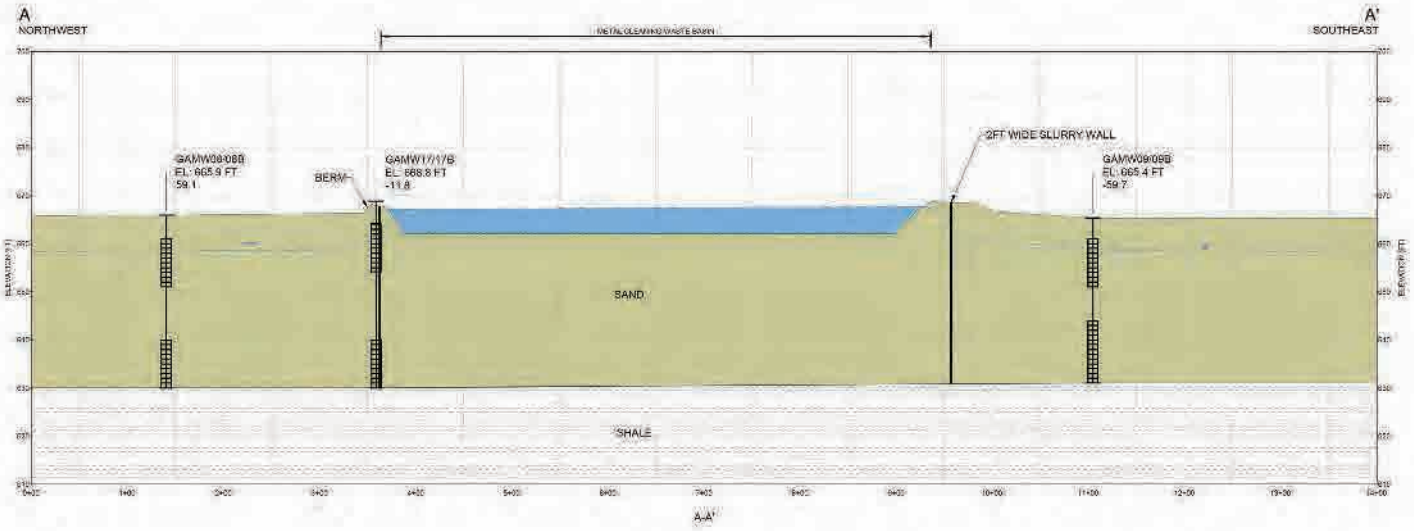
Estimated volume of impacted groundwater was calculated using the following forumula:

$Volume = V_2*n = V_{water}$

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.





VERTICAL SCALE: 1" = 10' (0, 10, 20 FEET)

HORIZONTAL SCALE: 1" = 50' (0, 50, 100 FEET)

LEGEND

- GAMW-25-03B — EL. 663.8, 59.1 — WELL ID, 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/OBTAINED 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	2019-02-26
REVISED	RWO
PREPARED	RWO
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
1648171	03	0	3



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

FIGURE NARRATIVE

NOTES:

NORTHERN INDIANA PUBLIC SERVICE COMPANY

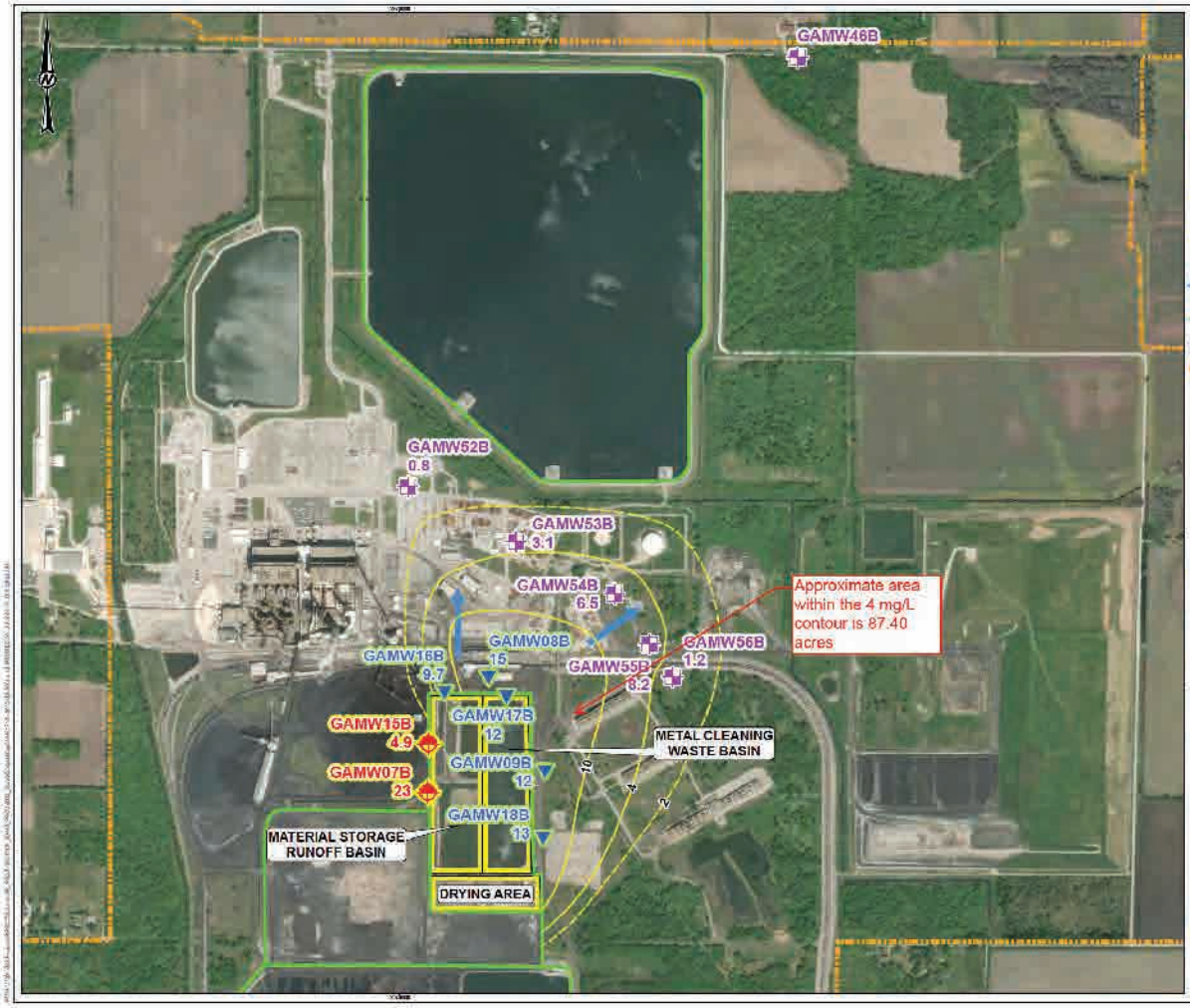
NORTHERN INDIANA PUBLIC SERVICE COMPANY
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

ASSESSMENT OF CORRECTIVE MEASURES
BORON ISOCONCENTRATION CONTOUR MAP
OCTOBER 2018 (SHALLOW)

GOLDER

DESIGNED: DFS
PREPARED: SHL
REVIEWED: MAH
APPROVED: MAH

PROJECT NO: 1648(1710)
DATE/REV: A
REV: 0
FIGURE: 6



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

FIGURE NARRATIVE

THIS FIGURE SHOWS THE INTERPRETED BORON ISOCONCENTRATION CONTOURS BASED ON GROUNDWATER ANALYTICAL DATA FROM THE DEEPER WATER-BEARING UNIT FOR SITE WITH A DETECTION MONITORING SYSTEM. ADDITIONALLY, THE ISOCONCENTRATION CONTOURS ARE INTENDED TO DEPICT THE INTERPRETED 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 WELLS DETECTED IN GAMW 07B AND GAMW 15B ARE NOT CONTOURED IN THIS MAP BASED ON INTERPRETATION IN THAT THESE CONCENTRATIONS ARE DUE TO UPGRADIENT INFLUENCE.

NOTE(S)

1. THIS FIGURE DEPICTS THE GENERALIZED GROUNDWATER FLOW DIRECTION WITHIN THE DEEPER PORTION OF THE SHALLOW AQUIFER.
2. ALL VALUES ARE REPORTED IN MILLIGRAMS PER LITER (MG/L).

REFERENCE(S)

1. DERIVED FROM SOURCES SUCH AS ESRI, USGS, NOAA, DELORME, GEOEYE, DIGITALGLOBE, 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

DESIGNED	DFS
PREPARED	SHL
REVIEWED	BDH
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
1648(1710)	A	0	7

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	7/6/2016	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

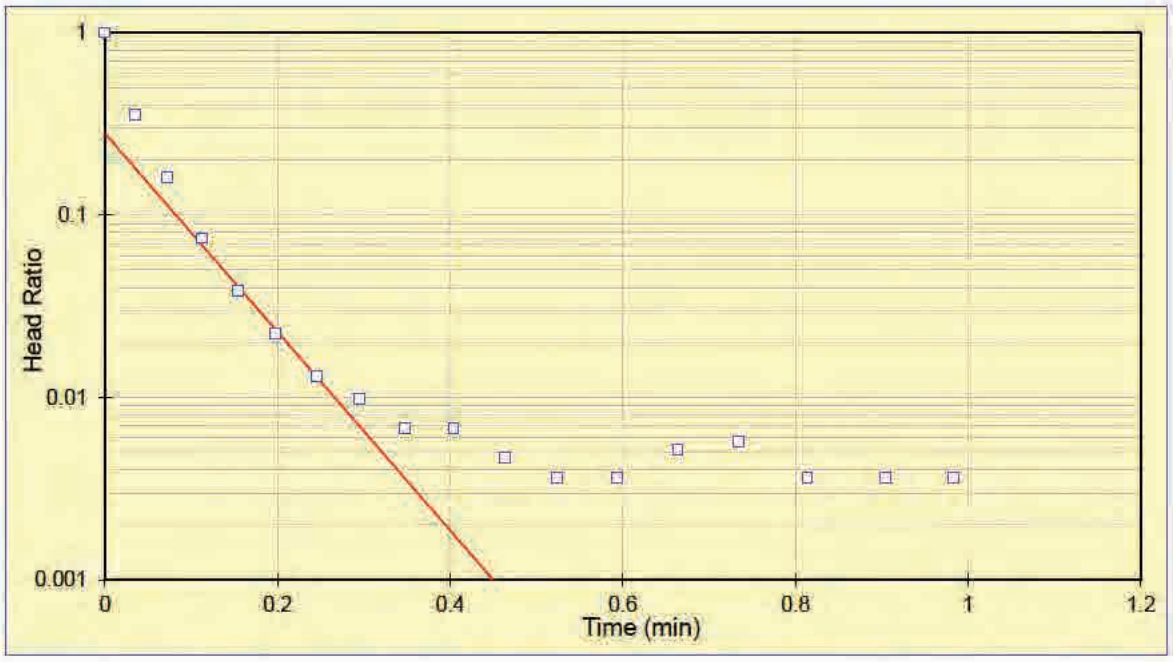
Prepared by: DFS
Checked by: KMC
Reviewed by: MAH

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

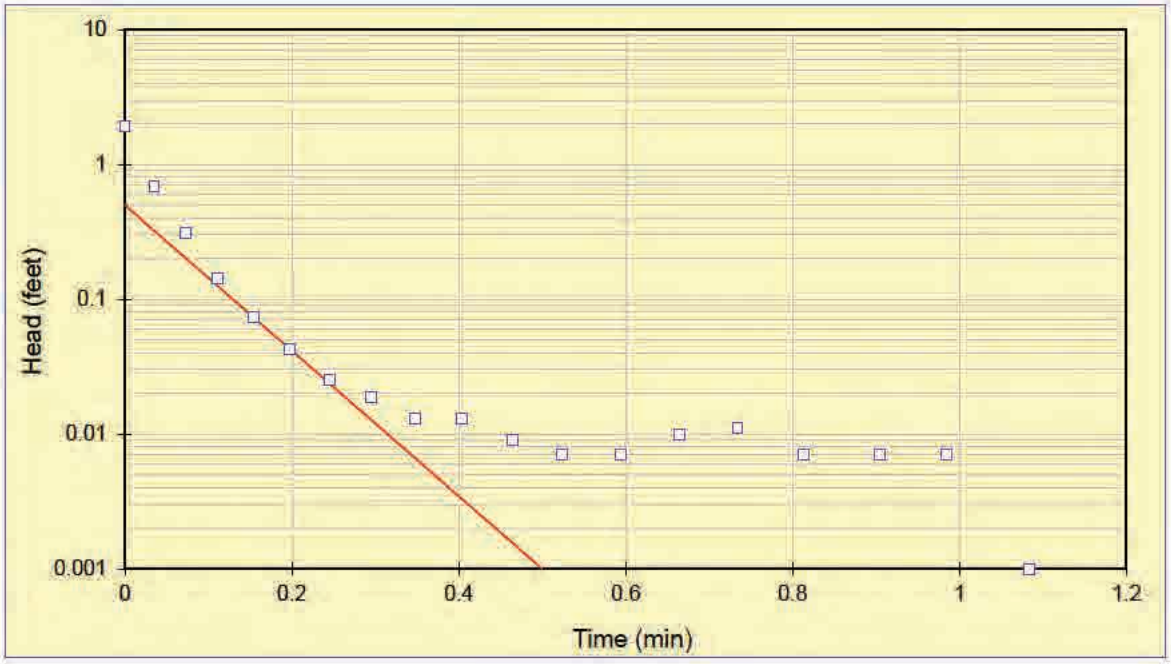
where:

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

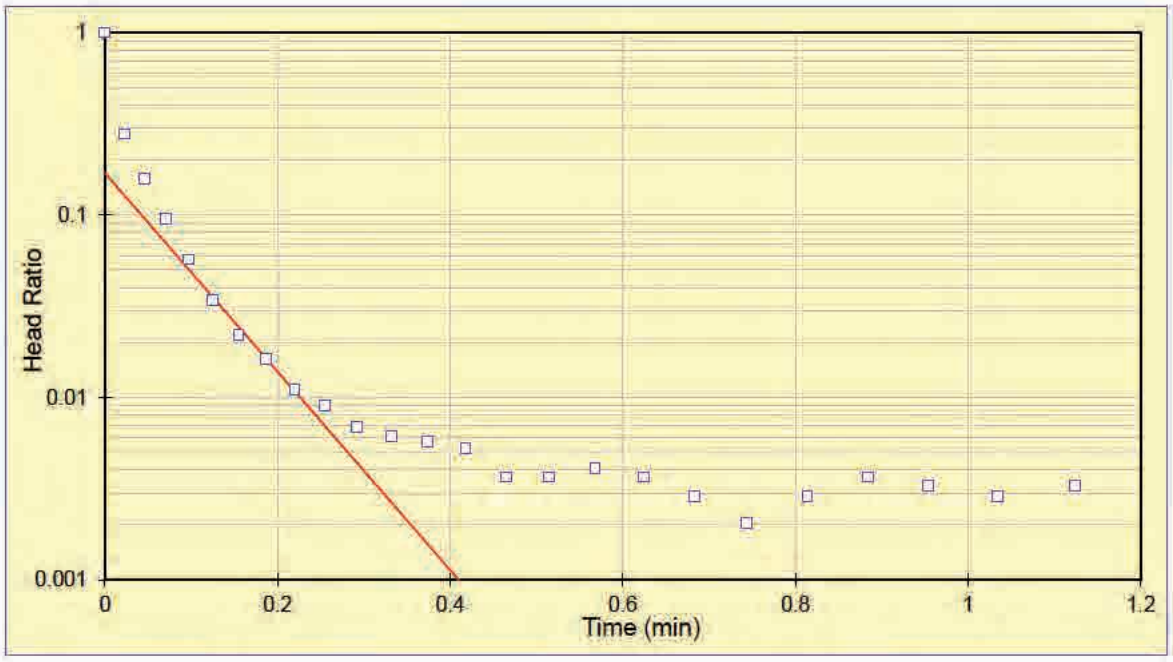
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

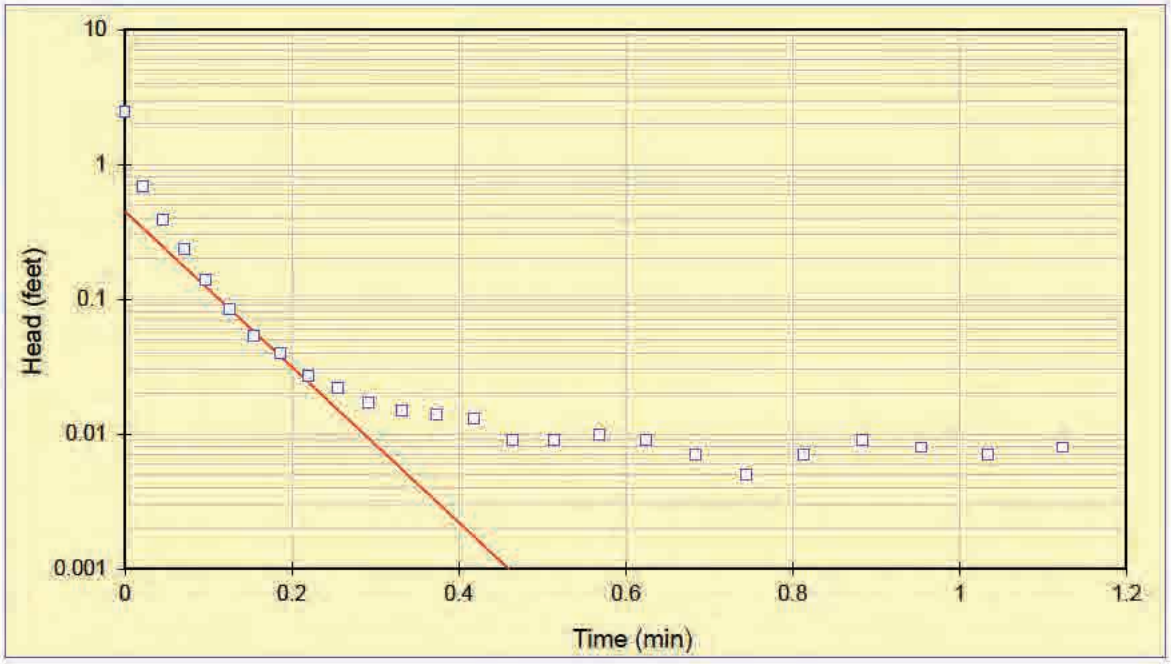
where:

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

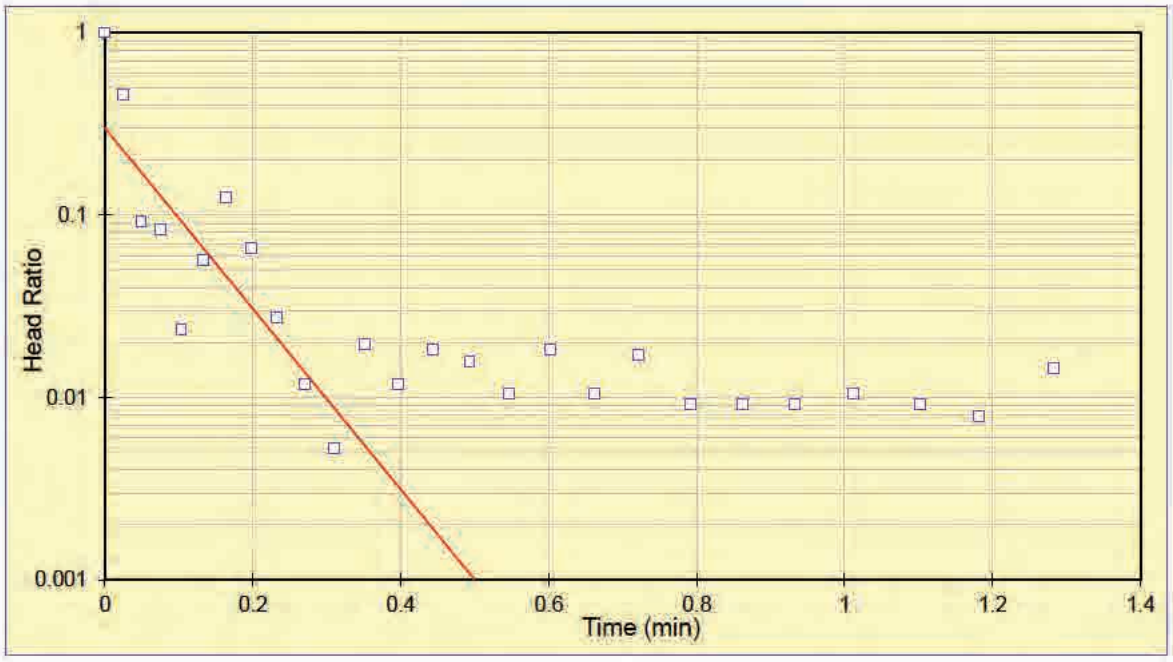
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

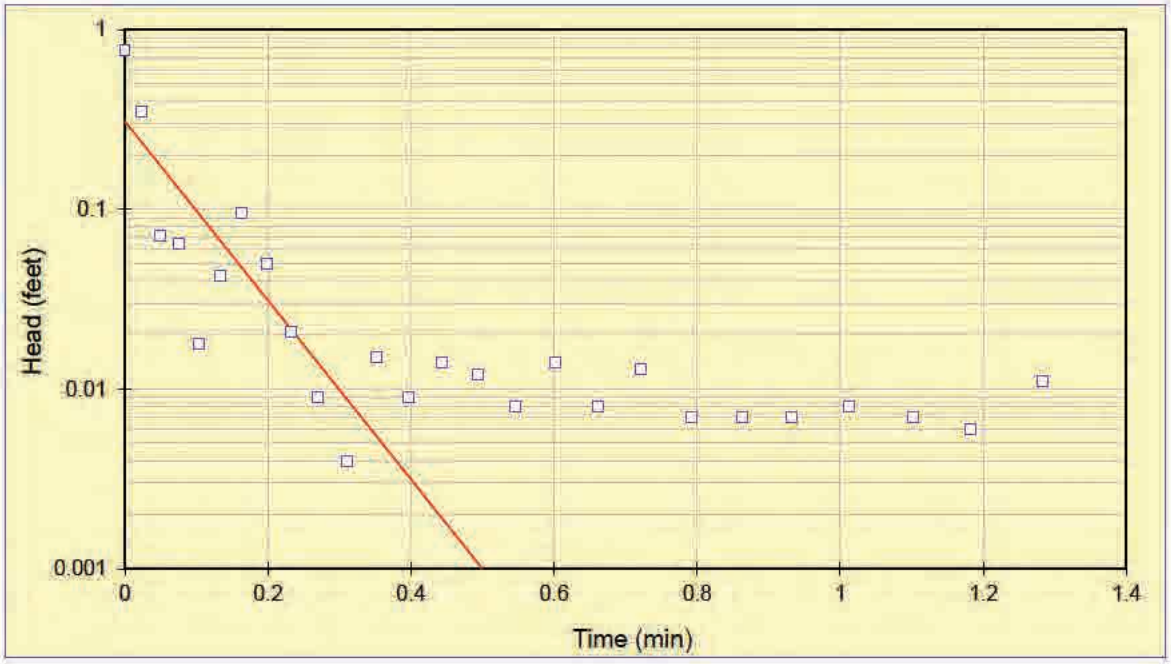
where:

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

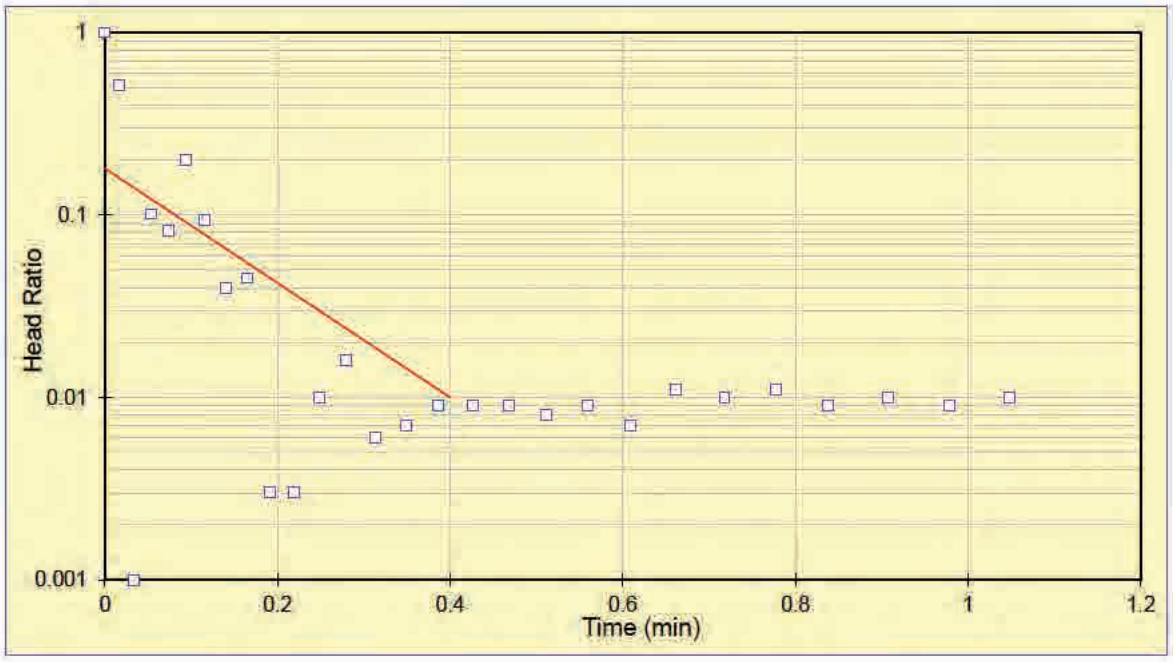
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

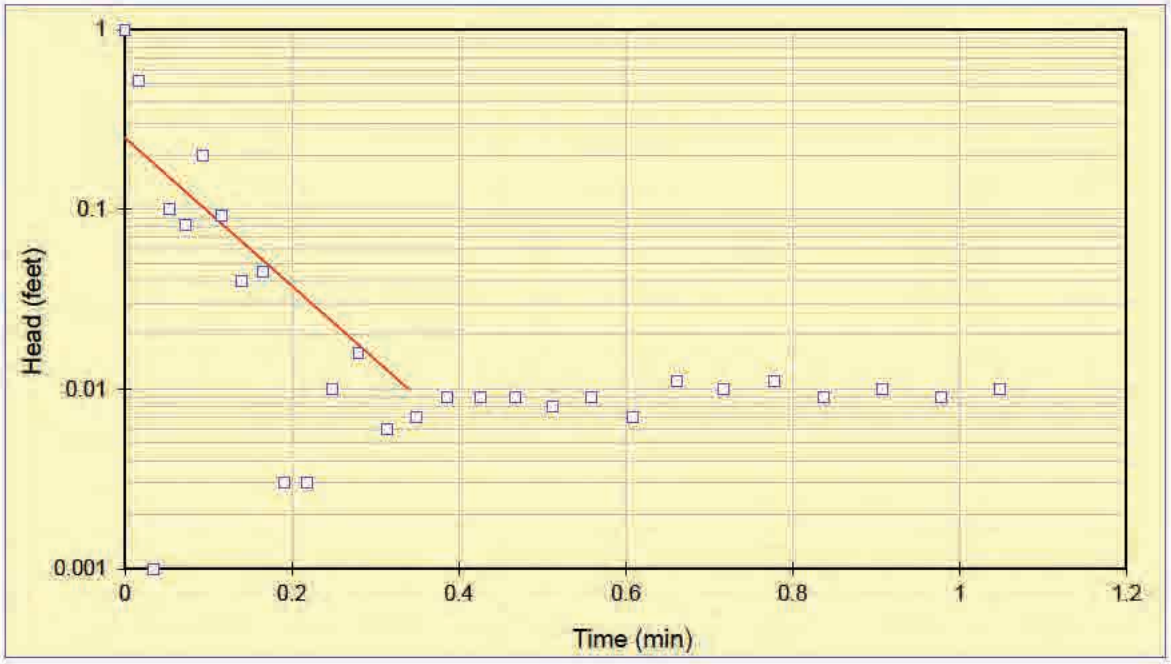
where:

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

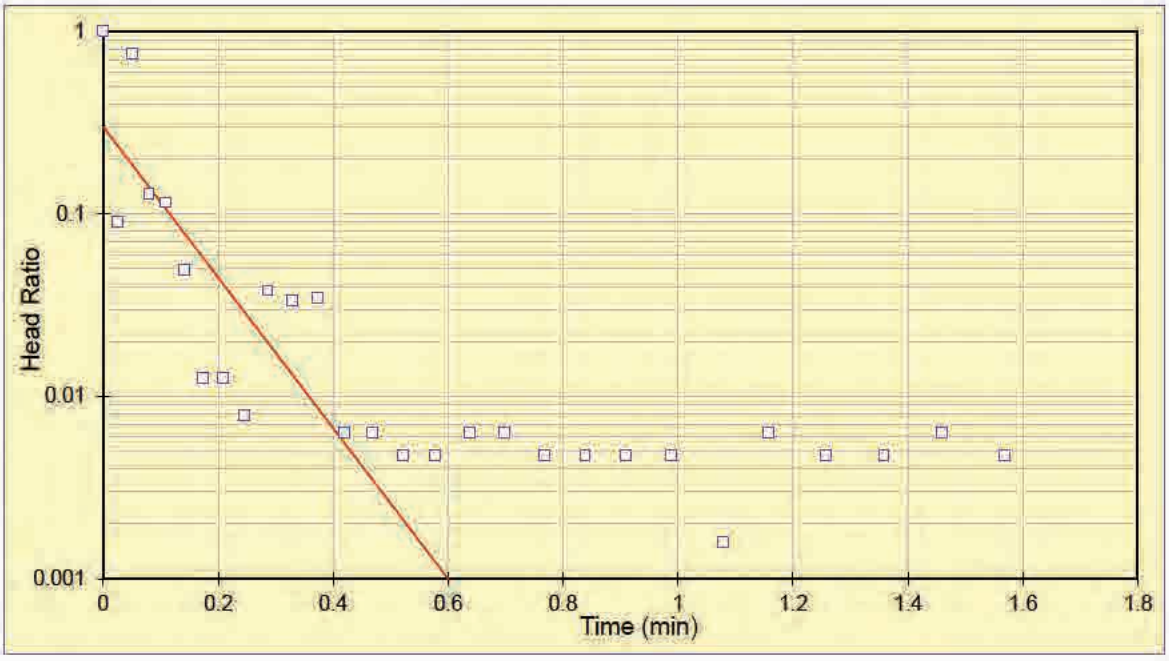
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

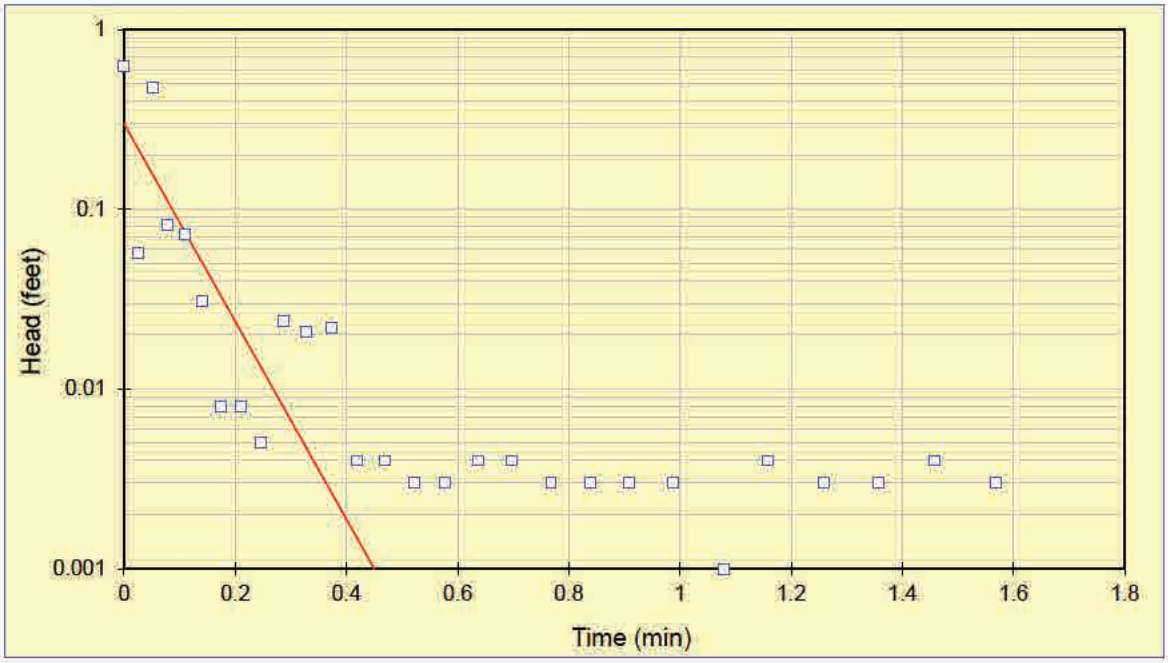
where:

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:

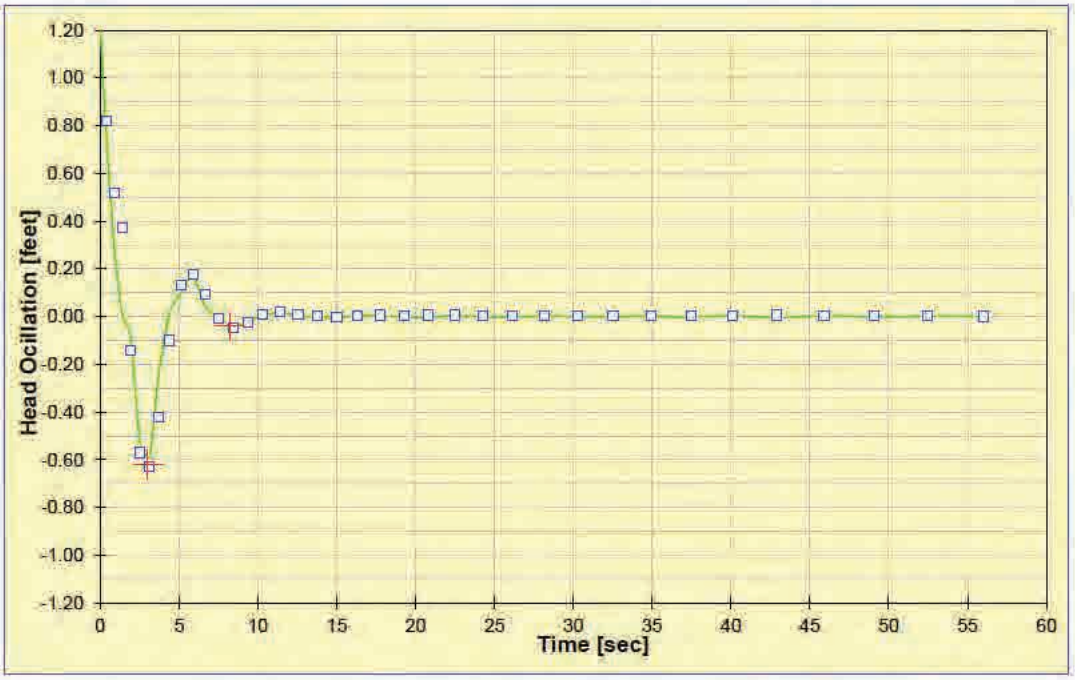
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/(\omega^2 + \gamma^2)$$

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

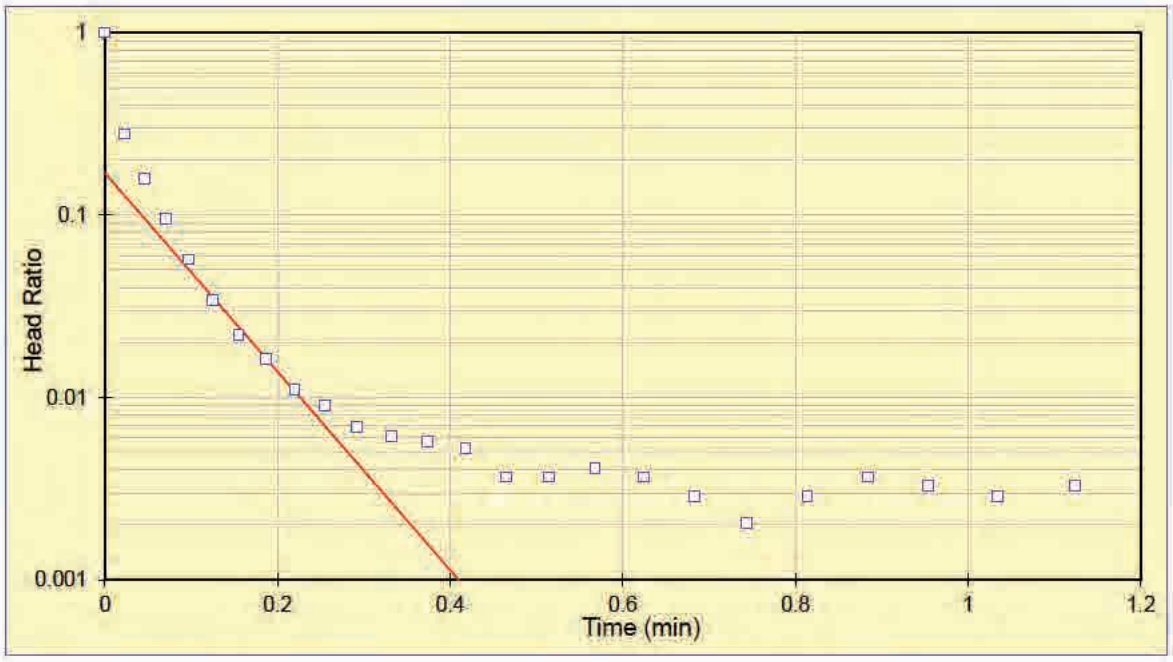
Analysis By: DFS
Checked By: JRS
Analysis Date: 8/8/2016

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

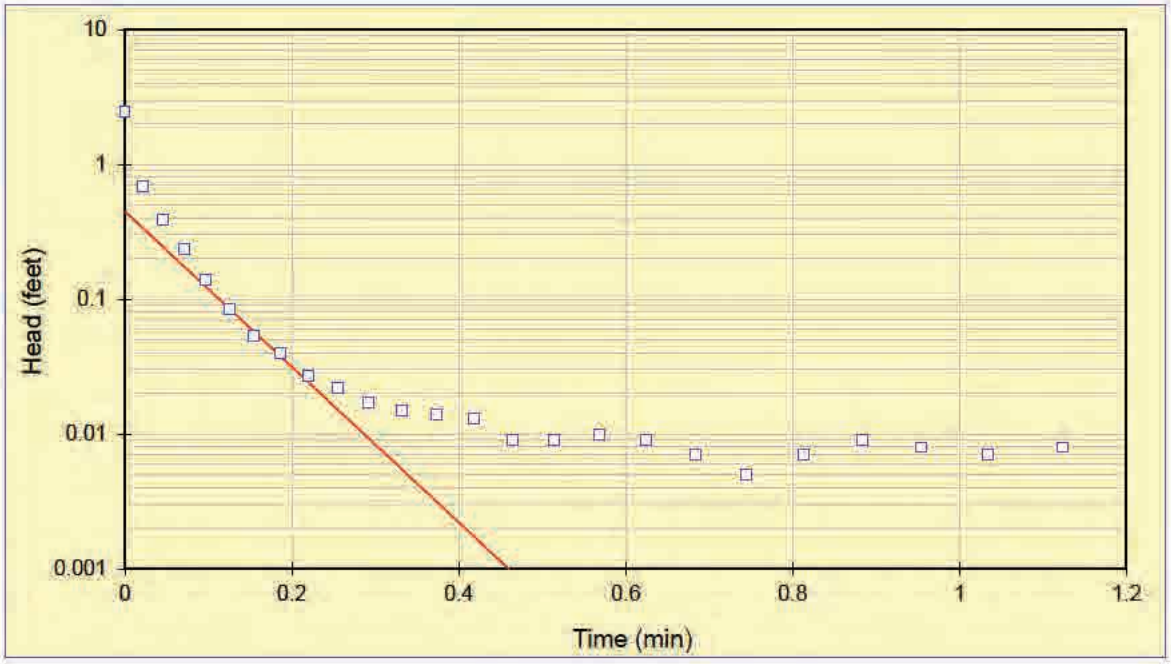
where:

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

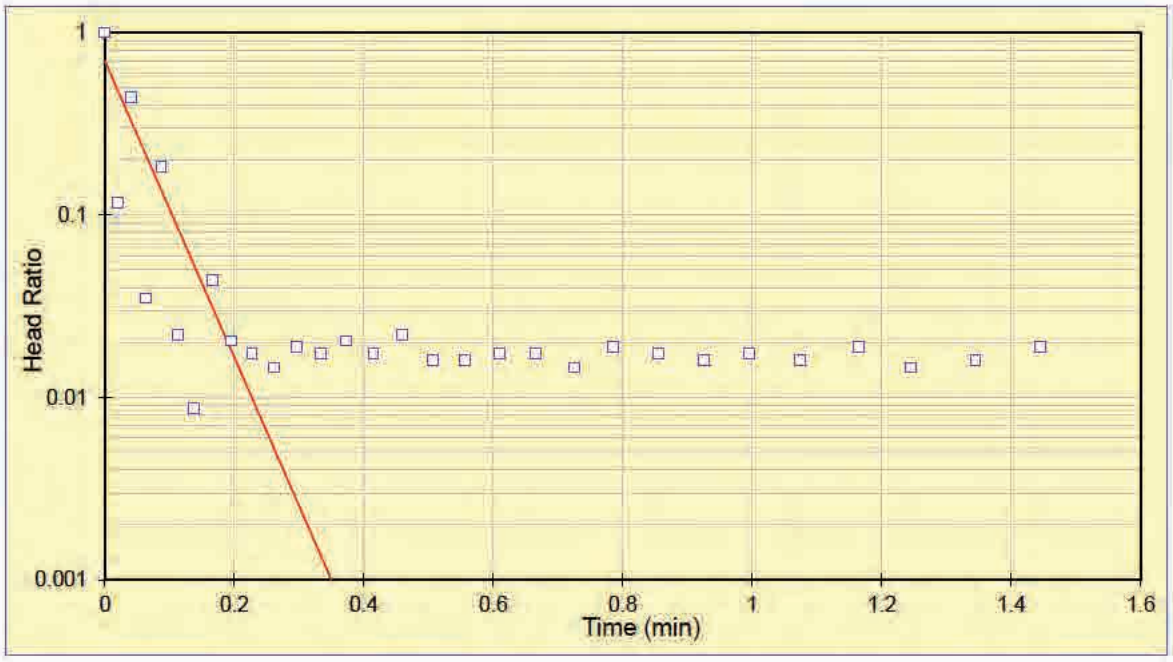
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.11E-02	cm/sec
t_1 =	0	K=	3.15E+01	ft/day
t_2 =	0.35			
h_1/h_0 =	0.70			
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-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

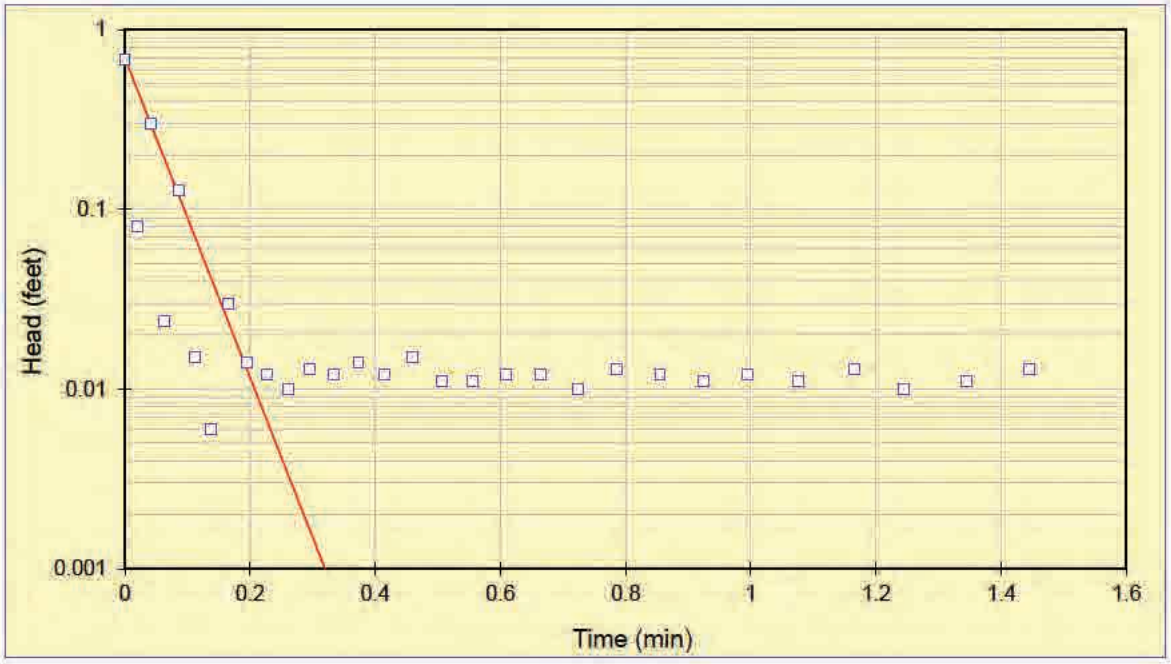
where:

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
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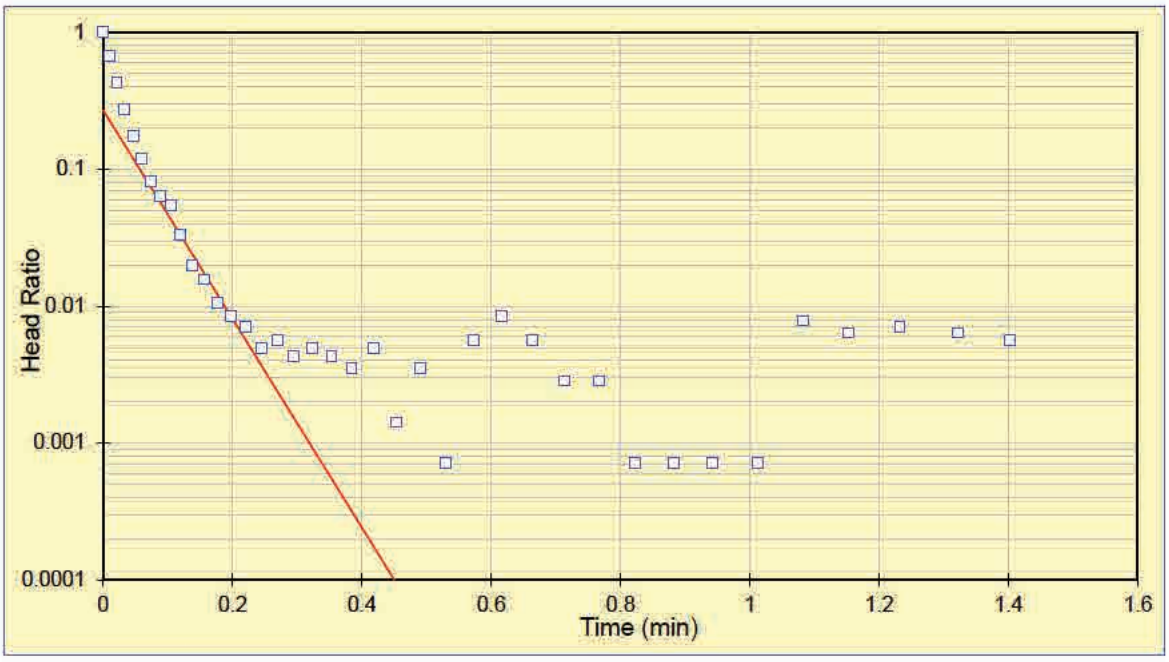
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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			



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BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

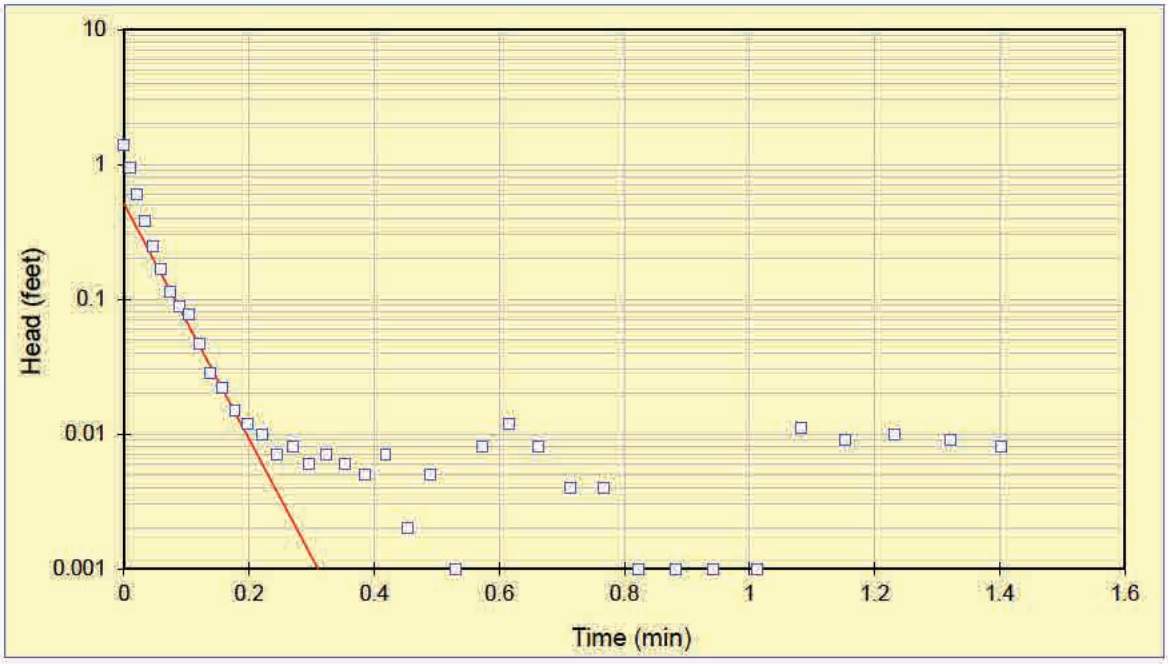
where:

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



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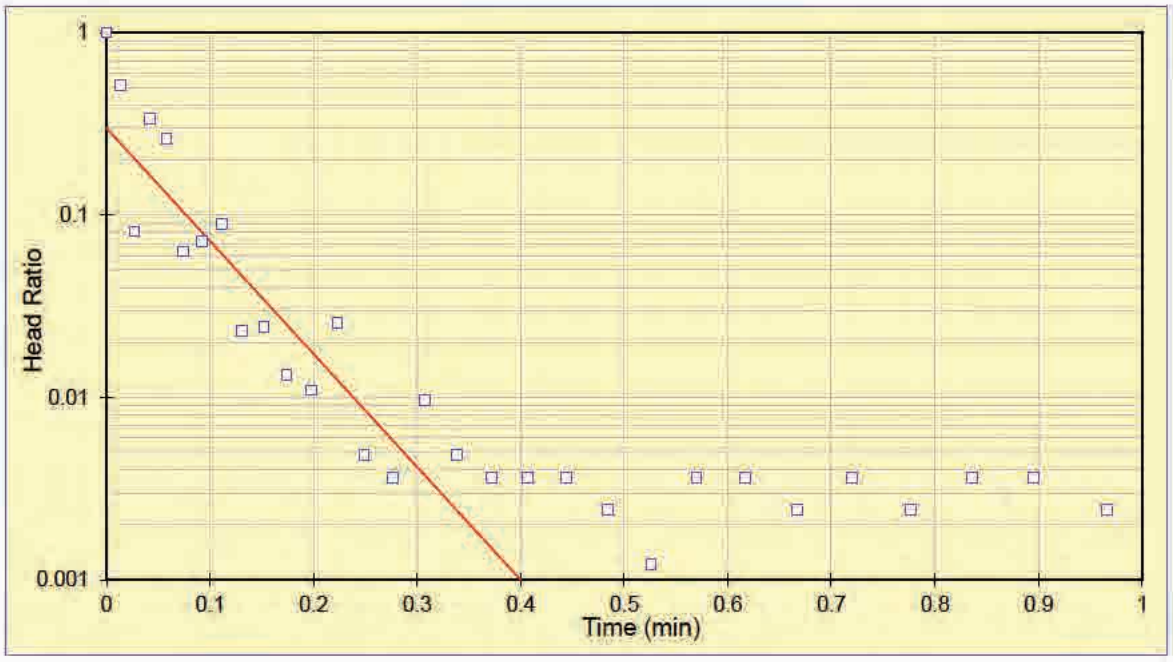
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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
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Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

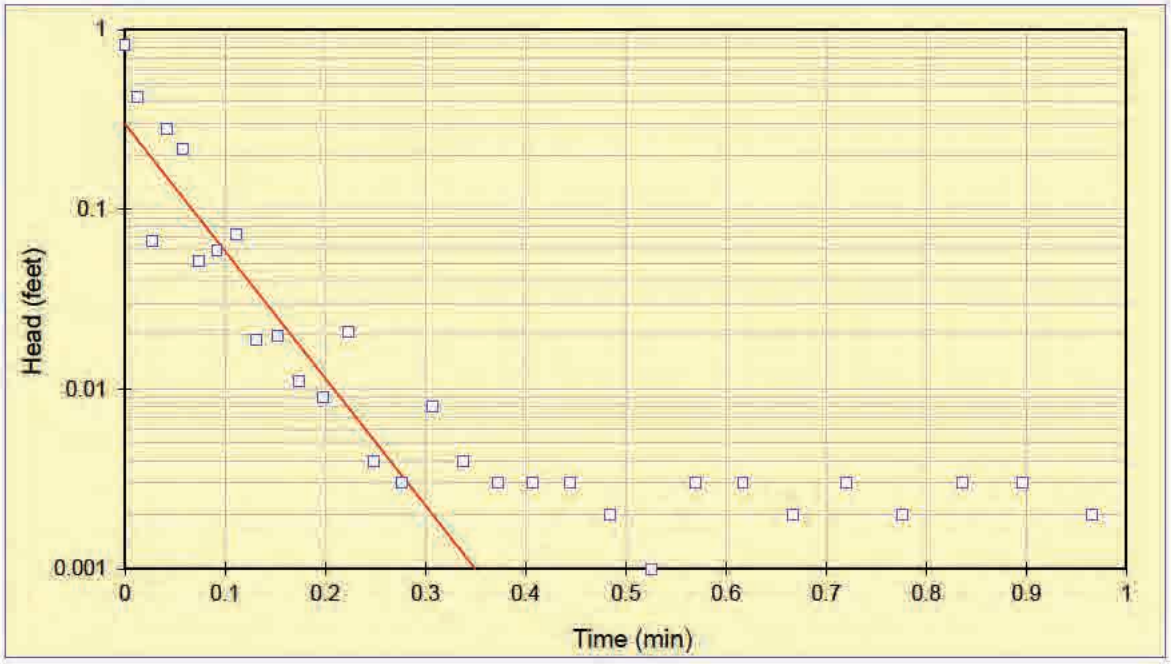
where:

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
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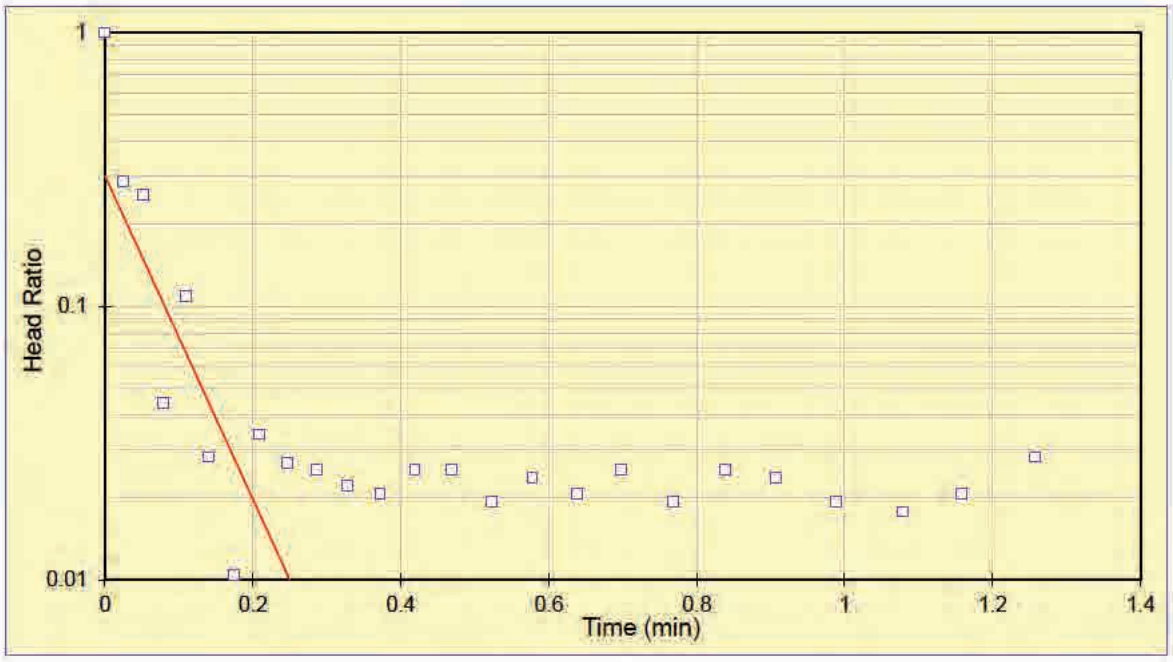
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 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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BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

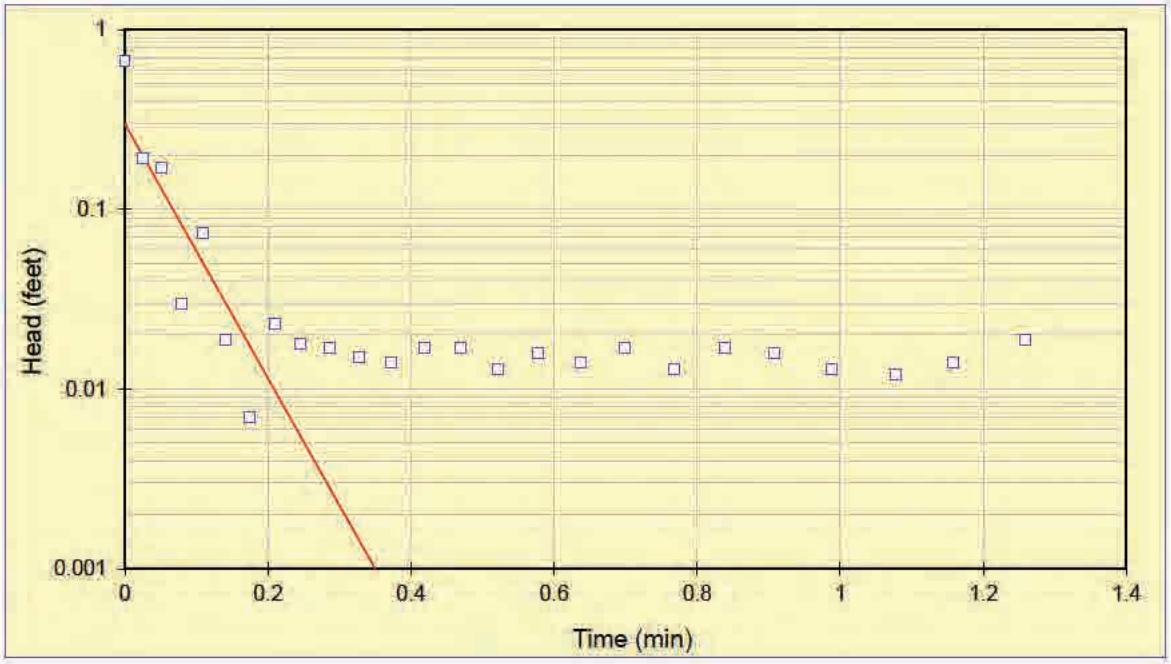
where:

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:

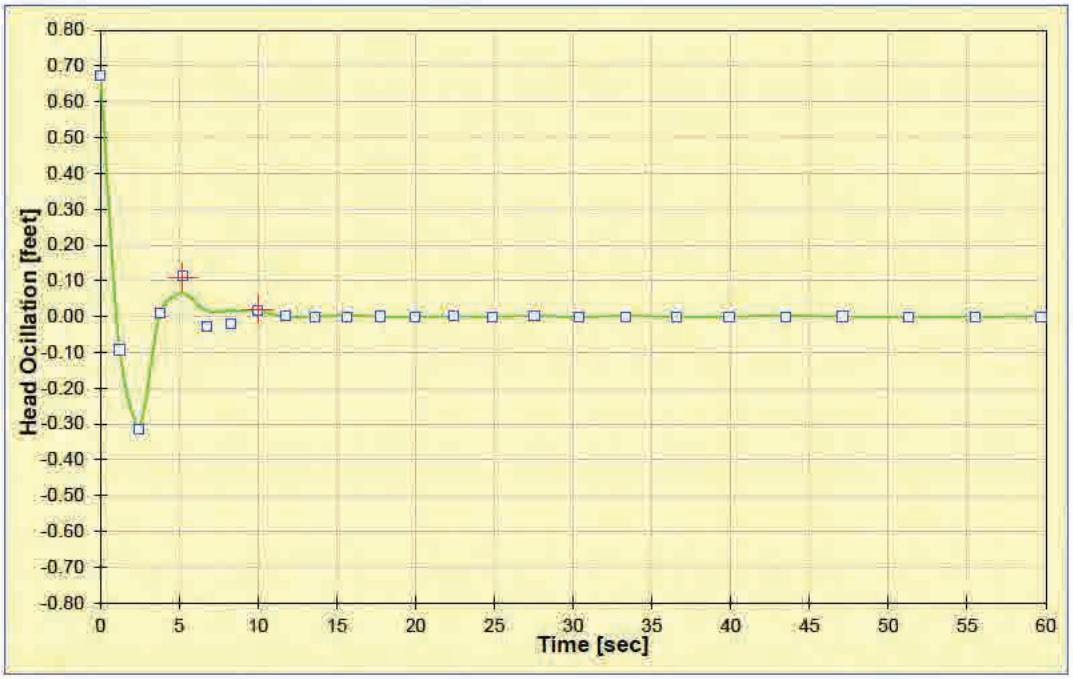
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma/(g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

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

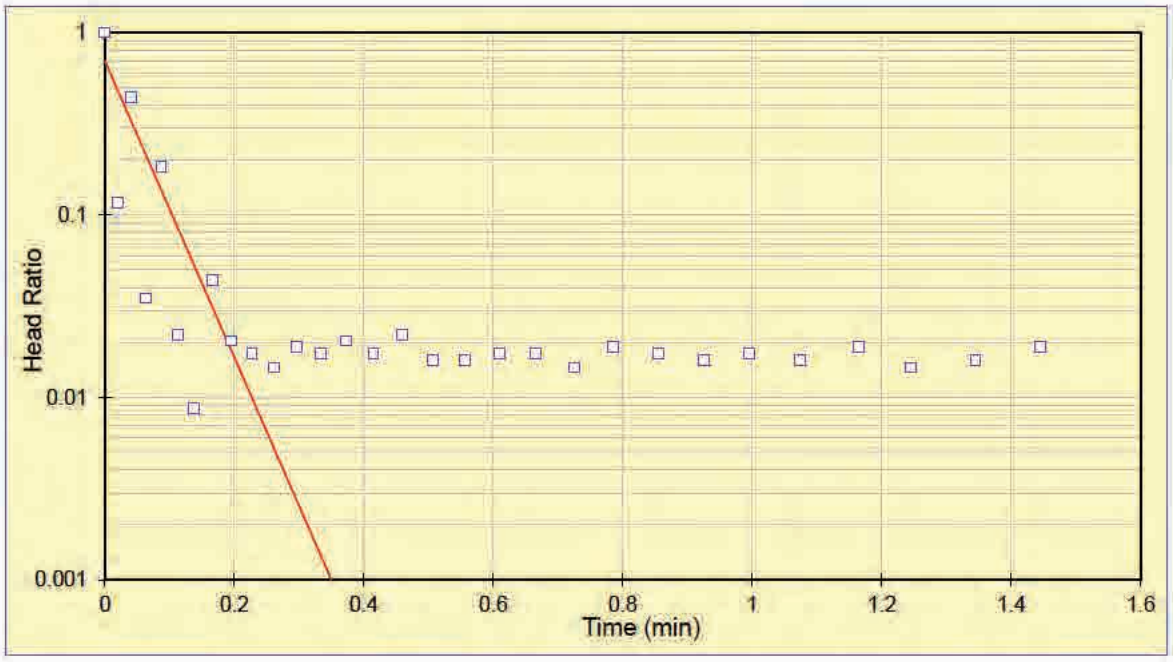
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

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		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.11E-02	cm/sec
t_1 =	0	K=	3.15E+01	ft/day
t_2 =	0.35			
h_1/h_0 =	0.70			
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 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

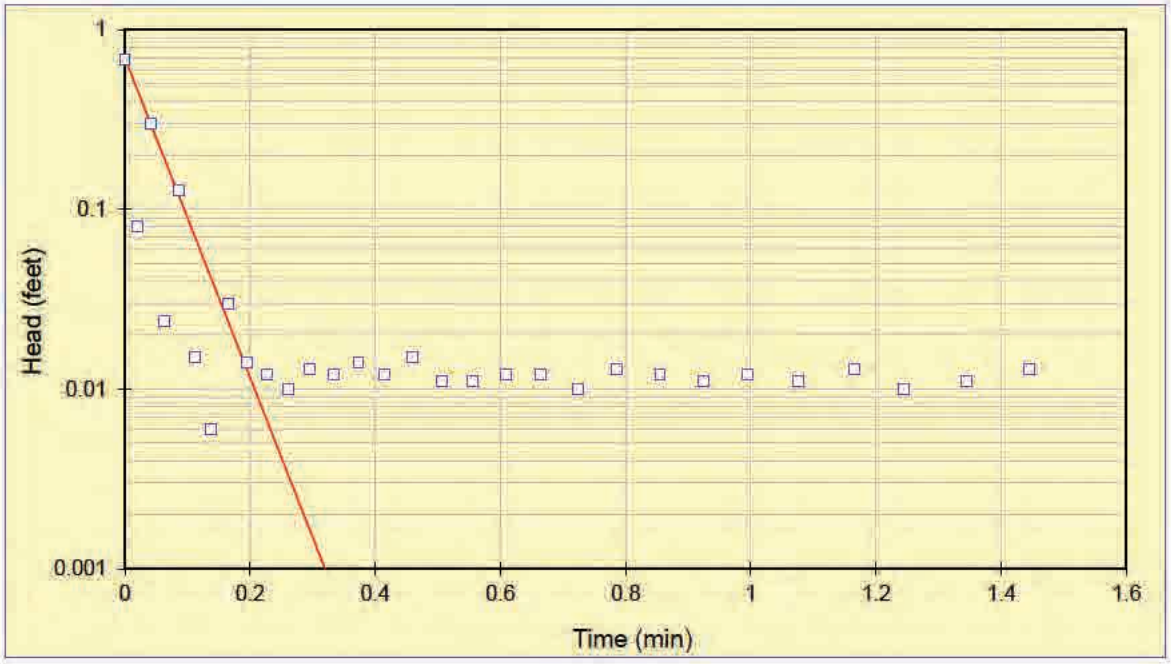
where:

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:

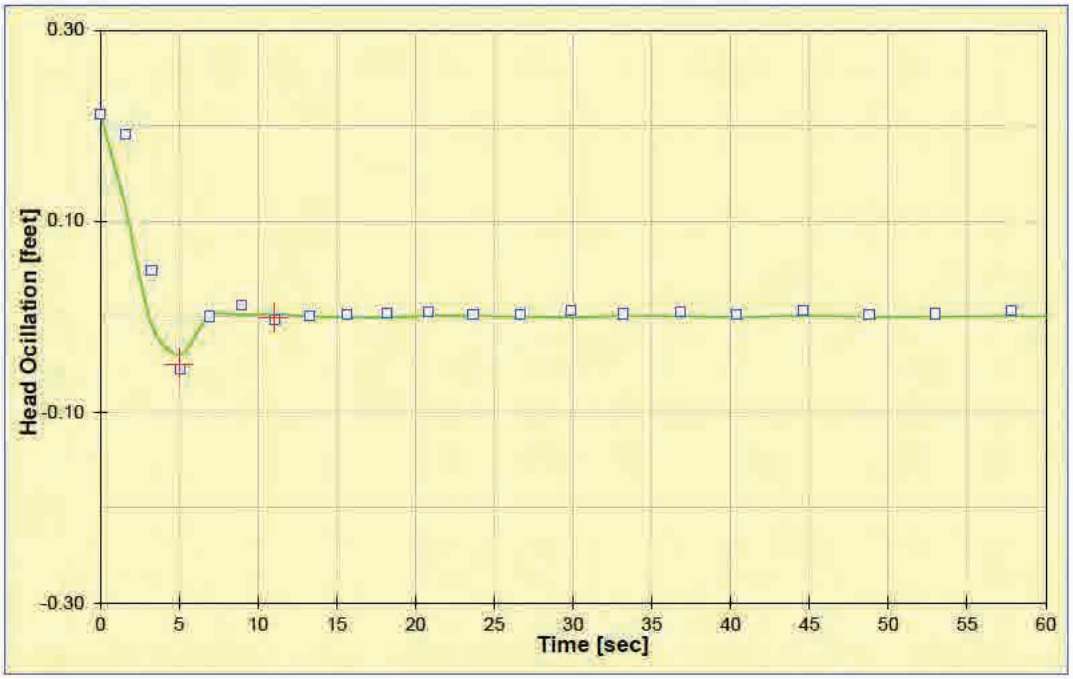
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

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

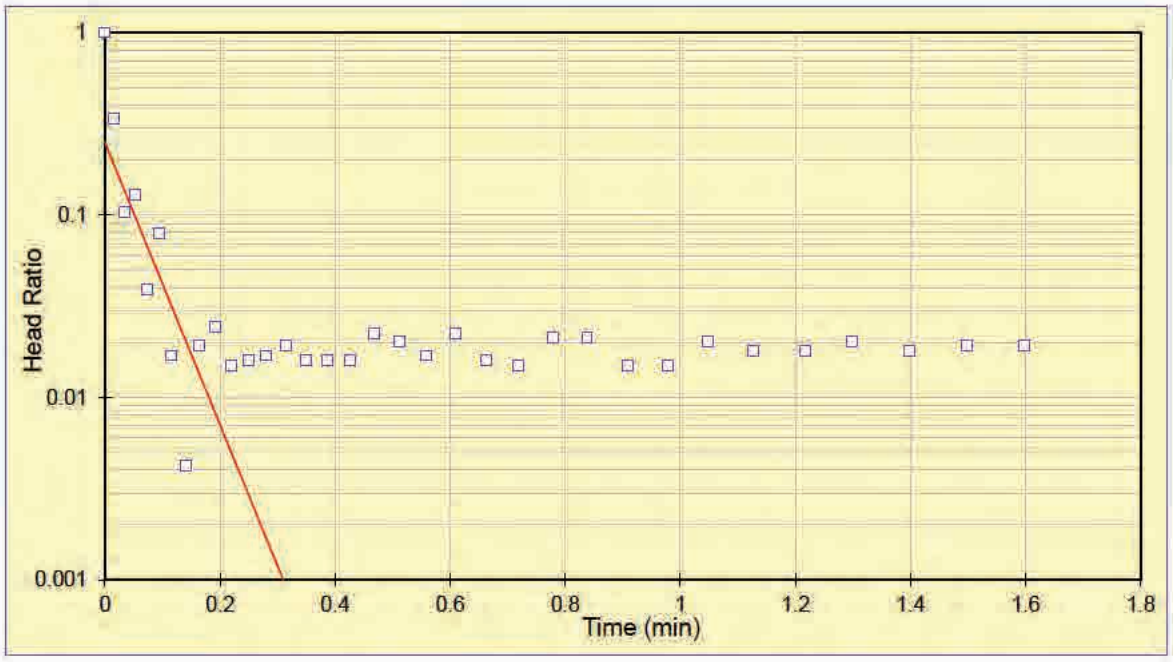
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

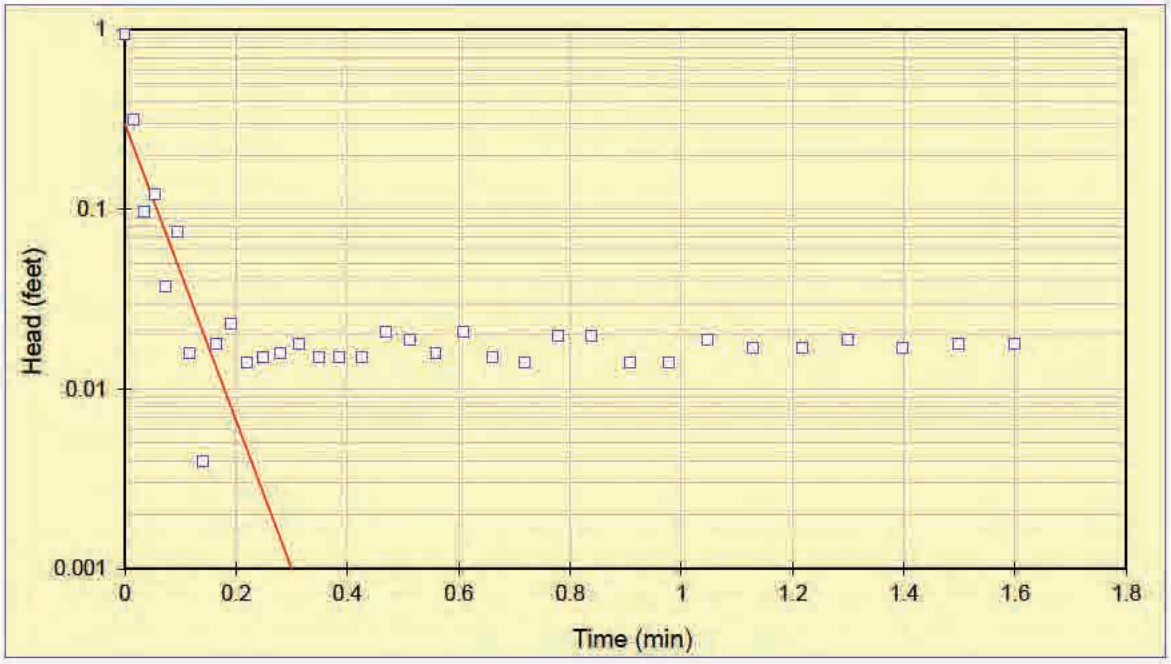
where:

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

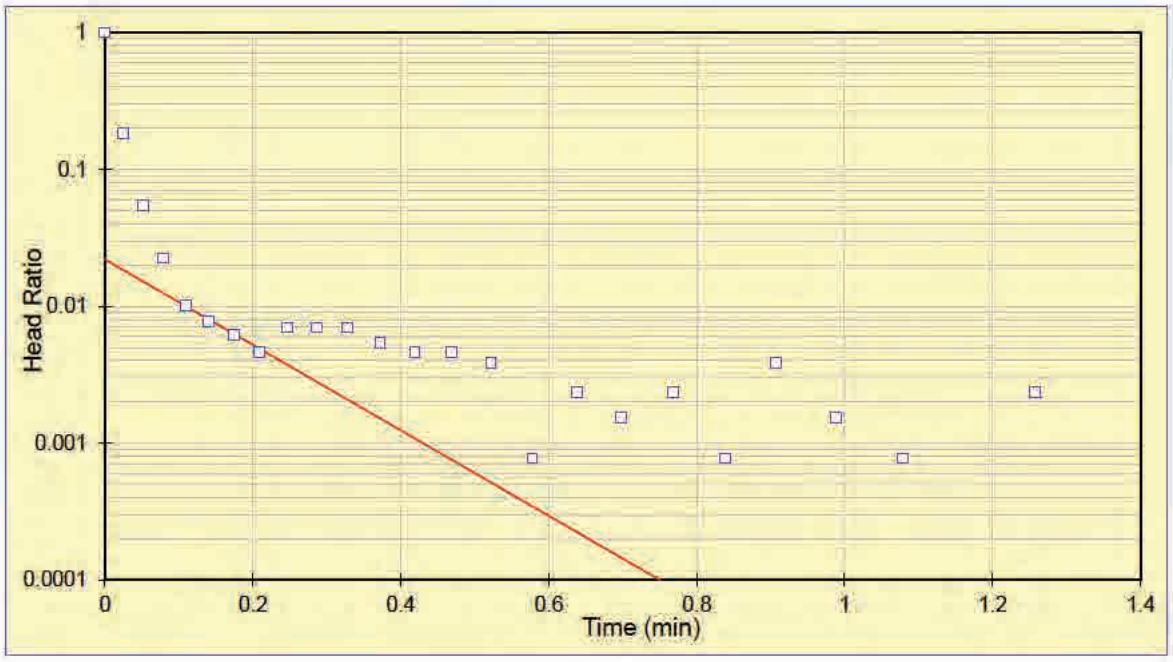
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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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Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15 (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

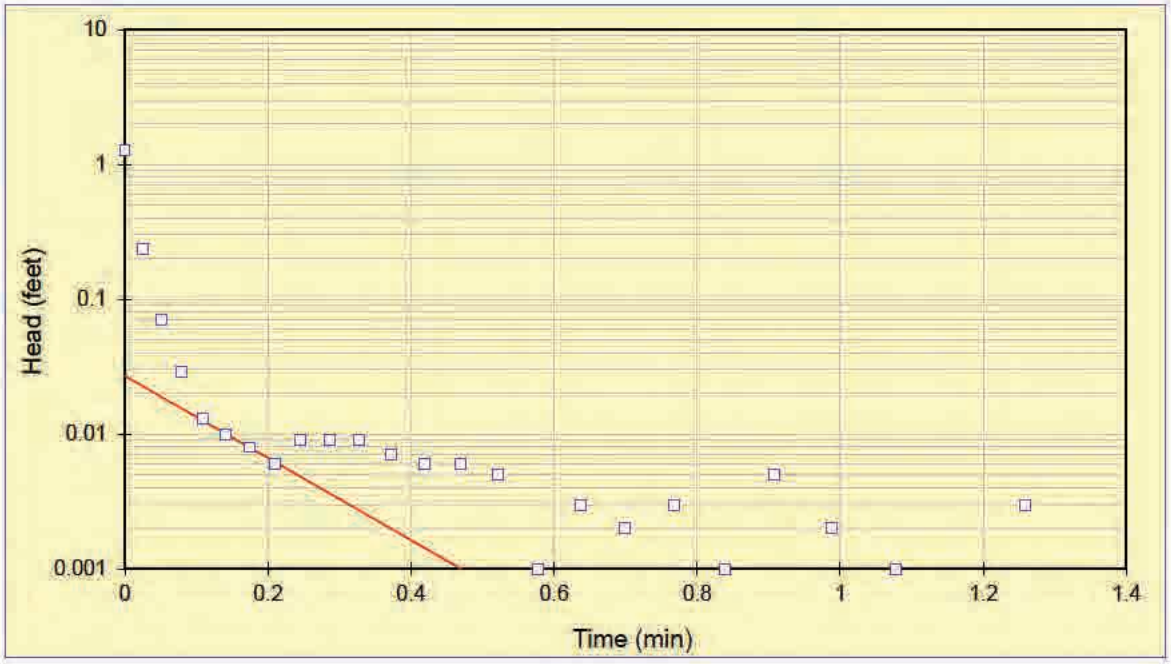
where:

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
Project No.: 164-8171
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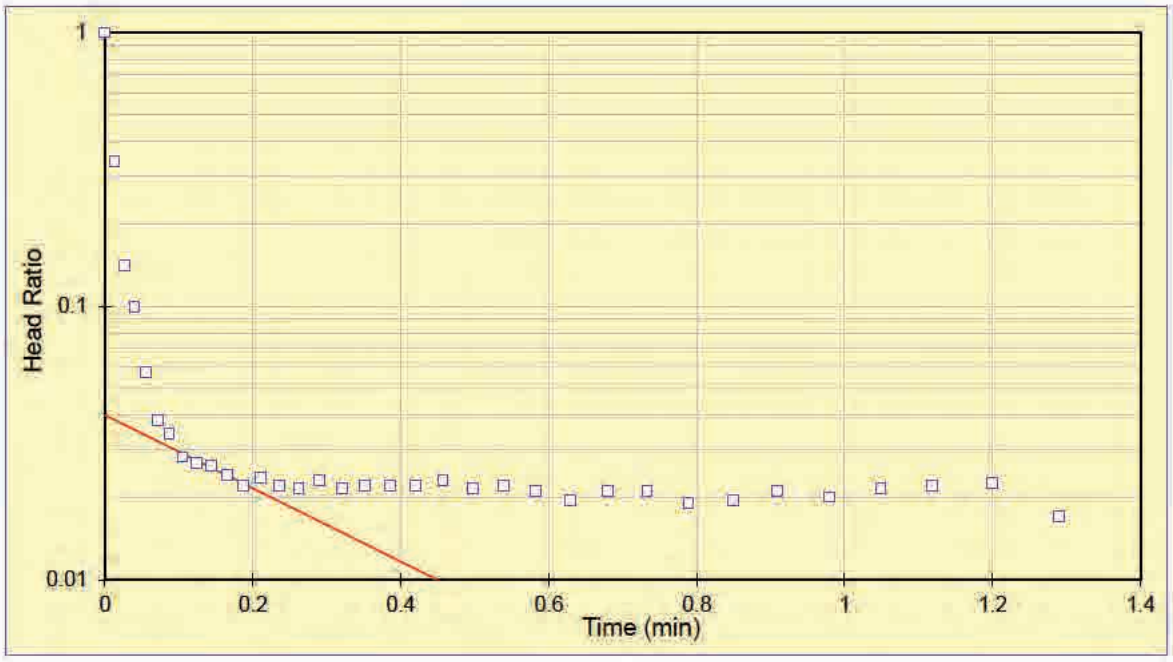
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

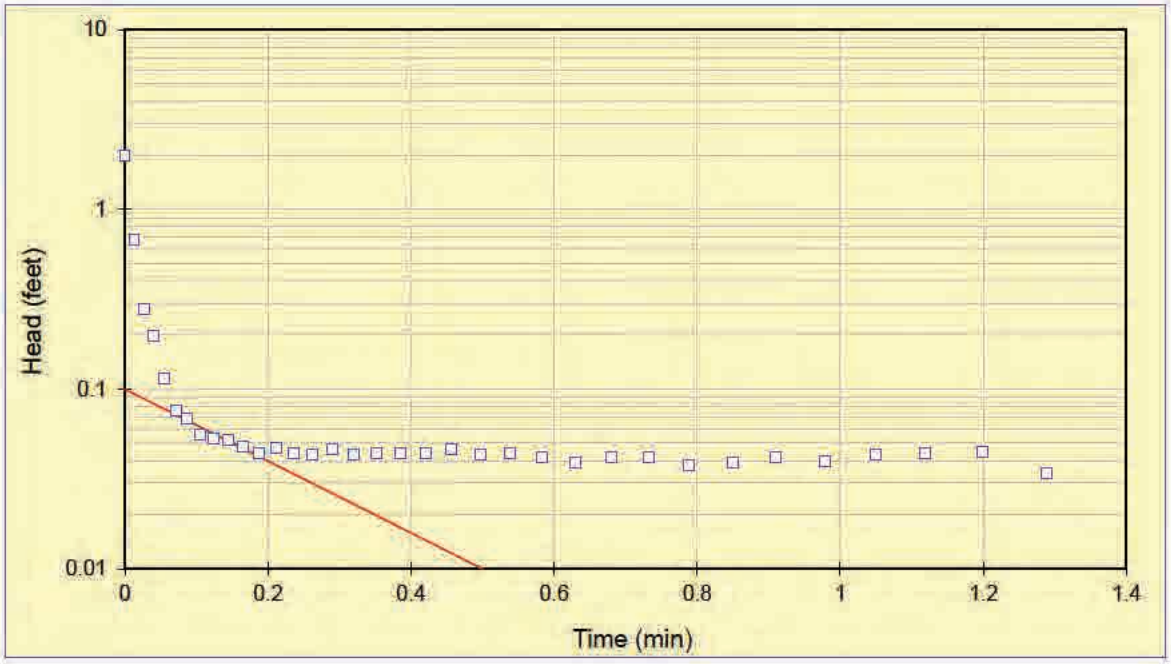
where:

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



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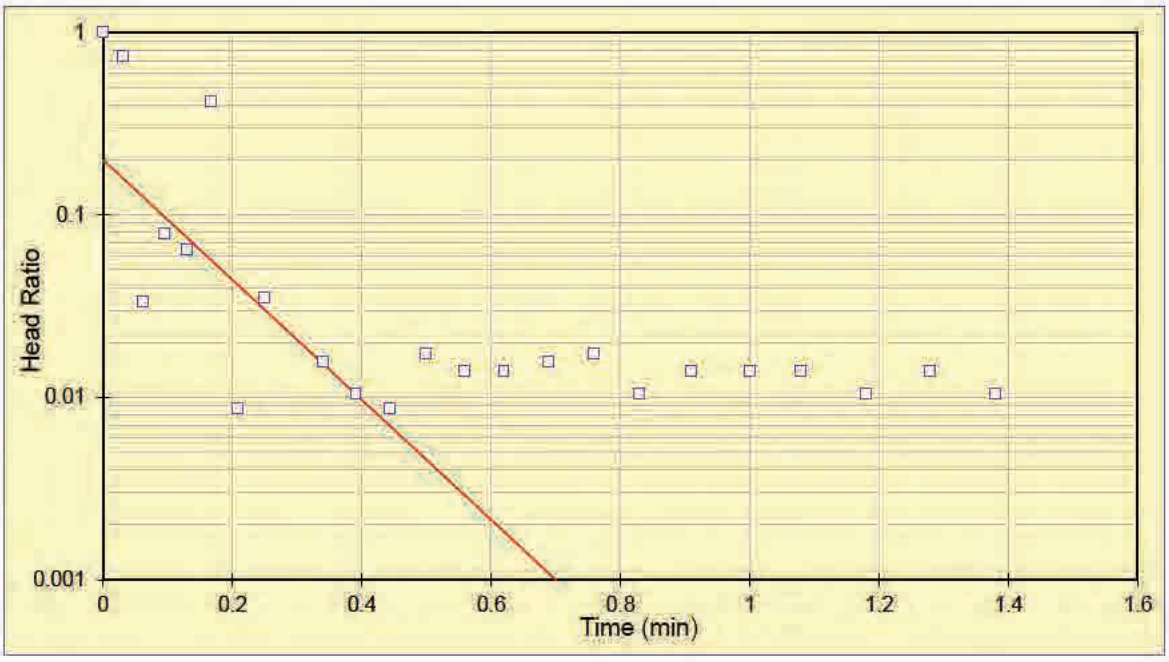
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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			



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BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

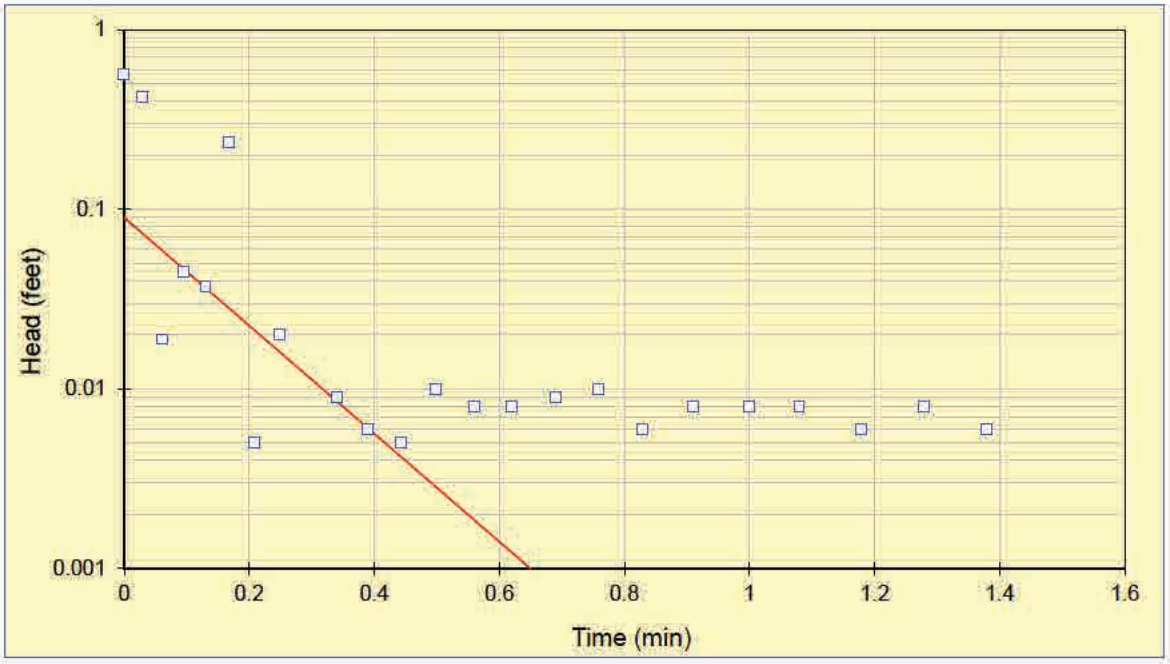
where:

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



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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:

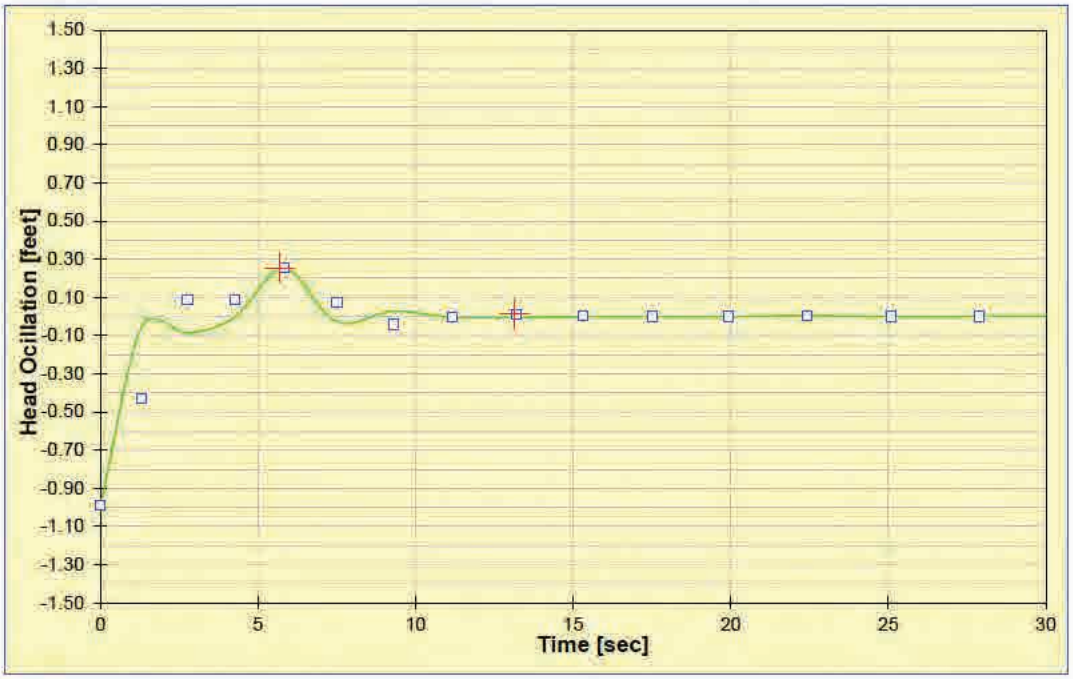
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma/(g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

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



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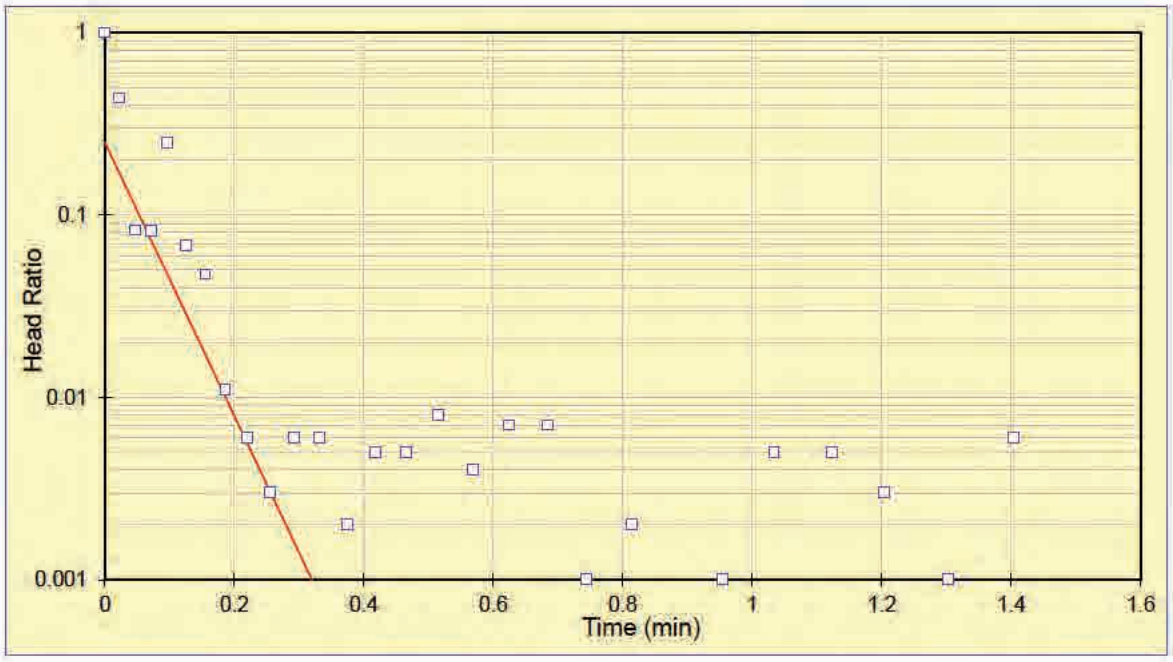
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

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			



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Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

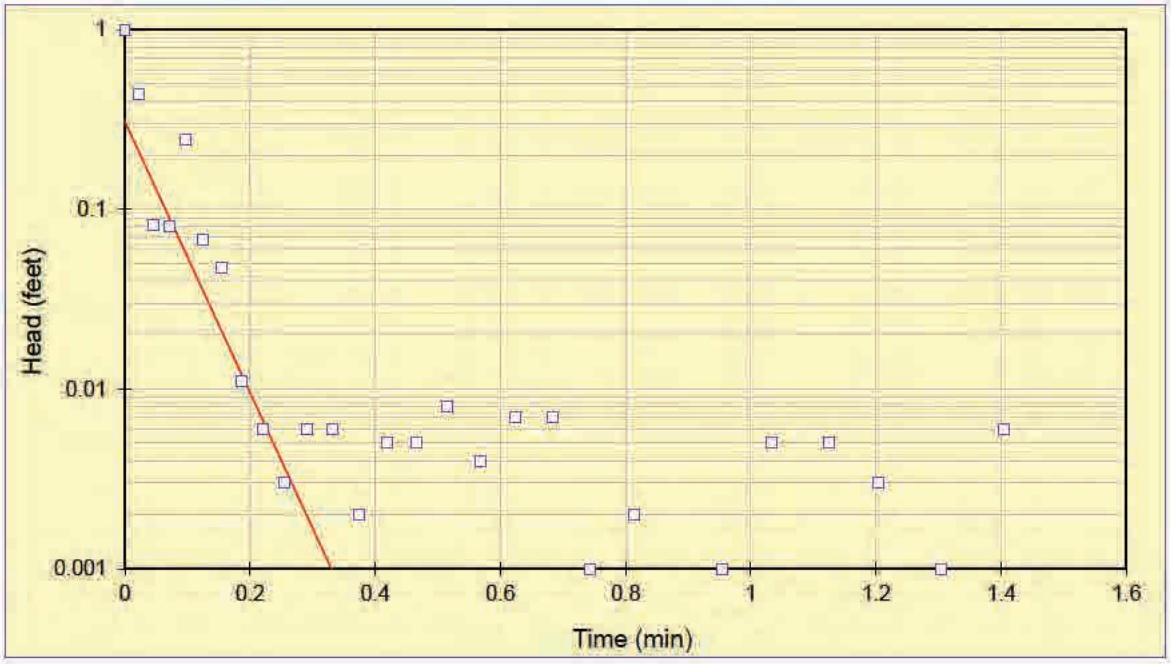
where:

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
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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 1)

$$T = b + a \ln T$$

where:

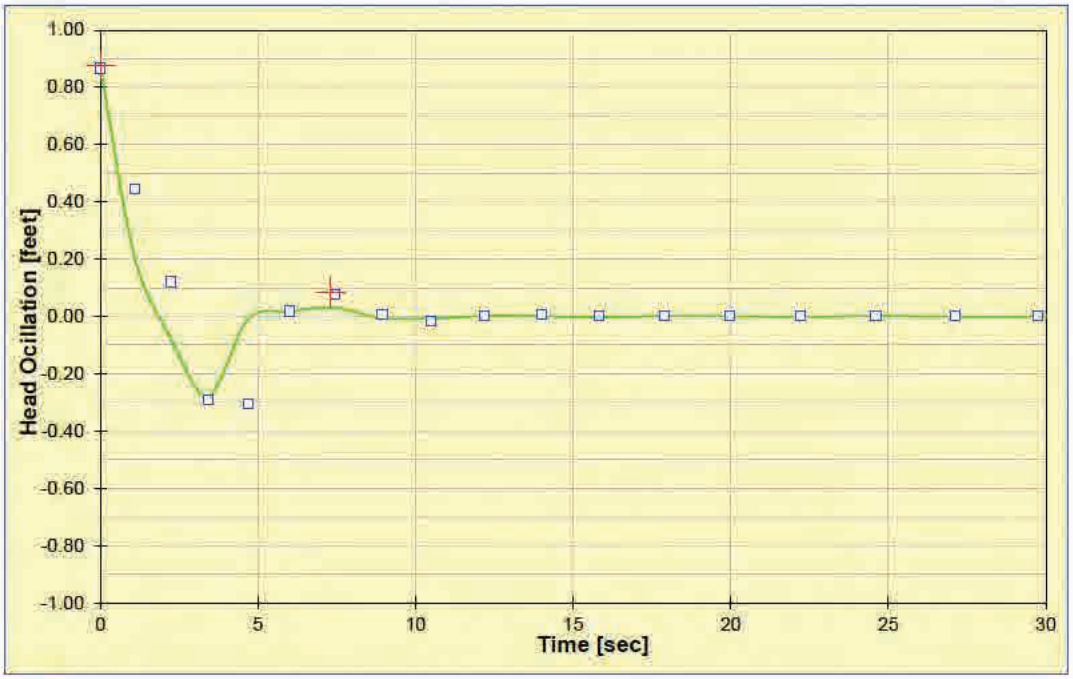
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

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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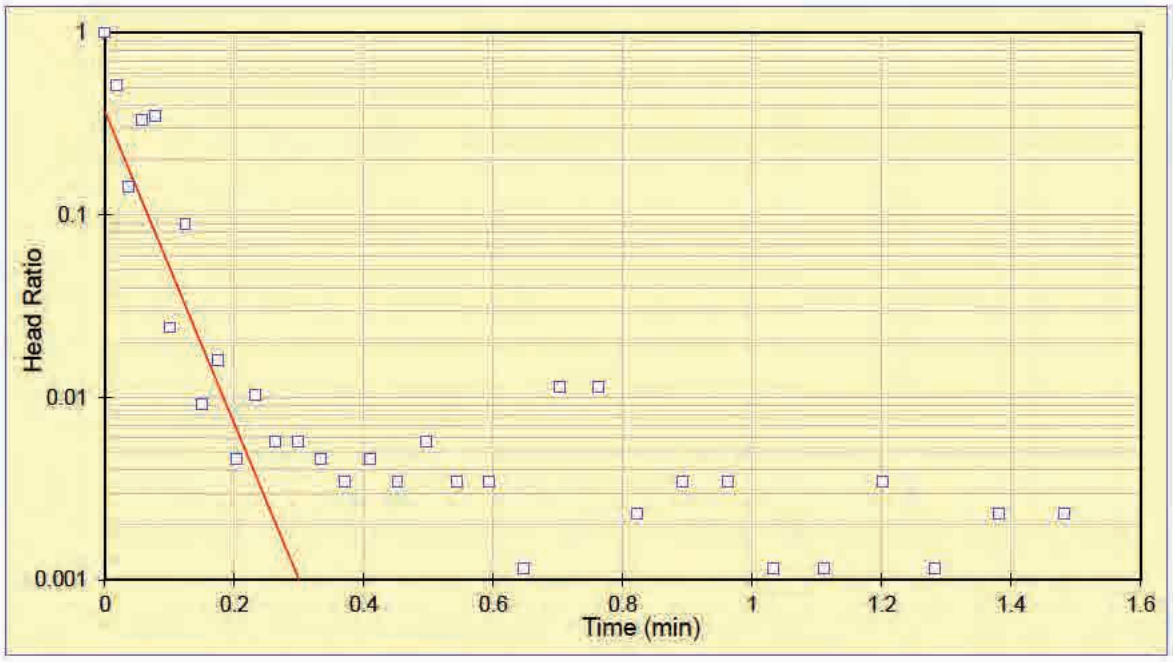
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

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
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BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

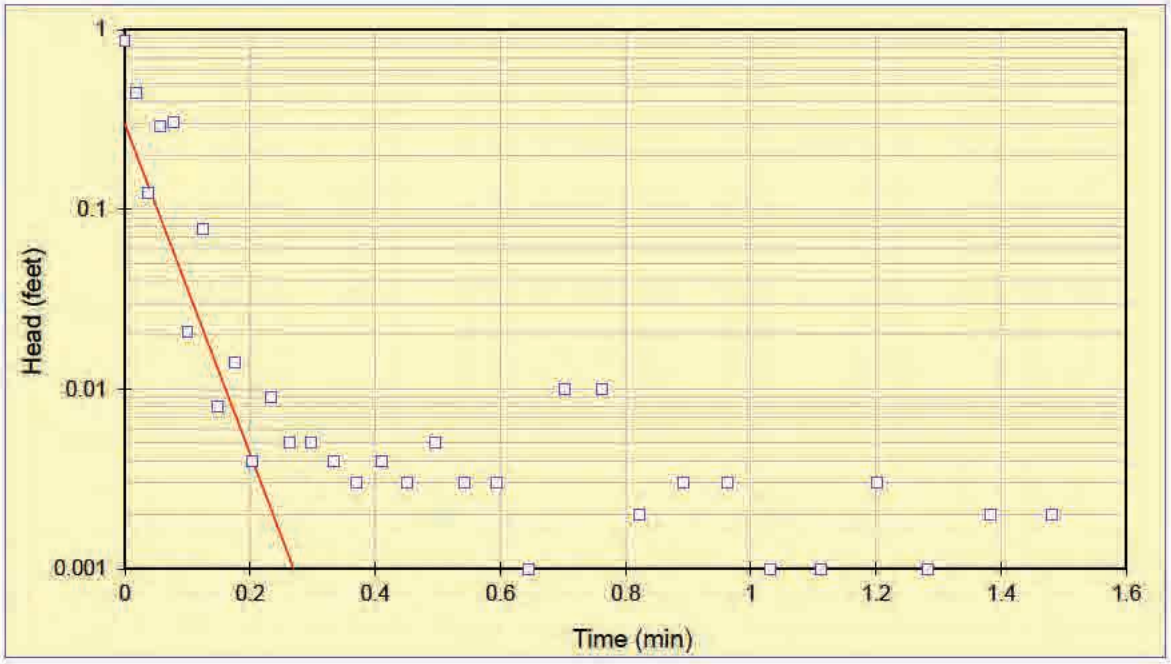
where:

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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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:

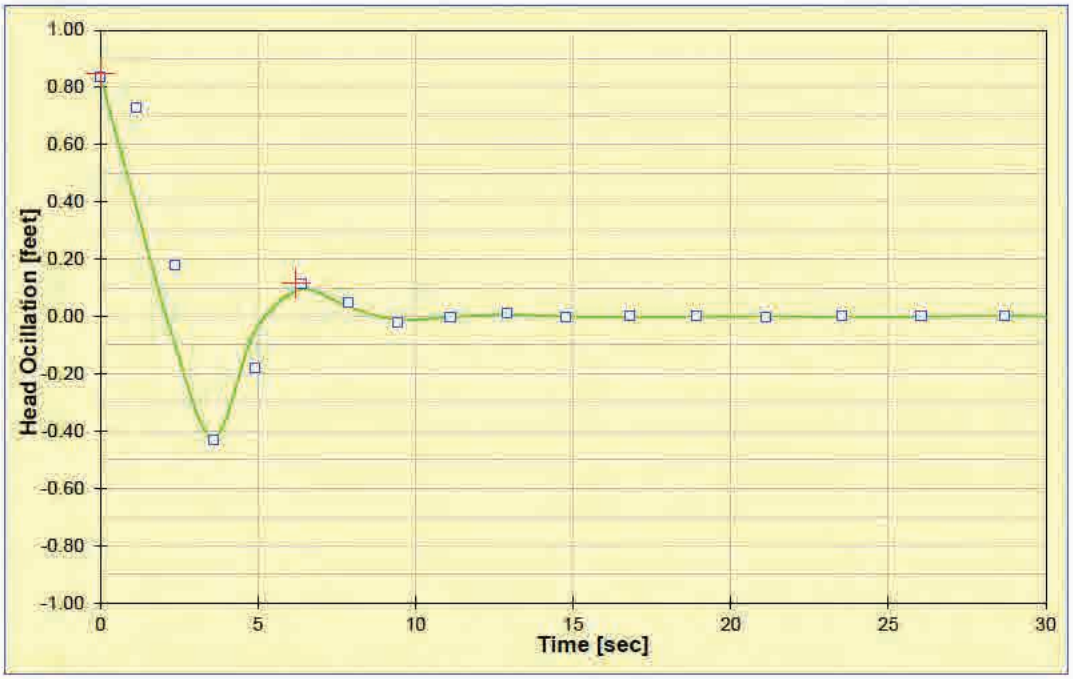
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma/(g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

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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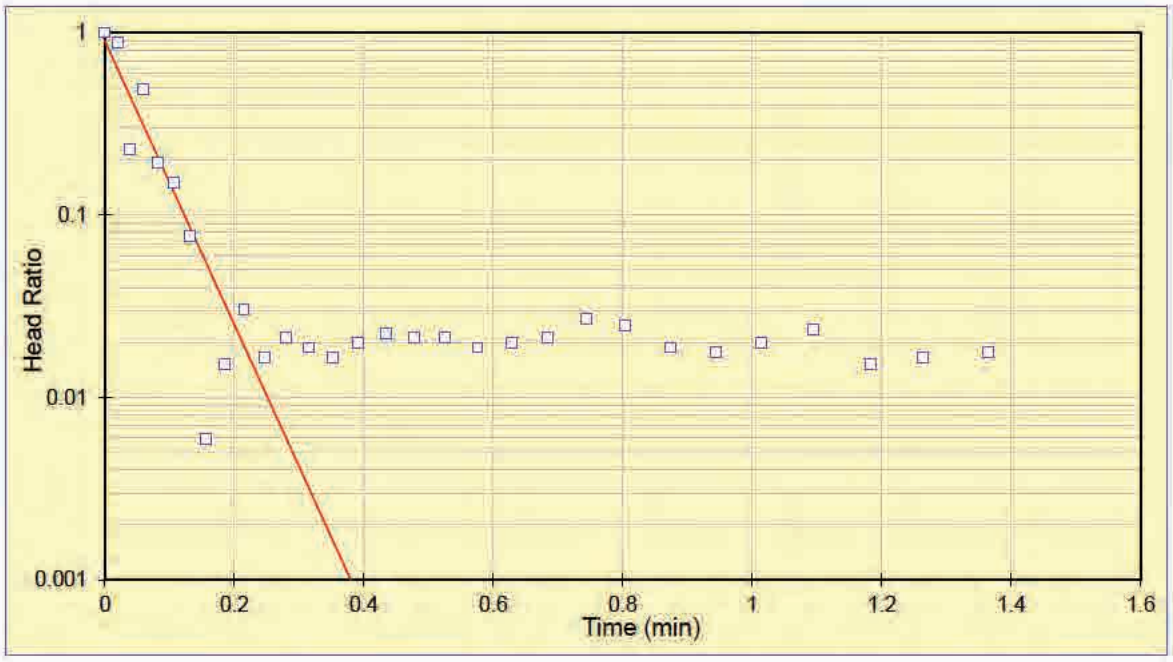
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

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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BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

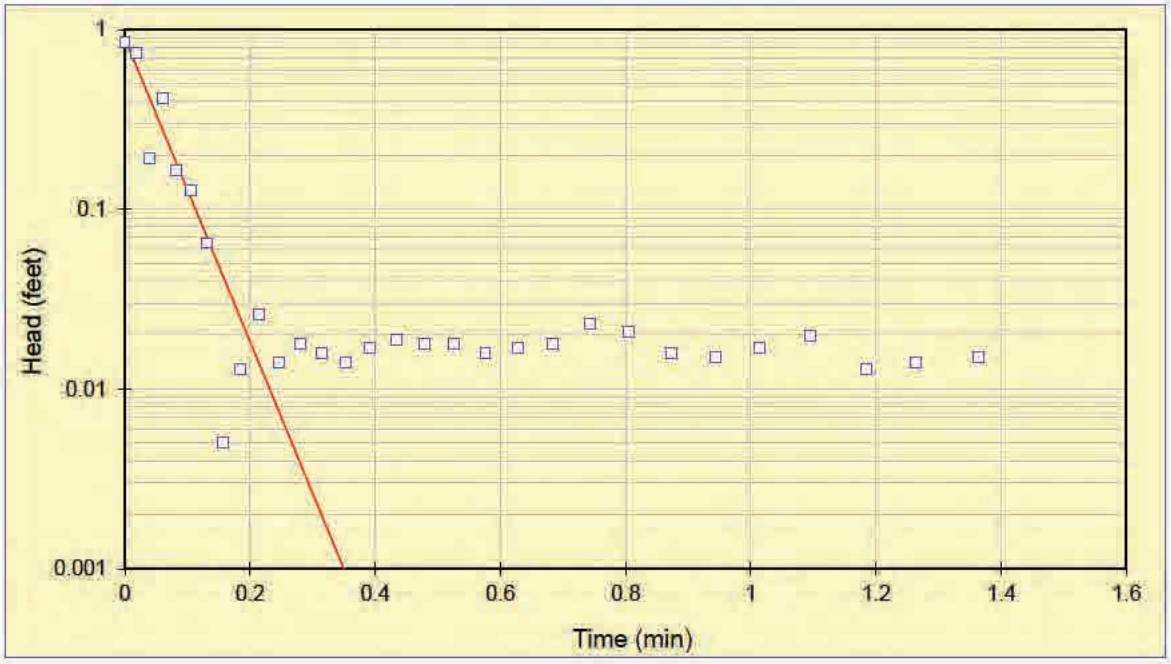
where:

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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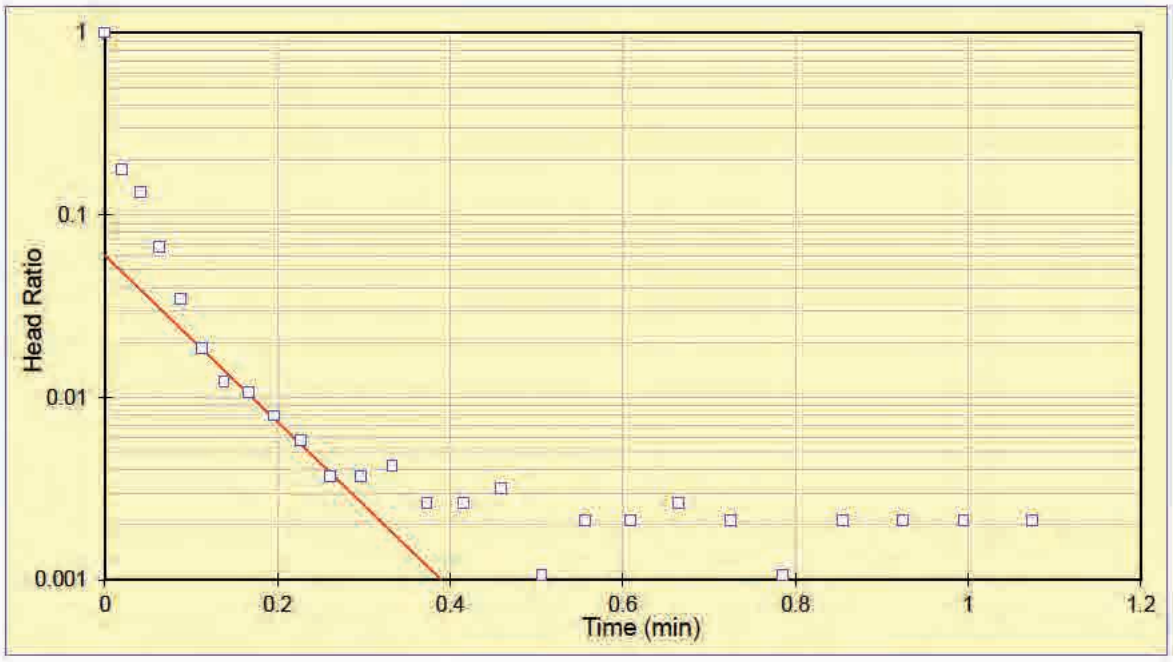
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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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BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19 (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

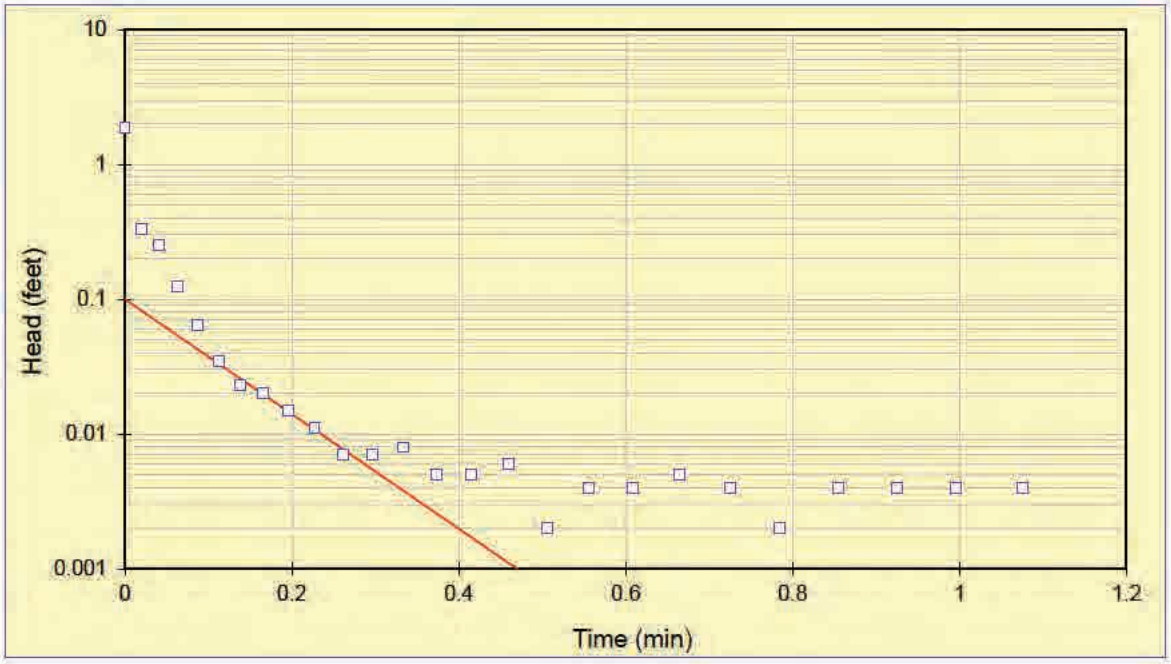
where:

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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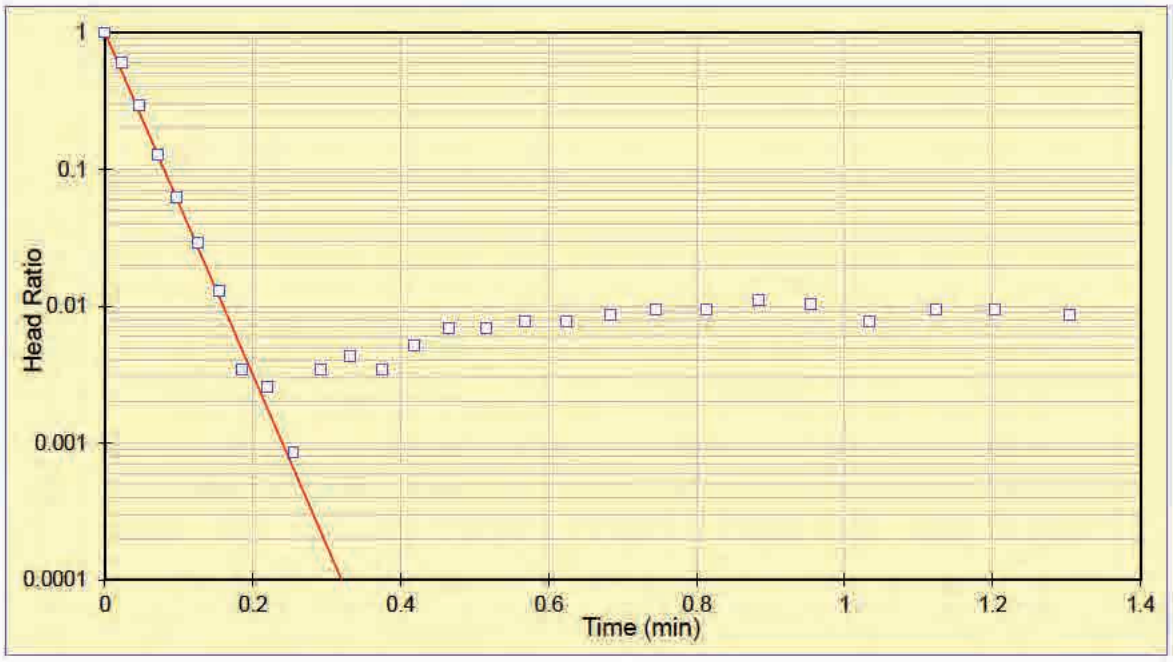
Analysis By: DFS
Checked By: JRS
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HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19 (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

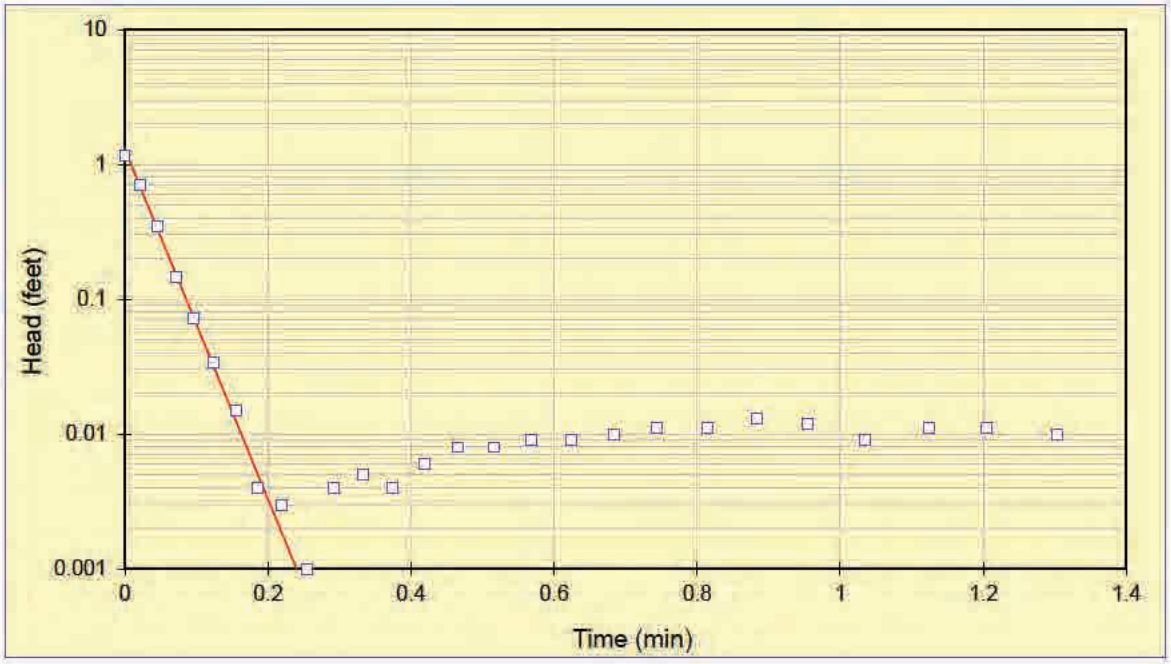
where:

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



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

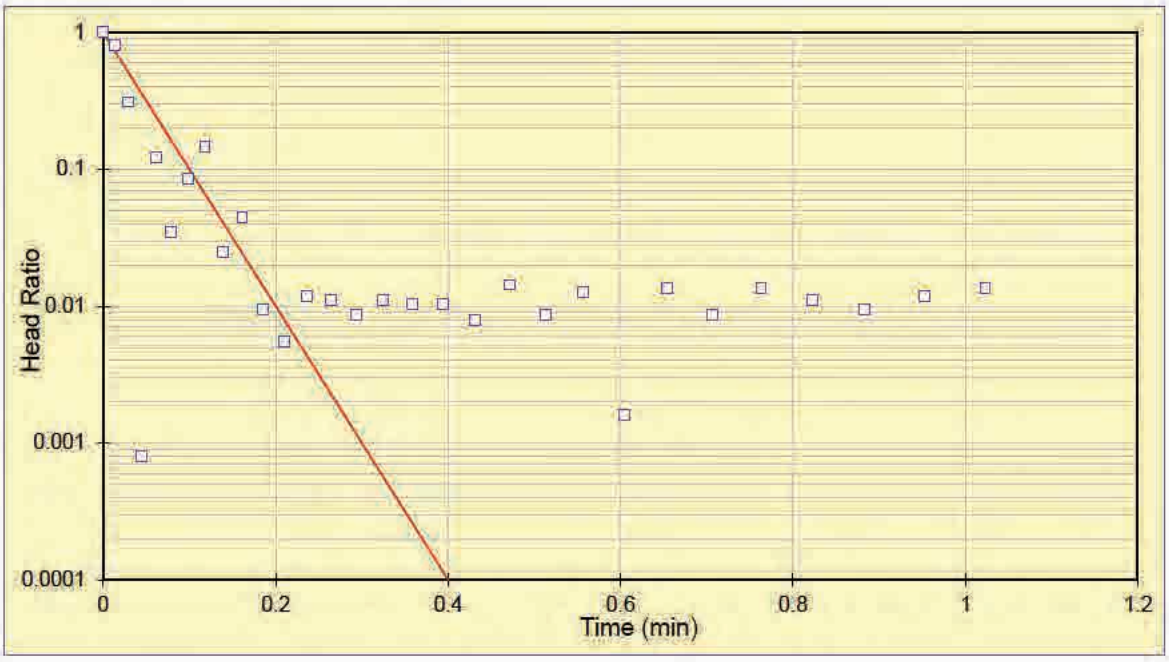
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-19B (TEST 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
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 1)

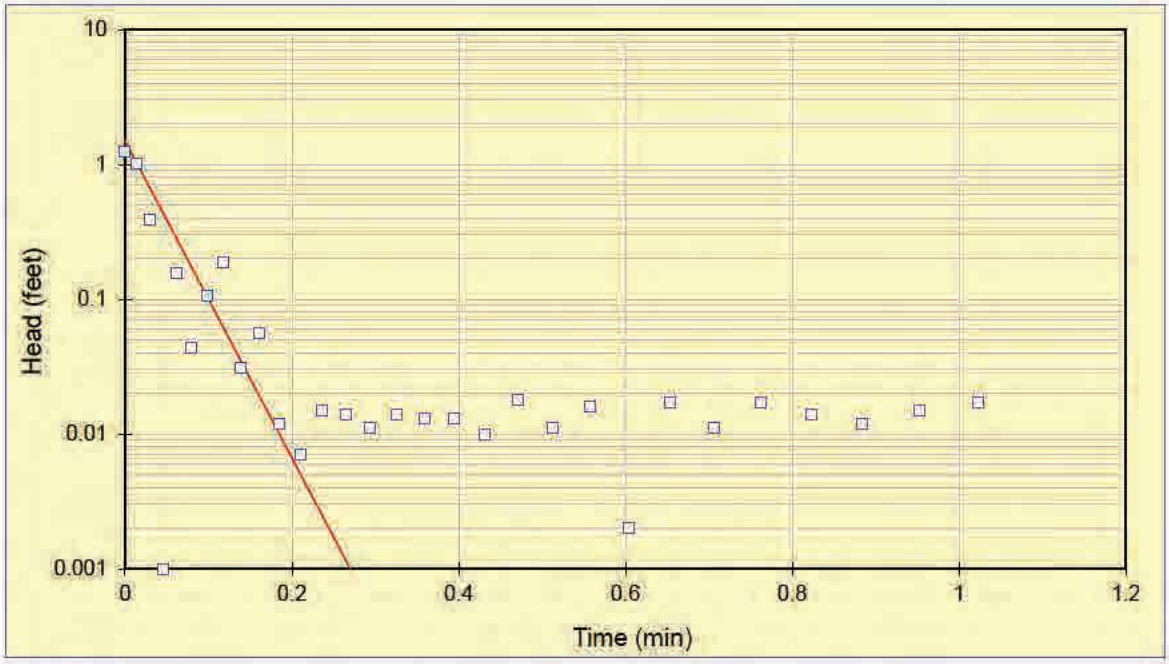
$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

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

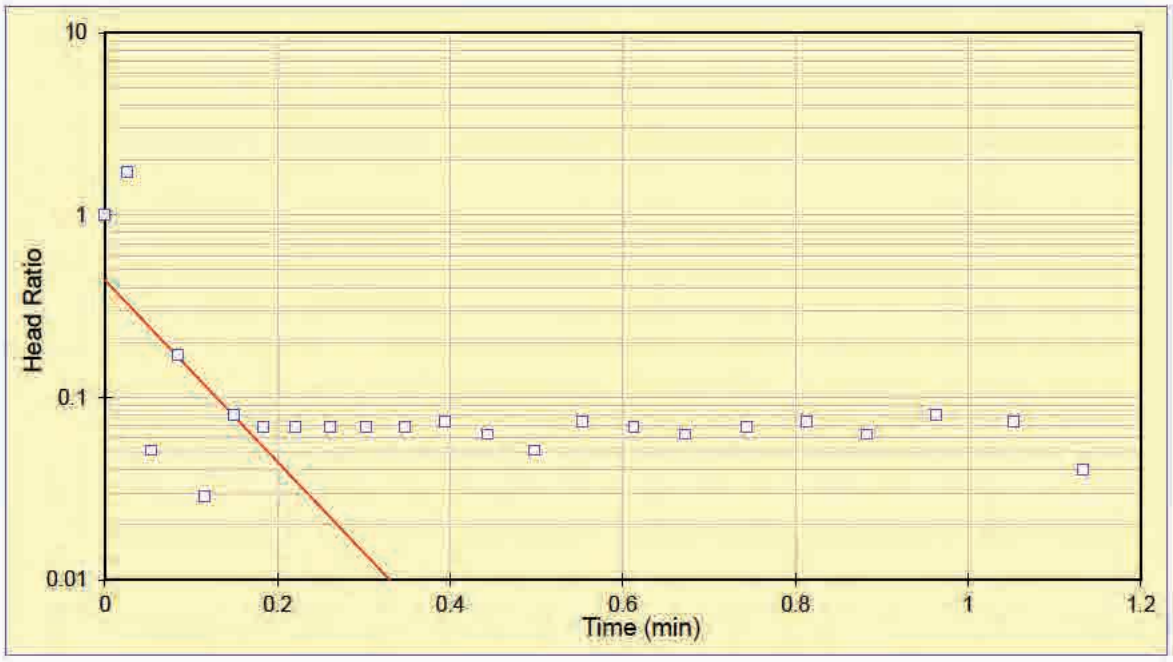
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

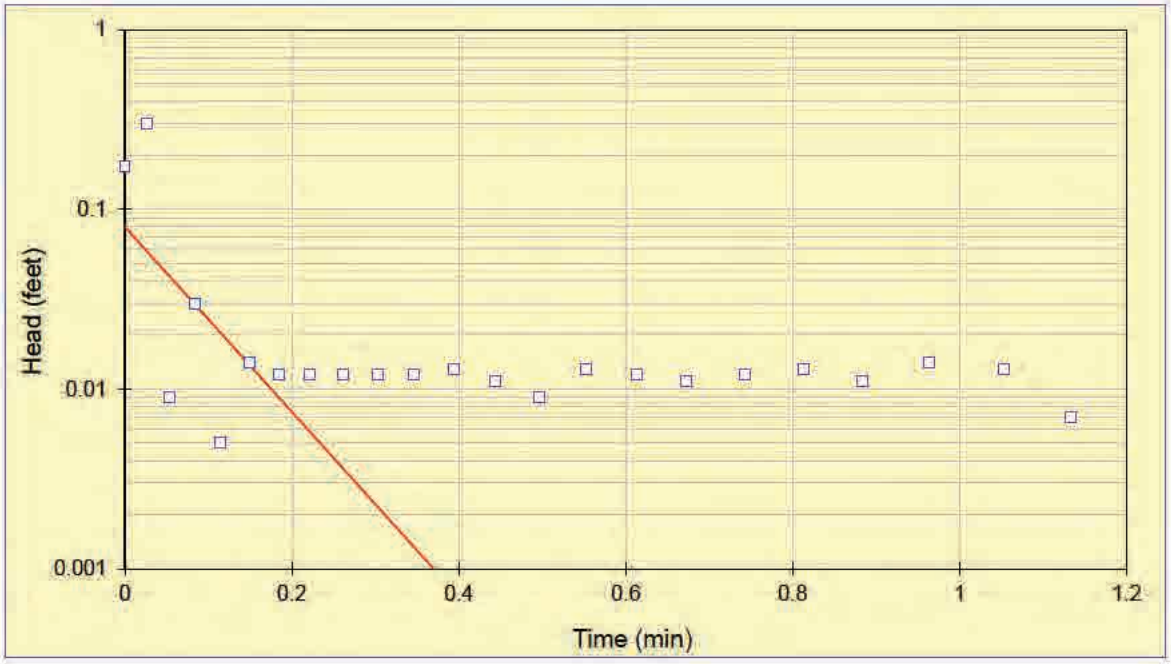
where:

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:

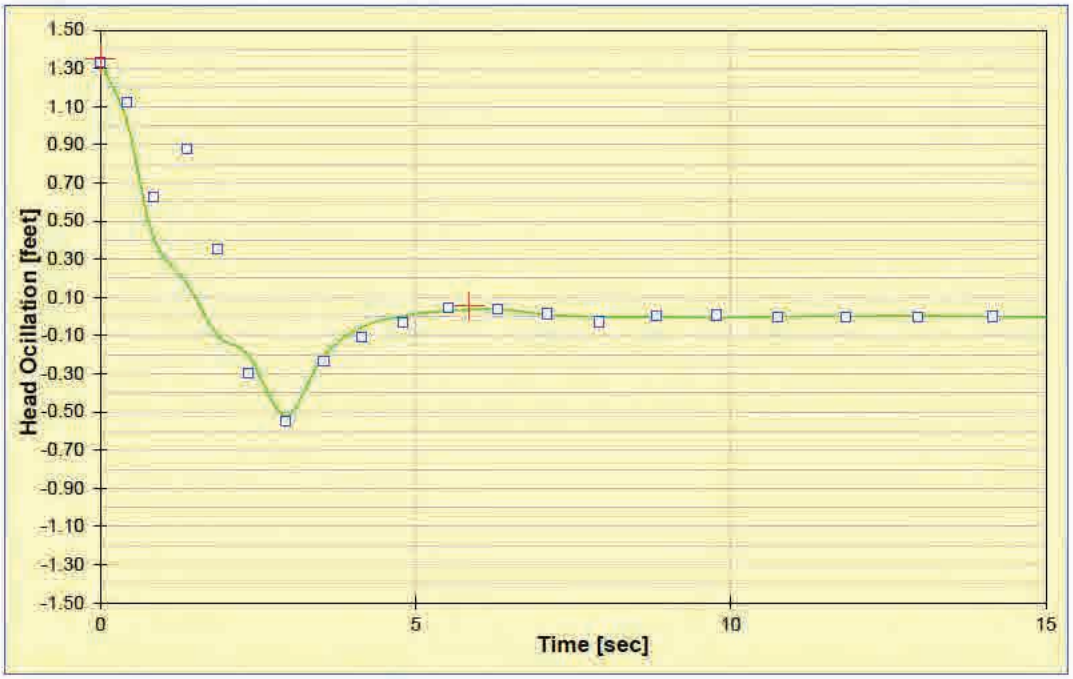
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma/(g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

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

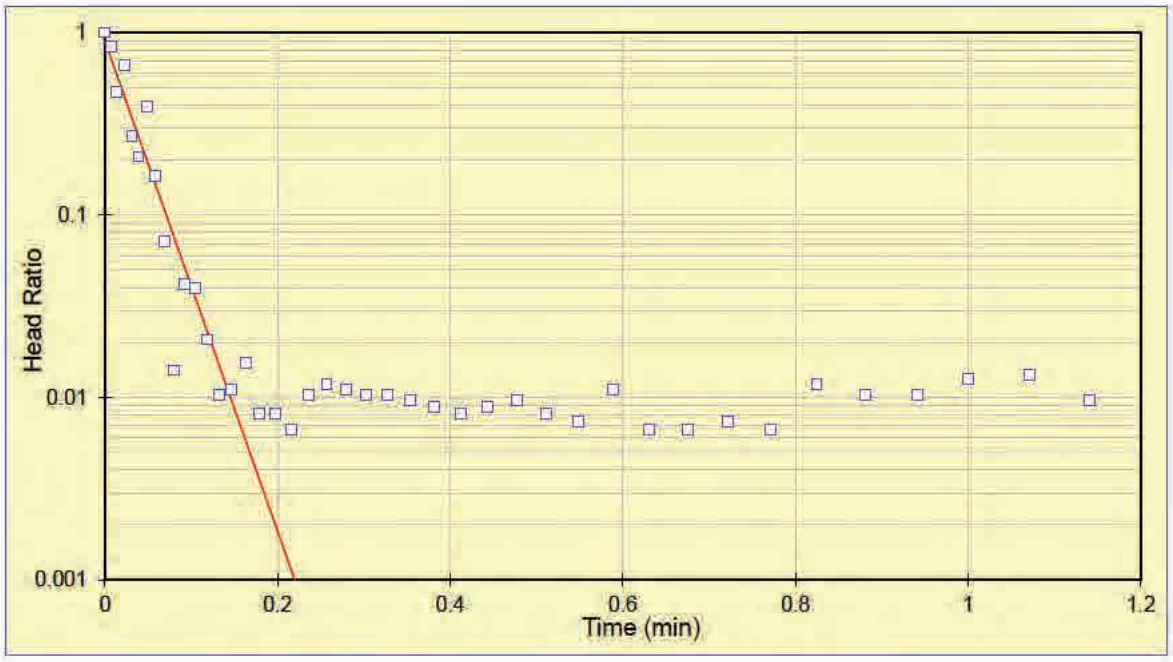
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

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		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.84E-02	cm/sec
t_1 =	0	K=	5.21E+01	ft/day
t_2 =	0.22			
h_1/h_0 =	0.90			
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 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

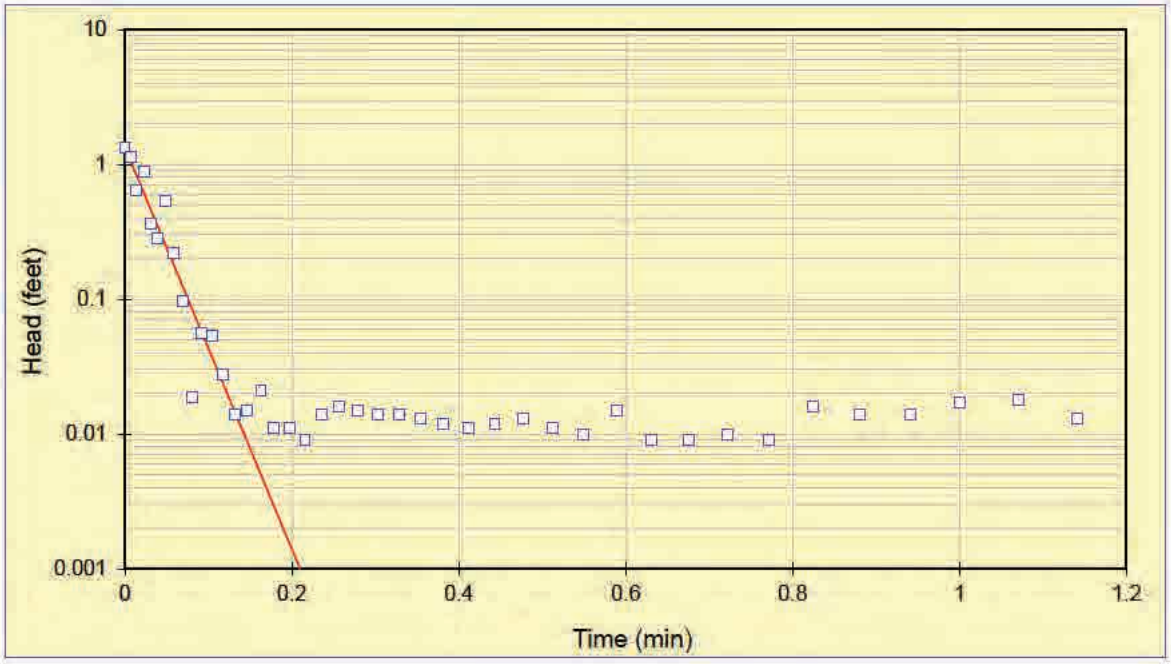
where:

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:

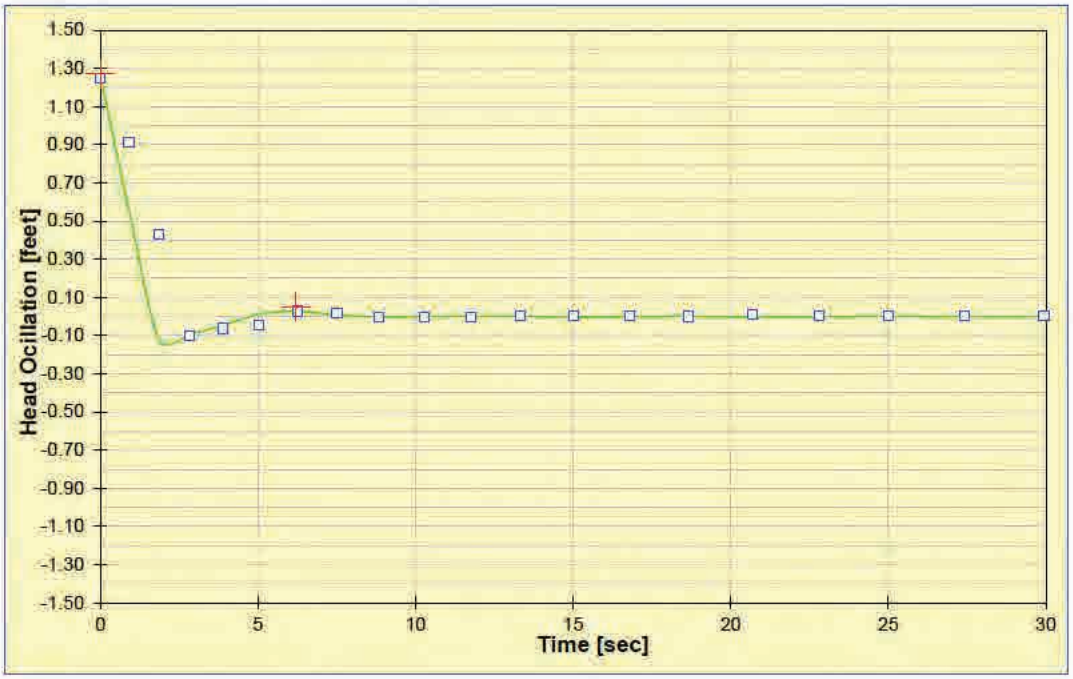
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

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

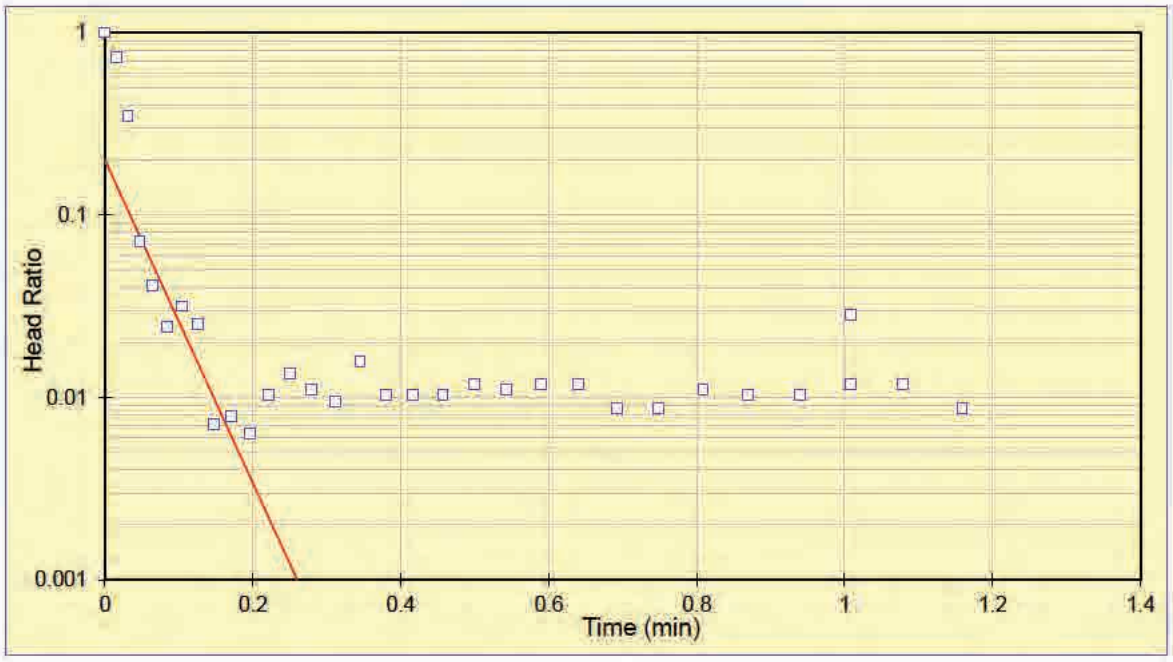
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

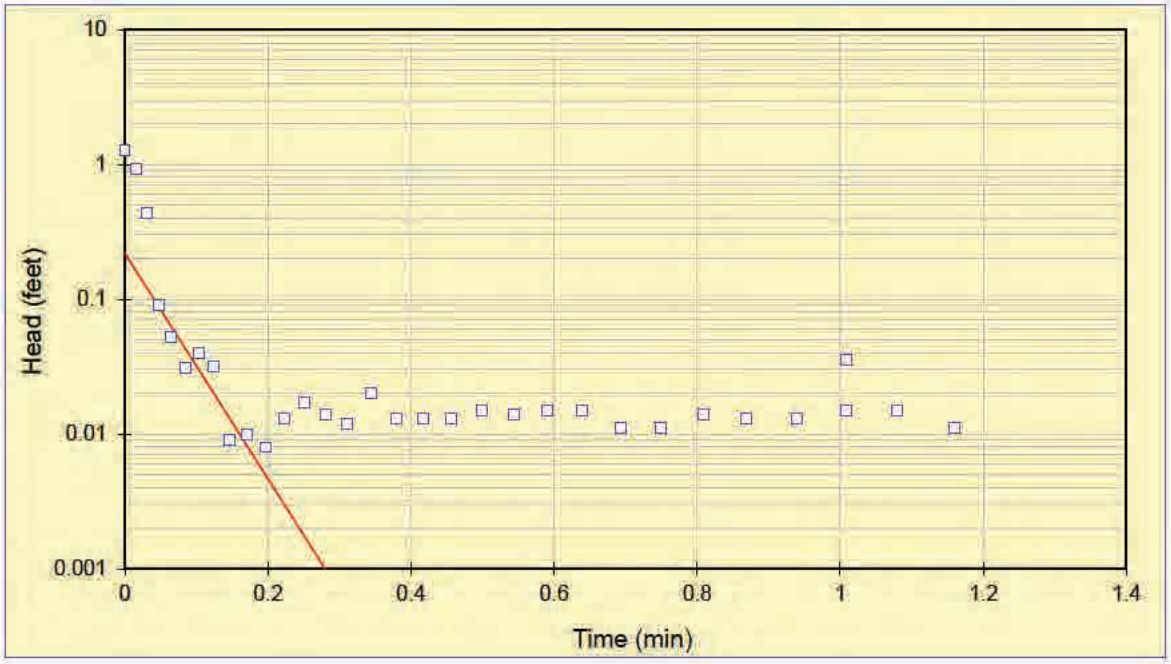
where:

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 D
VERTICAL GRADIENT FLOW CALCULATIONS

Monitoring Well Locations	Ground Surface Elevation (ft-masl)	Top of Casing Elevation (ft-masl)	Screen Interval				June 13, 2016				July 11, 2016				September 9, 2016				November 2, 2016			
			Top (ft-bgs)	Bottom (ft-bgs)	Center (ft-bgs)	Center (ft-masl)	Depth To Water (ft-btoc)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction
GAWW01	993.02	993.94	5	15	10	983.02	10.77	983.17			10.84	983.10			10.85	983.09			11.00	982.94		
GAWW01B	993.01	993.93	20	40	30	963.01													11.04	982.90	-0.0018	Down
GAWW02	992.45	992.76	5	15	10	982.45	9.91	982.85							9.91	982.85			10.14	982.62		
GAWW02B	992.40	992.76	20	35	27	965.40													10.14	982.62	-0.0458	Down
GAWW03	992.16	992.49	5	15	10	982.16	9.62	982.54			10.29	981.89			9.11	983.04			9.52	982.63		
GAWW03B	992.16	992.54	24.5	34.5	29.5	962.66	9.75	982.54	-0.180-02	Down	9.81	982.48	-0.145-02	Down	8.15	983.11	-0.245-02	Down	9.68	982.67	-0.0459	Down
GAWW10	993.21	993.05	5	15	10	983.04	9.52	983.53			9.82	983.23			9.22	983.83			9.36	983.69		
GAWW10B	993.11	993.05	29.3	37.1	33.2	959.91	9.15	983.90	-0.417-03	Down	9.42	983.63	0.00E+00	Flat	9.18	983.87	1.67E-03	up	8.96	984.09	0.0000	up
GAWW11E	992.57	992.97	5	15	10	982.57	9.21	983.76	-0.00E-00	Down	9.61	983.36	1.46E-01	up	9.18	983.79	-0.45E-01	up	8.32	984.65	0.960-02	up
GAWW11B	992.70	992.76	70.76	74.71	72.74	919.96	8.91	983.85			8.80	983.96			7.91	984.85			8.64	983.13		
GAWW11C	993.01	992.80	5	15	10	983.01	9.19	983.61			9.29	983.51			10.05	982.75			9.25	983.55		
GAWW12B	992.83	993.05	28	38	33	957.83	10.79	982.26	-0.22E-03	up	9.77	983.28	0.61E-01	Down	10.05	982.99	4.22E-02	Down	10.23	982.81	0.23E-01	Down
GAWW16	993.74	994.07	5	15	10	983.74	9.75	983.99			9.96	983.77			9.44	984.29			9.80	983.93	0.90E-02	Down
GAWW16B	993.64	993.47	25	35	30	958.64	--	--			--	--			--	--			9.54	983.93		
GAWW18B	991.00	990.83	5	15	10	981.00	--	--	NA	NA	--	--	NA	NA	--	--	NA	NA	9.06	981.94	-0.11E-01	Down
GAWW19B	993.90	993.79	22	32	27	966.90	--	--			--	--			--	--			9.05	984.74		
GAWW20	994.27	993.72	5	15	10	984.27	--	--	NA	NA	--	--	NA	NA	--	--	NA	NA	9.06	984.66	1.66E-03	Up
GAWW20B	992.20	992.93	27	37	32	960.20	--	--			--	--			--	--			9.05	983.89		
GAWW53	991.89	991.54	5	15	10	981.89	--	--	NA	NA	--	--	NA	NA	--	--	NA	NA	8.85	983.04	1.42E-03	Up
GAWW53B	992.17	992.04	28	38	33	959.17	--	--			--	--			--	--			8.87	983.30		
GAWW54	992.97	992.57	5	15	10	982.97	--	--	NA	NA	--	--	NA	NA	--	--	NA	NA	9.05	983.92	1.81E-03	up
GAWW54B	992.99	992.67	32	42	37	955.99	--	--			--	--			--	--			8.87	984.12		
GAWW55	992.95	992.84	5	15	10	982.95	--	--	NA	NA	--	--	NA	NA	--	--	NA	NA	8.54	984.30	0.00E+00	Flat
GAWW55B	992.16	992.93	25	35	30	962.16	--	--			--	--			--	--			8.54	984.39		
GAWW56	992.43	992.61	5	15	10	982.43	--	--	NA	NA	--	--	NA	NA	--	--	NA	NA	7.90	984.71	-0.00E+00	Down
GAWW56B	992.35	992.84	30	40	35	957.35	--	--			--	--			--	--			7.90	984.77		

Notes:
ft-bgs = Feet below ground surface
ft-msl = Feet above mean sea level
ft-btoc = Feet below top of casing
NA = Not applicable

Monitoring Well Location	Ground Surface Elevation (ft-masl)	Top of Casing Elevation (ft-masl)	Screen Interval				January 4, 2017				February 21, 2017				April 24, 2017				June 26, 2017			
			Top (ft-bgs)	Bottom (ft-bgs)	Center (ft bgs)	Center (ft masl)	Depth To Water (ft-bTOC)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-bTOC)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-bTOC)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-bTOC)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction
GAMW07	991.15	993.94	5	15	10	981.15	10.08	983.86	1.10E-03	Down	9.85	984.09	1.07E-03	Down	9.85	984.09	NA	NA	9.80	984.14	NA	NA
GAMW07B	991.61	994.10	39	42	40	951.61	9.69	984.41			9.67	984.43			9.71	984.39			9.70	984.40		
GAMW08	992.45	995.15	5	15	10	982.45	10.60	984.55	1.64E-03	Up	10.63	984.52	2.61E-03	Down	9.71	985.44	NA	NA	10.15	984.99	NA	NA
GAMW08B	979.15	981.97	20	35	27	952.15	9.21	984.76			9.07	984.90			--	--	--	--	--	--	--	--
GAMW09	990.1	992.86	5	15	10	980.1	9.49	983.37	3.20E-03	Down	9.50	983.36	2.70E-03	Down	9.25	984.22	0.03E-03	Down	9.30	984.09	2.1E-03	Down
GAMW09B	993.19	995.94	34.5	44.5	39.5	953.69	9.85	984.81			9.81	984.85			9.26	985.40			9.80	985.21		
GAMW10	993.17	995.95	5	15	10	983.17	9.83	984.82	1.22E-03	Up	9.86	984.80	1.84E-03	Up	7.60	987.38	1.47E-03	Up	9.80	985.05	0.00E+00	NA
GAMW10B	993.18	995.95	37.5	47.5	42.5	950.68	9.13	984.82			9.11	984.84			8.77	985.24			9.80	985.35		
GAMW11	992.7	995.37	5	15	10	982.7	9.33	984.14	1.63E-03	Up	9.46	983.91	1.02E-03	Up	9.27	984.10	0.97E-03	Up	9.72	983.65	1.03E-03	Up
GAMW11B	992.76	995.76	47.76	52.76	50.26	942.50	9.71	984.05			9.70	984.06			9.34	984.42			9.68	984.08		
GAMW12	993.51	996.80	5	15	10	983.51	NA				11.24	984.36			11.35	984.25			11.31	984.43		
GAMW12B	994.13	997.0	35	45	40	959.13	11.60	984.53	0.0E+00	Up	11.54	984.59	0.00E+00	Up	11.60	984.53	0.00E+00	Up	11.58	984.55	1.56E-03	Up
GAMW13	993.74	996.57	5	15	10	983.74	9.68	984.11			9.84	983.95			9.48	984.31			9.85	983.72		
GAMW13B	993.14	995.47	25	35	30	963.64	9.62	984.04	6.2E-02	Down	9.61	984.05	0.0E+00	Down	--	--	--	--	--	--	NA	NA
GAMW14	991.09	993.63	5	15	10	981.09	9.75	983.53			9.84	983.70			--	--	NA	NA	--	--		
GAMW14B	990.80	993.76	22	32	27	963.80	9.75	984.04	-3.0E-04	Down	9.69	984.10	1.93E-04	Up	--	--			--	--	NA	NA
GAMW15	994.27	996.93	5	15	10	984.27	9.77	984.14			9.76	984.15			--	--	--	--	--	--		
GAMW15B	992.20	994.83	37	47	42	950.20	9.78	984.14	9.1E-03	Up	9.80	984.12	2.05E-03	Up	--	--	NA	NA	--	--	NA	NA
GAMW16	990.80	993.24	5	15	10	980.80	9.55	983.79	4.1E-03	Up	9.61	983.73	2.37E-03	Up	--	--	NA	NA	--	--	NA	NA
GAMW16B	990.91	993.53	26	36	31	954.91	9.85	983.78			9.81	983.82			--	--	--	--	--	--		
GAMW17	992.07	995.01	5	15	10	982.07	9.58	985.53	3.92E-03	Up	9.61	985.50	3.80E-03	Up	--	--	NA	NA	--	--	NA	NA
GAMW17B	992.09	994.67	32	42	37	955.09	9.62	985.05			9.61	985.06			--	--	--	--	--	--		
GAMW18	990.05	992.84	5	15	10	980.05	9.62	983.22	1.5E-03	Down	9.81	983.03	1.6E-03	Down	--	--	NA	NA	--	--	NA	NA
GAMW18B	988.16	990.93	25	35	30	958.16	9.81	983.12			9.76	983.17			--	--	--	--	--	--		
GAMW19	990.23	992.91	5	15	10	980.23	9.73	983.18	1.0E-03	Down	9.85	983.06	4.6E-03	Down	--	--	NA	NA	--	--	NA	NA
GAMW19B	988.33	990.91	30	40	35	953.33	9.77	983.14			9.80	983.11			--	--	--	--	--	--		

Notes:
Bold = Well located in groundwater mound
Italic = Well above mound (sump well)
Bold + Italic = Well below mound (sump well)
NA = Not Available
*Min = Minimum detected

Appendix C
VERTICAL GRADIENT FLOW CALCULATIONS

Monitoring Well Locations	Ground Surface Elevation (ft-masl)	Top of Casing Elevation (ft-masl)	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 masl)	Depth To Water (ft-bgs)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-bgs)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-bgs)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-bgs)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction
GAMW09	993.02	993.94	5	15	10	983.02	10.92	983.02	NA	NA	10.75	983.19	NA	NA	–	–	NA	NA	9.8	984.06	NA	NA
GAMW09R	994.67	995.02	290	40	35	959.67	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GAMW08	992.45	992.76	5	15	10	982.45	10.10	982.53	NA	NA	NA	–	NA	NA	–	–	NA	NA	9.38	983.38	NA	NA
GAMW08B	979.52	980.40	20	35	27	952.52	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GAMW04	992.1	992.96	5	15	10	982.01	9.11	983.85	0.0018/0.02	Down	10.25	982.85	0.0015/-0.02	Down	–	–	NM	NM	9.29	983.67	-0.1/-0.02	Down
GAMW08R	993.19	993.56	294.5	345	319.5	674.69	1.65	991.91			9.81	983.38			–	–			9.92	983.27		
GAMW10	993.01	993.95	5	15	10	983.01	9.66	984.29	0.0027/-0.02	Up	9.80	984.21	0.0028/-0.02	Up	–	–	NM	NM	9.36	984.59	0.0022/-0.02	Up
GAMW10B	993.14	993.95	27.5	37.5	32.5	960.64	7.33	986.62			8.47	985.48			–	–			7.96	985.99		
GAMW11	992.0	992.97	5	15	10	982.0	9.15	982.85	0.0024/0.02	Up	10.68	982.32	0.0028/0.02	Up	–	–	NM	NM	9.36	982.64	0.0022/0.02	Up
GAMW10A	992.16	992.76	170.16	181.75	175.96	816.20	7.64	984.96			9.87	982.82			–	–			8.07	984.62		
GAMW11B	993.51	994.83	5	15	10	983.51	10.34	984.49			NA				–	–			10.45	984.38		
GAMW12B	993.63	993.0	35	55	45	948.63	10.95	982.05	0.0006/-0.02	Down	12.23	980.77			–	–			9.12	984.18	0.0005/-0.02	Up
GAMW12	993.74	994.19	5	15	10	983.74	9.23	984.51			11.73	982.00			–	–			9.8	983.93		
GAMW10B	993.14	993.47	25	35	30	963.64	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TW09MW01	991.00	992.69	5	20	13	977.00	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA
GAMW09B	993.80	993.76	22	32	27	966.80	–	–	–	–	–	–	–	–	–	–	NM	NM	–	–	–	–
GAMW09A	994.27	994.10	5	15	10	984.27	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA
GAMW05B	992.20	992.93	37	57	52	940.20	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GAMW05	992.80	992.24	5	15	12	982.80	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA
GAMW05B	992.47	992.19	26	36	31	962.80	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GAMW04	992.97	992.57	5	15	13	982.97	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA
GAMW04B	992.99	992.47	32	42	37	955.99	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GAMW06	992.05	992.34	5	15	10	982.05	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA
GAMW06B	992.18	992.53	25	35	30	962.18	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GAMW07	992.03	992.51	5	15	10	982.03	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA
GAMW07B	992.33	992.84	35	45	40	952.33	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Notes:
ft-bgs = Feet below ground surface
ft-masl = Feet above mean sea level
ft-bgsc = Feet below top of casing
NA = Not applicable
NM = Not measured

Monitoring Well Location	Ground Surface Elevation (ft-asl)	Top of Casing Elevation (ft-asl)	Screen Interval				April 13, 2016				June 12, 2016				August 27-30, 2016				October 22-24, 2016			
			Top (ft-bgs)	Bottom (ft-bgs)	Center (ft-bgs)	Center (ft-asl)	Depth To Water (ft-bTOC)	Groundwater Elevation (ft-asl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-bTOC)	Groundwater Elevation (ft-asl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-bTOC)	Groundwater Elevation (ft-asl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-bTOC)	Groundwater Elevation (ft-asl)	Vertical Gradient (m/m)	Flow Direction
GAMW09	691.62	693.94	5	15	10	681.62	9.99	683.95	7.70E-01	Up	9.70	684.24	1.71E-01	Up	9.95	683.99	3.43E-01	Up	10.07	683.87	1.71E-01	Up
GAMW09B	691.67	693.93	39	49	44	647.67	9.32	684.61			9.30	684.63			9.58	684.35			10.17	683.76		
GAMW08	692.45	694.76	5	15	10	682.45	9.84	684.92	1.03E-01	Up	9.60	685.17	1.03E-01	Up	12.32	682.45	1.20E-03	Up	11.16	683.62	2.56E-01	Up
GAMW08B	692.52	694.82	40	50	45	647.52	9.79	685.03			9.80	685.02			9.84	684.98			9.95	684.87		
GAMW06	690.1	692.56	5	15	10	680.1	7.42	685.14	2.07E-02	Down	7.5	685.06	2.15E-02	Down	9.52	683.04	2.04E-02	Down	8.66	683.90	2.04E-02	Down
GAMW06B	690.19	692.76	49.5	54.5	52	638.19	7.14	685.62			7.25	685.51			9.15	683.61			8.29	684.47		
GAMW15	693.07	695.25	5	15	10	683.07	9.83	685.42			9.8	685.45			9.58	685.67			8.93	686.31		
GAMW15B	693.11	695.08	29.1	37.1	33.1	660.01	7.4	687.68	9.63E-03	Up	8.85	686.26	1.04E-02	Up	8.93	686.18	1.93E-02	Up	8.002	687.11	1.77E-02	Up
GAMW16	692.07	693.97	5	15	10	682.07	8.15	685.82	5.59E-03	Up	8.36	685.61	9.14E-03	Up	9.95	684.02	1.72E-03	Up	8.7	685.27	2.14E-03	Up
GAMW16B	692.13	693.76	47.16	54.71	50.76	641.84	6.45	687.31			7.5	686.26			9.24	684.52			8.65	685.10		
GAMW17	693.51	695.83	5	15	10	683.51	11.35	684.48			11.45	684.38			11.66	684.17			10.7	685.13		
GAMW17B	693.63	695.6	35	45	40	653.63	10.42	685.18	4.98E-03	Up	10.23	685.38	5.00E-03	Up	10	685.6	2.11E-03	Down	9.43	686.18	2.11E-03	Down
GAMW18	693.74	695.57	5	15	10	683.74	9.47	686.1			9.72	685.85			9.98	685.59			8.7	686.87		
GAMW18B	693.64	695.47	25	35	30	663.64	9	686.47	1.39E-03	Up	8.93	686.71	1.93E-03	Up	9.28	686.36	1.11E+00	Up	8.32	687.32	2.89E-03	Up
GAMW07	691.09	692.63	5	15	10	681.09			NA	NA	7.07	685.56	-1.55E-04	Down	9.14	683.52	-1.03E+00	Down	8.29	684.37	-1.03E+00	Down
GAMW08	690.93	692.74	22	32	27	674.08	–	–			7.06	685.87			9.24	683.56			8.39	684.42		
GAMW10	694.27	696.13	5	15	10	684.27	–	–	–	–	–	–	–	–	9.55	686.58	–	–	9.06	687.07	–	–
GAMW10B	694.29	696.13	37	47	42	652.29	–	–	NA	NA	–	–	0.0	NA	9.55	686.58	0.00E+00	No	9.06	687.07	0.00E+00	No
GAMW05	690.39	692.24	5	15	10	680.39	–	–	NA	NA	7.03	685.21	1.72E-02	Up	8.85	683.44	5.67E-03	Up	8.10	684.19	1.15E-02	Up
GAMW05B	690.41	692.24	26	36	31	659.41	–	–			7.05	685.19			8.77	683.47			9.05	685.19		
GAMW04	692.97	695.37	5	15	10	682.97	7.23	–	–	–	7.05	688.32	–	–	7.58	687.79	–	–	7.09	688.27	–	–
GAMW04B	693.02	695.47	32	42	37	656.98	7.32	688.15	1.83E-03	Up	7.07	688.40	9.47E-03	Up	7.72	687.75	3.81E-03	Down	6.92	688.52	3.81E-03	Down
GAMW05	690.05	691.94	5	15	10	680.05	–	–	NA	NA	6.84	685.09	3.02E-02	Up	9.01	682.92	2.93E-03	Down	6.93	685.01	3.04E-03	Down
GAMW06	695.16	697.03	35	45	40	655.16	–	–			6.86	690.17			9.03	688.00			6.95	690.08		
GAMW06B	695.23	697.01	5	15	10	685.23	–	–	NA	NA	6.84	690.17	-9.68E-04	Down	9.06	687.78	1.93E-03	Up	6.93	690.06	1.93E-03	Up
GAMW07	695.33	697.31	37	47	42	653.33	–	–			7.05	690.26			9.03	688.28			6.93	690.38		

Notes:
Bold = Well screen groundwater head
Italics = Well screen mean sea level
Italics = Calculation Result
NM = Not Measured
NA = Not Available

Appendix C
VERTICAL GRADIENT FLOW CALCULATIONS

Monitoring Well Locations	Ground Surface Elevation (masl)	Top of Casing Elevation (masl)	Screen Interval				February 23, 2016				Average Vertical Gradient (m/m)	Flow Direction
			Top (m bgs)	Bottom (m bgs)	Center (m bgs)	Center (masl)	Depth To Water (m BTOC)	Groundwater Elevation (masl)	Vertical Gradient (m/m)	Flow Direction		
DMW07	1000.23	999.95	5	10	7.5	992.45	10.55	989.40				
DMW10S	999.61	999.33	10	13	11.5	988.11	8.33	991.28	0.05E-02	Up	0.0030	Up
DMW11S	999.95	999.66	5	11	8	991.95	8.61	991.05				
DMW11D	999.92	999.61	45	51	48	951.95	8.13	991.48	0.00E+00	Up	0.0031	Up
DMW12S	1001.1	1000.99	7	13	10	991.10	9.05	991.21				
DMW12D	999.83	999.53	84.5	91.5	88.0	911.83	8.48	991.47	-0.04E-02	Down	-0.0214	Down
DMW13	999.07	998.79	5	10	7.5	991.57	7.68	991.39				
DMW15S	998.1	998.06	37.9	47.3	42.6	955.46	7.07	991.04	0.03E-02	Up	0.0061	Up
DMW16	999.2	998.97	5	11	8	991.2	8.20	990.94				
DMW17S	998.16	997.79	27.74	37.16	32.19	965.97	7.22	990.57	0.03E-02	up	0.0057	Up
DMW17D	998.81	998.53	5	10	7.5	991.31	7.94	990.59				
DMW18S	999.36	999.13	24	34	29	965.36	8.54	990.59	-0.23E-02	Down	-0.0111	Down
DMW18D	999.03	998.77	5	10	7.5	991.53	8.24	990.53				
DMW19S	999.04	998.47	25	33	29	969.04	8.55	990.02	0.10E-02	Up	0.0050	Up
DMW19D	999.00	998.69	5	10	7.5	991.50	8.66	990.03				
DMW20S	997.46	996.79	22	32	27	970.79	7.03	989.76	-0.05E-02	Up	-0.0033	Up
DMW21	994.01	993.73	5	10	7.5	986.77	8.10	989.99				
DMW22S	997.00	996.93	25	30	27.5	969.43	8.29	988.64	0.02E-02	Up	0.0020	Up
DMW23	994.66	991.24	5	10	7.5	986.66	8.46	988.78				
DMW23D	994.65	991.39	25	30	27	969.52	8.35	988.94	-0.02E-02	Up	-0.0013	Up
DMW25S	993.89	993.21	5	10	7.5	986.21	8.09	989.40				
DMW25D	993.96	993.47	25	30	27	966.53	8.08	989.27	0.00E-00	Down	0.0001	Up
DMW26	992.99	992.58	5	10	7.5	985.33	8.05	988.81				
DMW26D	993.35	992.93	25	30	27.5	965.75	7.93	988.77	0.04E-02	Down	0.0022	Down
DMW27S	727.62	727.62	5	10	7.5	720.12	7.91	988.70				
DMW27D	993.55	993.42	25	30	27.5	965.92	7.93	988.70	0.00E-00	Down	0.0000	Down

Notes:
Masl = Meters above ground surface
bgs = Meters below ground surface
BTOC = Top of well casing
Bold = Well below lowest casing
NA = Field Well
NM = Not measured

Prepared by: EMW
Checked by: TV
Reviewed by: MAH

APPENDIX D

Monitored Natural Attenuation Evaluation

GOLDER

REPORT

MONITORED NATURAL ATTENUATION EVALUATION

Northern Indiana Public Service Company LLC
Rollin M Schahfer Generating Station
Wheatfield, IN

Submitted to:

Submitted by:

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19121567

November 2020

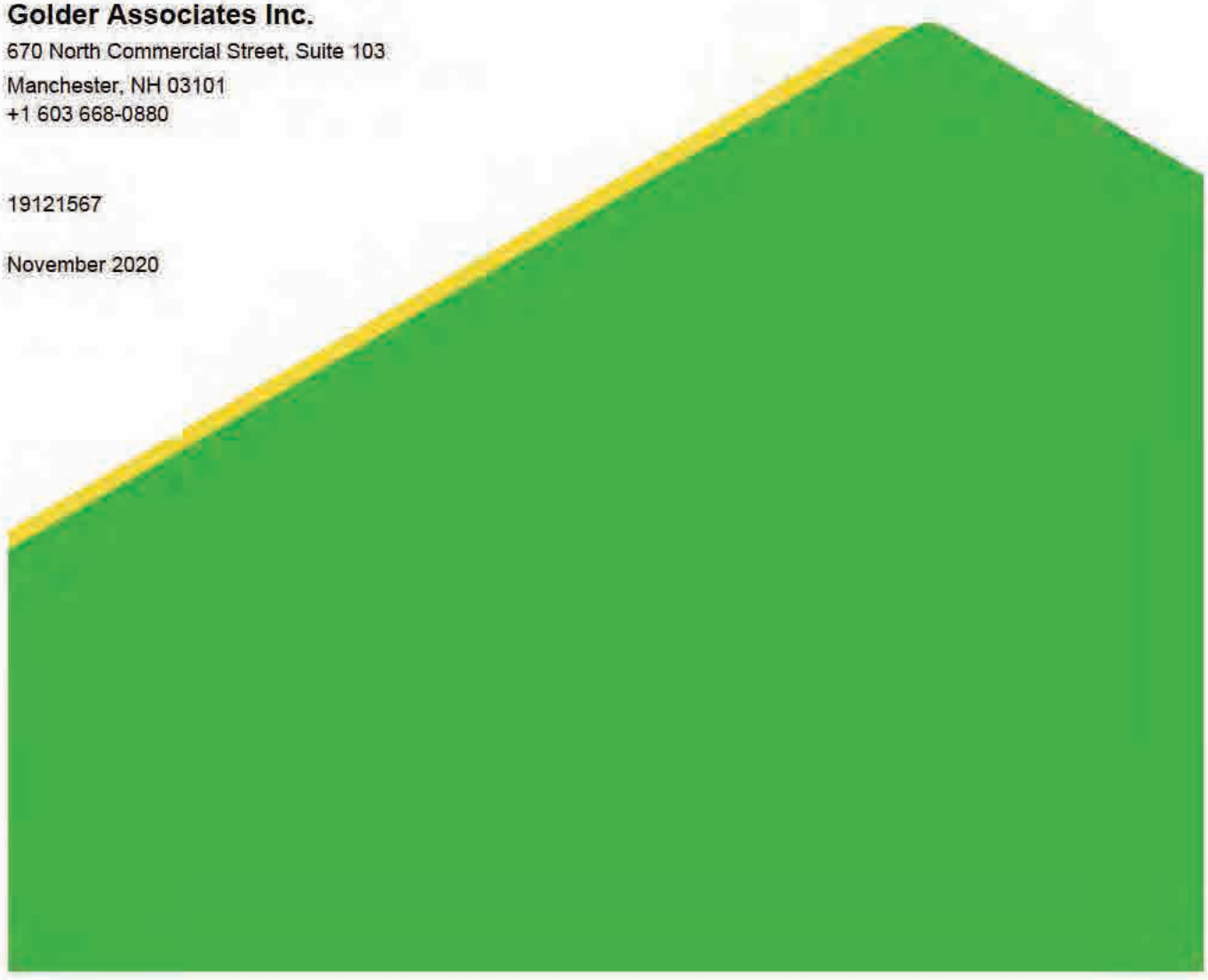


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APPENDICES

APPENDIX A
Groundwater and Porewater Monitoring Data

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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 revers bly 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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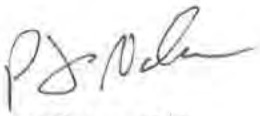
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Tables

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	-4.5	-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	**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 $10^{\wedge value}$ 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	$FeSO\ 7H_2O$	-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	-4.6	-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	$CaSO :2H_2O$	-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	$(H_3O)Fe_3(SO\ )_2(OH)_6$	-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	$KFe_3(SO\ )_2(OH)_6$	**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	$NaFe_3(SO\ )_2(OH)_6$	-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	**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^{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	$FeSO\ 7H_2O$	-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	-4.3	-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	$CaSO :2H_2O$	-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	$(H_3O)Fe_3(SO\ )_2(OH)_6$	-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	$KFe_3(SO\ )_2(OH)_6$	-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	$NaFe_3(SO\ )_2(OH)_6$	-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	**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^{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	$FeSO\ 7H_2O$	-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	-4.5	-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	$CaSO :2H_2O$	-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	$(H_3O)Fe_3(SO\ )_2(OH)_6$	-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	$KFe_3(SO\ )_2(OH)_6$	-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	$NaFe_3(SO\ )_2(OH)_6$	-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	**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^{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	$FeSO\ 7H_2O$	-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	-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	$CaSO :2H_2O$	-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	$(H_3O)Fe_3(SO\ )_2(OH)_6$	-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	$KFe_3(SO\ )_2(OH)_6$	**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	$NaFe_3(SO\ )_2(OH)_6$	-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	**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^{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	$FeSO\ 7H_2O$	-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	-4.9	-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	$CaSO :2H_2O$	-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	$(H_3O)Fe_3(SO\ )_2(OH)_6$	-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	$KFe_3(SO\ )_2(OH)_6$	**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	$NaFe_3(SO\ )_2(OH)_6$	**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	**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^{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	$FeSO\ 7H_2O$	-4.8	-4.8	-6.9	-5.1	-5.1	-5.9	-5.6	-5.0	-5.2	-4.8	-4.9
Anglesite	PbSO	-4.5	-4.6	-4.6	-5.4	-5.5	-5.1	-5.4	-5.0	-5.1	-4.7	-4.7
Gypsum	$CaSO :2H_2O$	-0.6	-0.6	-0.8	-1.7	-1.7	-1.9	-1.7	-1.2	-1.3	-1.0	-0.9
Jarosite-H	$(H_3O)Fe_3(SO)_2(OH)_6$	-3.6	-7.1	-8.6	-8.3	-6.6	-4.3	-8.7	-8.8	-6.6	-1.5	-7.8
Jarosite-K	$KFe_3(SO)_2(OH)_6$	**2.9**	**-0.5**	-1.9	-2.5	**-0.4**	**2.4**	-2.6	-2.6	**-0.4**	**4.6**	-1.2
Jarosite-Na	$NaFe_3(SO)_2(OH)_6$	**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	**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

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: SOURCES: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, AND THE GIS USER COMMUNITY

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

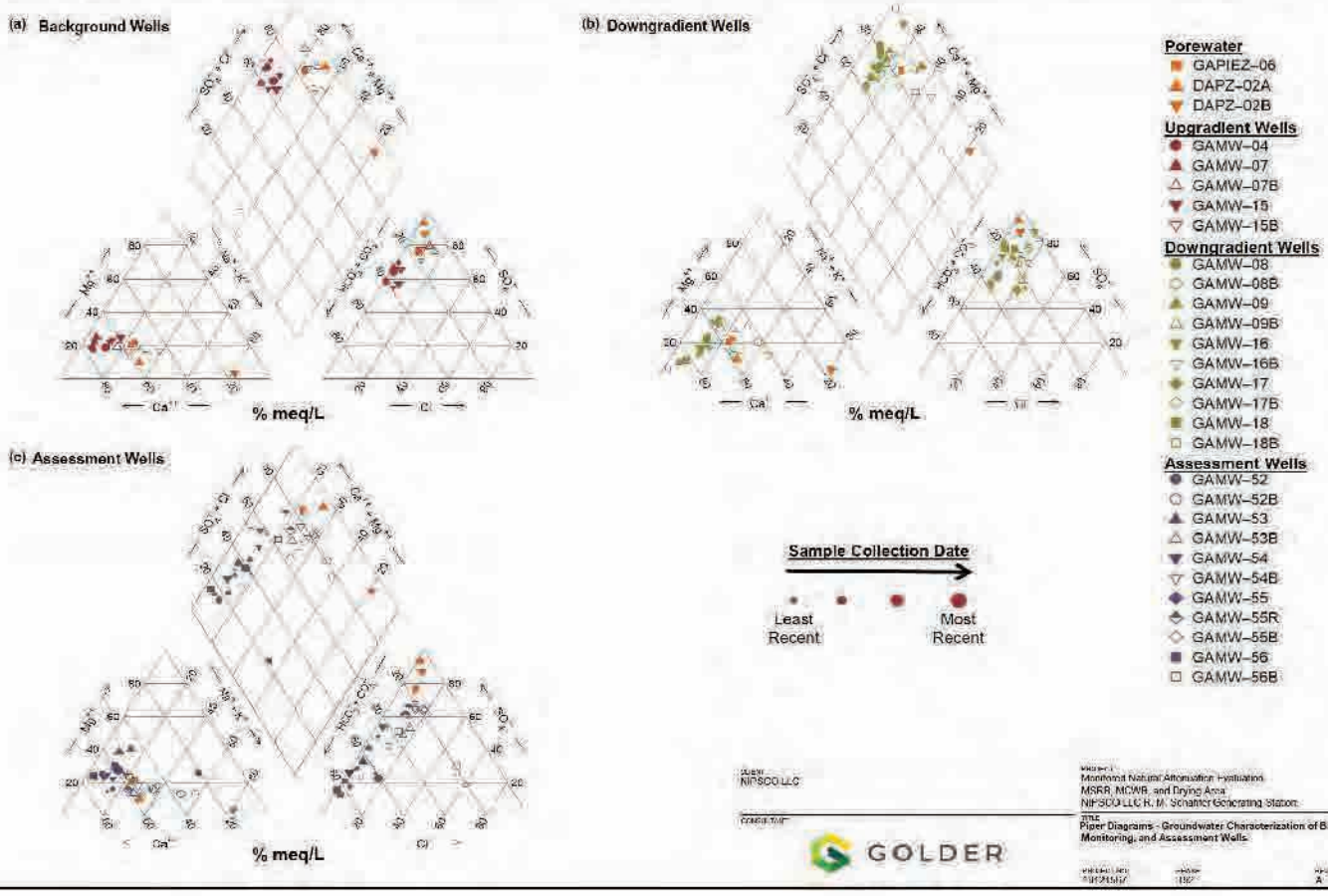
MONITORED NATURAL ATTENUATION EVALUATION
MSRD, MCWD, AND DRYING AREA
MICHIGAN CITY (R. M. SCHAHFER) GENERATING STATION

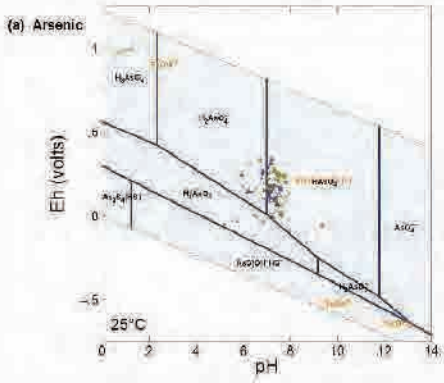
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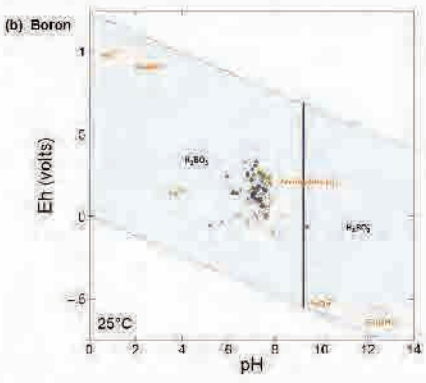
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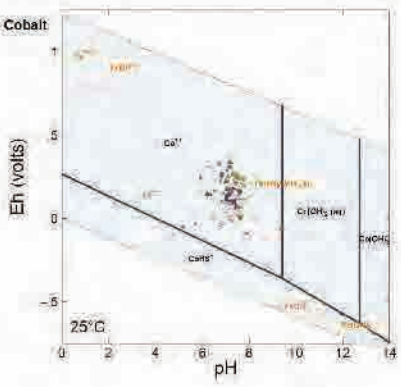
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APPROVED	MWH

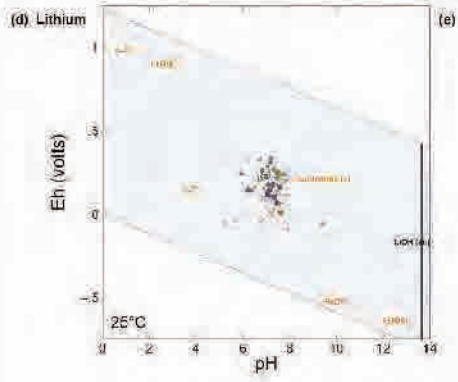
PROJECT NO. 19101587 | CONTROL A | REV. 0 | FIGURE 1

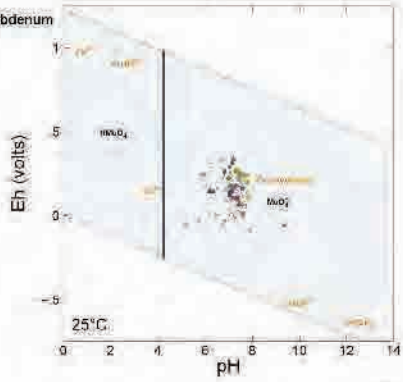

(a) Background Wells
(b) Downgradient Wells
(c) Assessment Wells
% meq/L
Porewater
GAPIEZ-06
DAPZ-02A
DAPZ-02B
Upgradient Wells
GAMW-04
GAMW-07
GAMW-07B
GAMW-15
GAMW-15B
Downgradient Wells
GAMW-08
GAMW-08B
GAMW-09
GAMW-09B
GAMW-16
GAMW-16B
GAMW-17
GAMW-17B
GAMW-18
GAMW-18B
Assessment Wells
GAMW-52
GAMW-52B
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
NIPSCO LLC
GOLDER
Monitored Natural Attenuation Evaluation
MSRR, MCWR, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Piper Diagrams - Groundwater Characterization of Background, Monitoring, and Assessment Wells
A
2a-c











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
NRG/SCO LLC

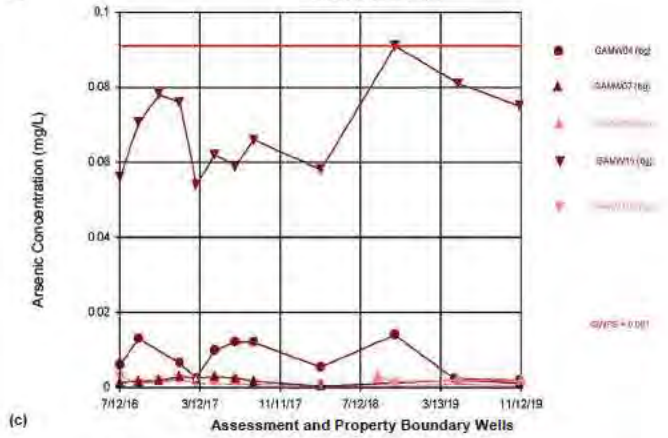
PROJECT
Monitored Natural Attenuation Evaluation
MGWR, MGWR, and Drying Area
NRG/SCO LLC/T.H. Schaefer Generating Station

TITLE
Pourbaix Diagrams For Arsenic, Boron, Cobalt, Lithium, and Molybdenum

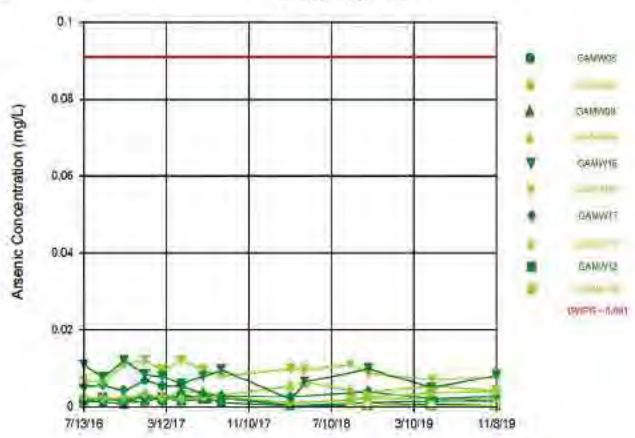
GOLDER

PROJECT NO. 1912165 | REV. 0 | FIG. A | 3a-e

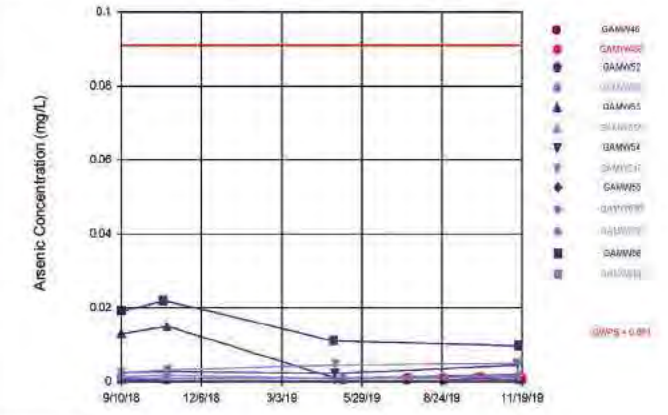
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit.

CLIENT
NIPSCO LLC

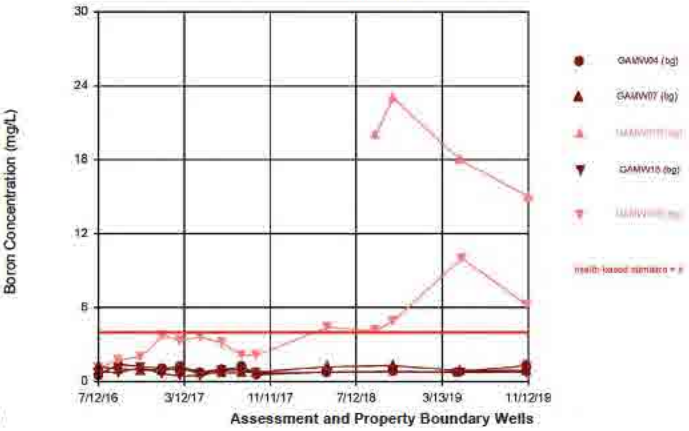
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

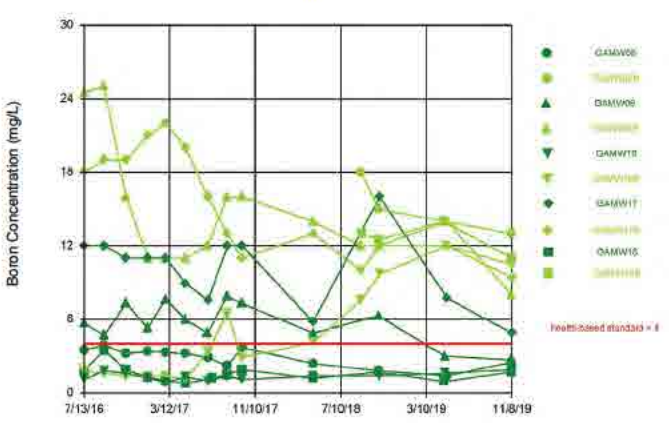
TITLE
Arsenic Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	4a-c

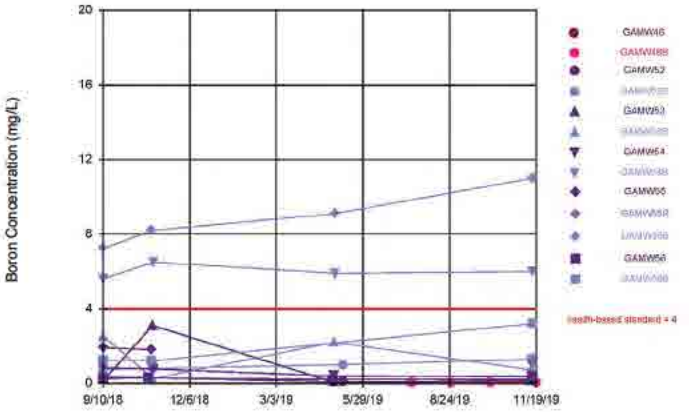
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit

CLIENT
NIPSCO LLC

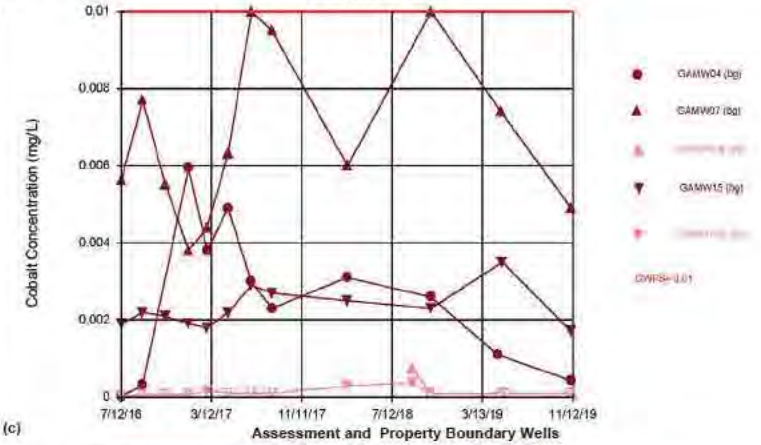
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

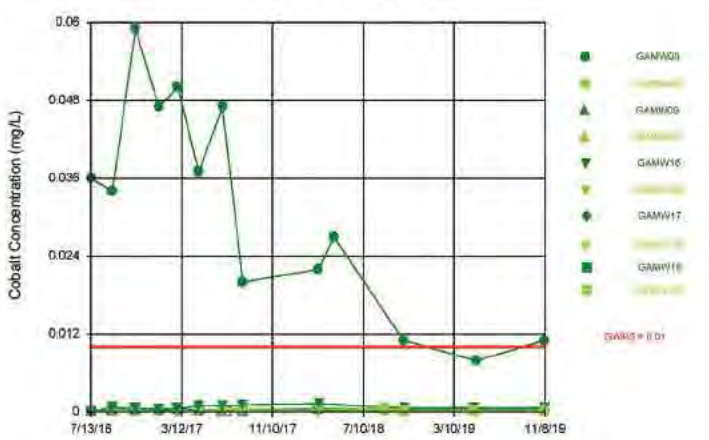
TITLE
Boron Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	5a-c

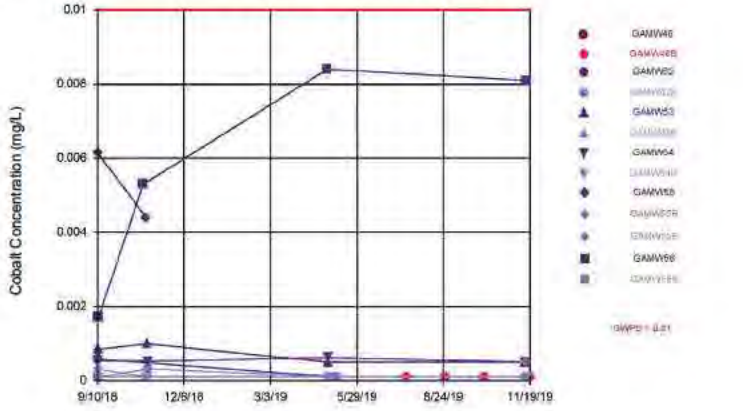
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit

CLIENT
NIPSCO LLC

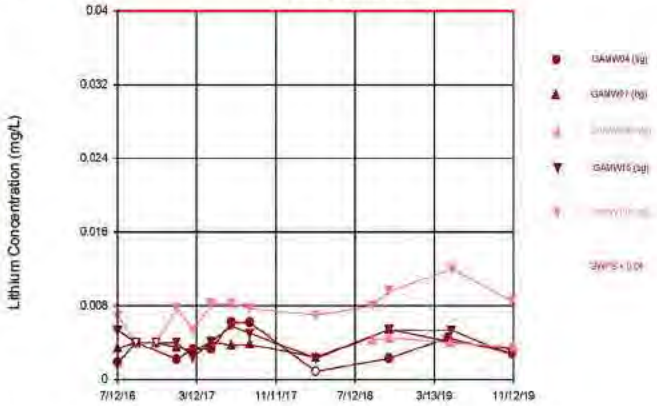
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

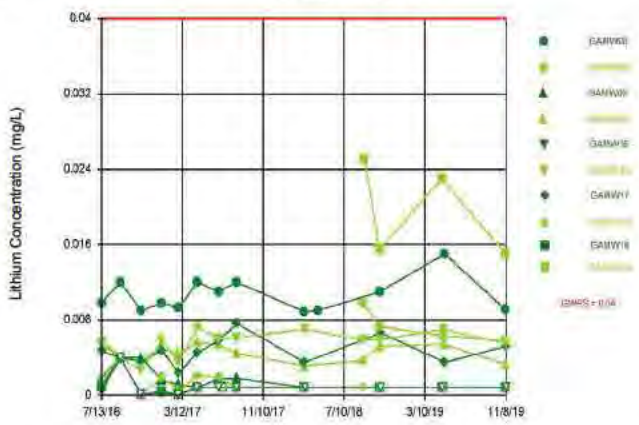
TITLE
Cobalt Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	152	A	6a-c

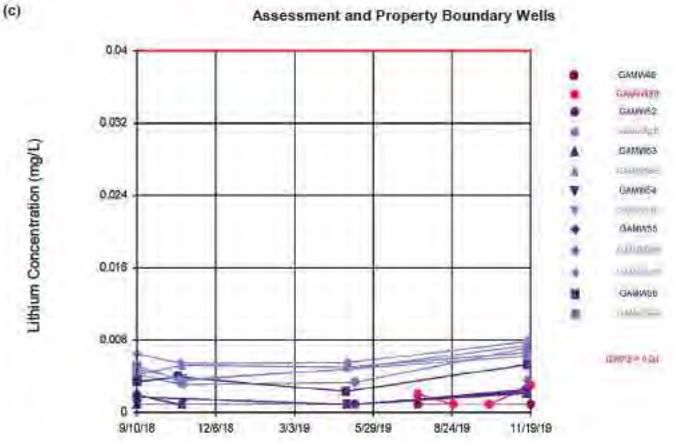
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit

CLIENT
NIPSCO LLC

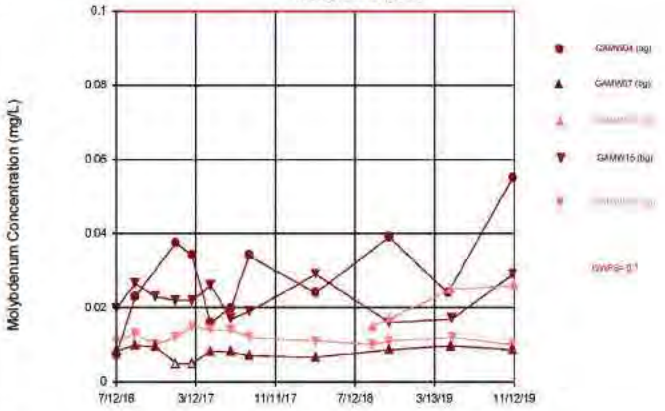
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

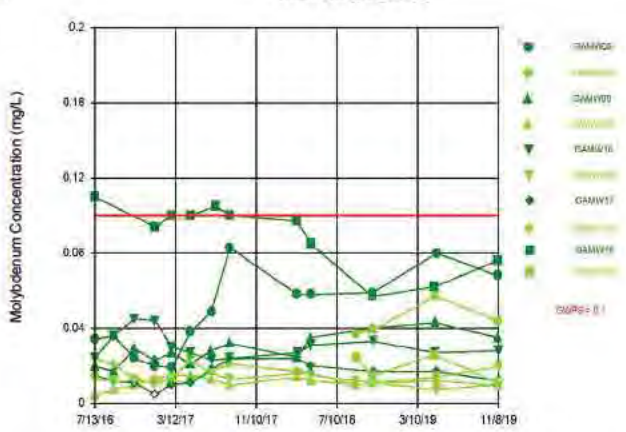
TITLE
Lithium Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	7a-c

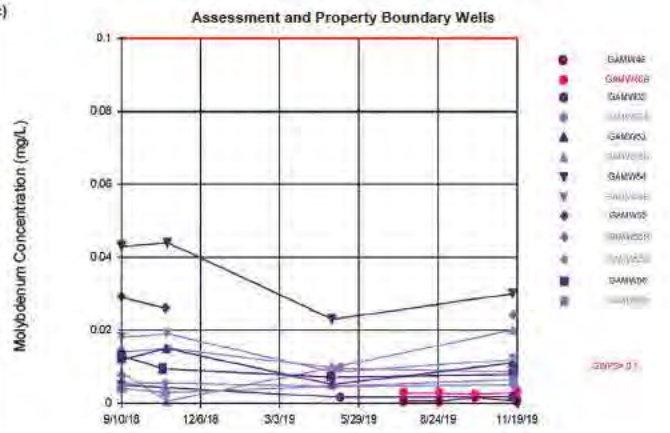
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit

CLIENT
NIPSCO LLC

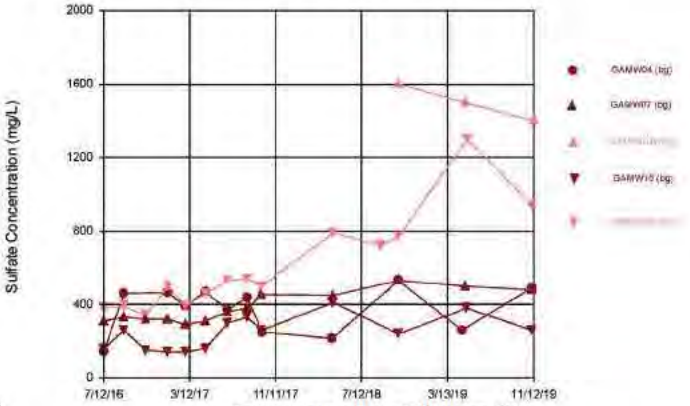
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

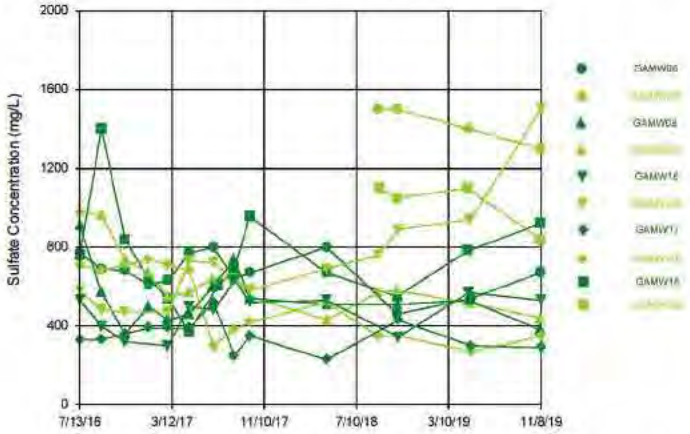
TITLE
Molybdenum Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	8a-c

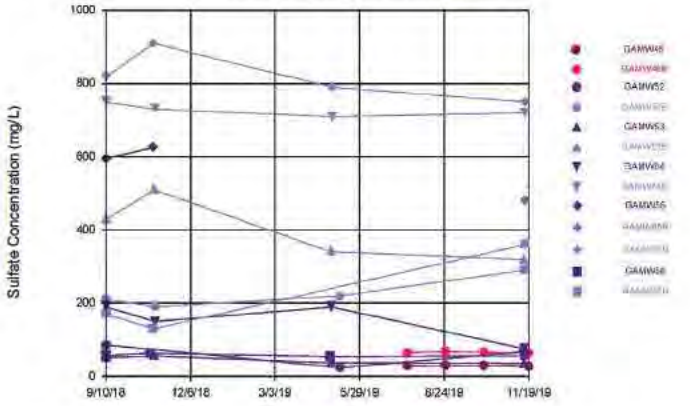
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit

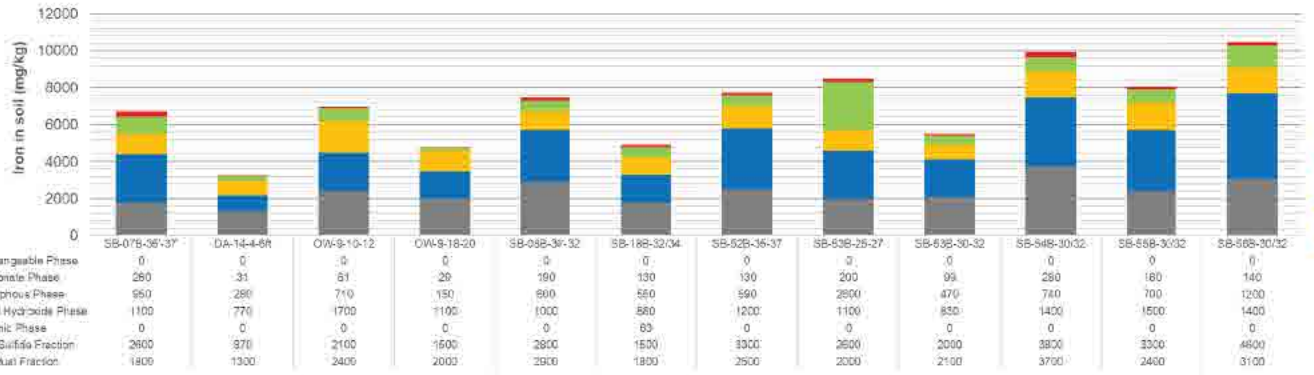
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

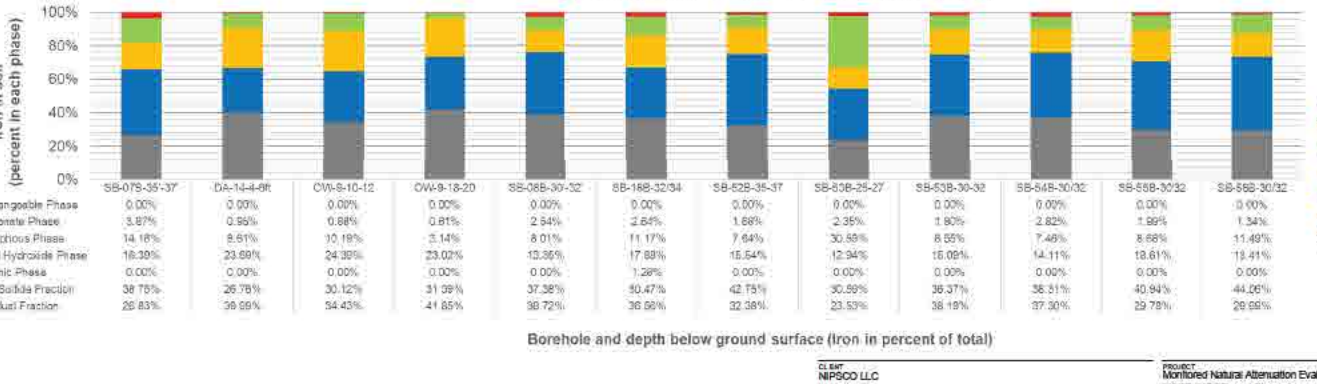
TITLE
Sulfate Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	9a-c



	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	180	140
Amorphous Phase	950	280	710	150	660	550	590	2800	470	740	700	1200
Metal Hydroxide Phase	1100	770	1700	1100	1000	880	1200	1100	850	1400	1500	1400
Organic Phase	0	0	0	0	0	63	0	0	0	0	0	0
Acid/Sulfide Fraction	2600	970	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%	8.81%	11.17%	7.64%	32.89%	8.55%	7.46%	8.68%	11.49%
Metal Hydroxide Phase	16.39%	23.69%	24.39%	23.02%	13.36%	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%	29.78%	30.12%	31.39%	37.38%	30.47%	42.75%	30.59%	36.37%	36.51%	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%	29.79%	29.69%

Borehole and depth below ground surface (Iron in percent of total)

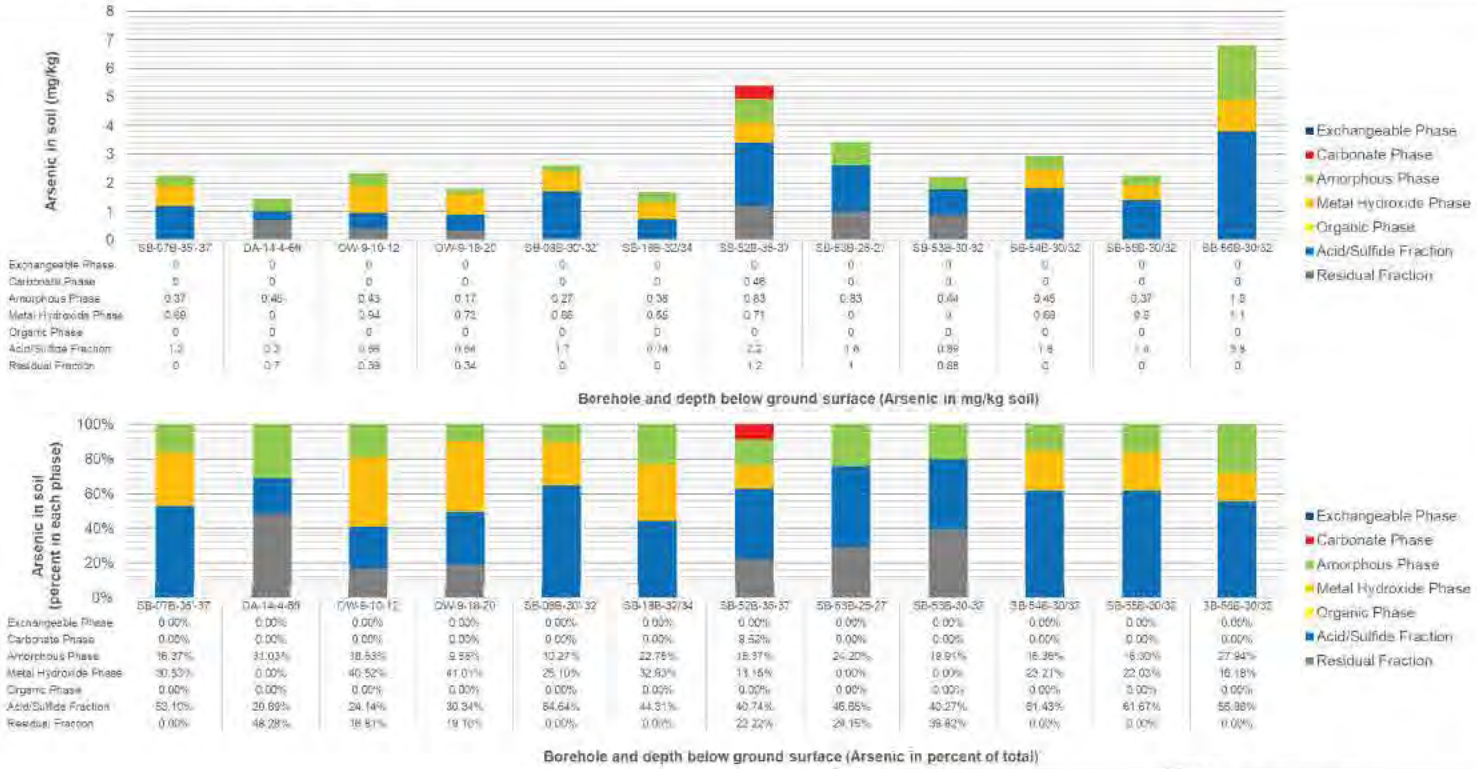
CLIENT
NIPSCO LLC

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



	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	0.46	0.43	0.17	0.27	0.38	0.83	0.83	0.64	0.45	0.37	1.9
Metal Hydroxide Phase	0.69	0	0.94	0.72	0.66	0.55	0.71	0	0	0.69	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	0.88	0.84	1.7	0.74	2.2	1.6	0.89	1.8	1.4	3.5
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%	16.36%	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%	25.21%	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)

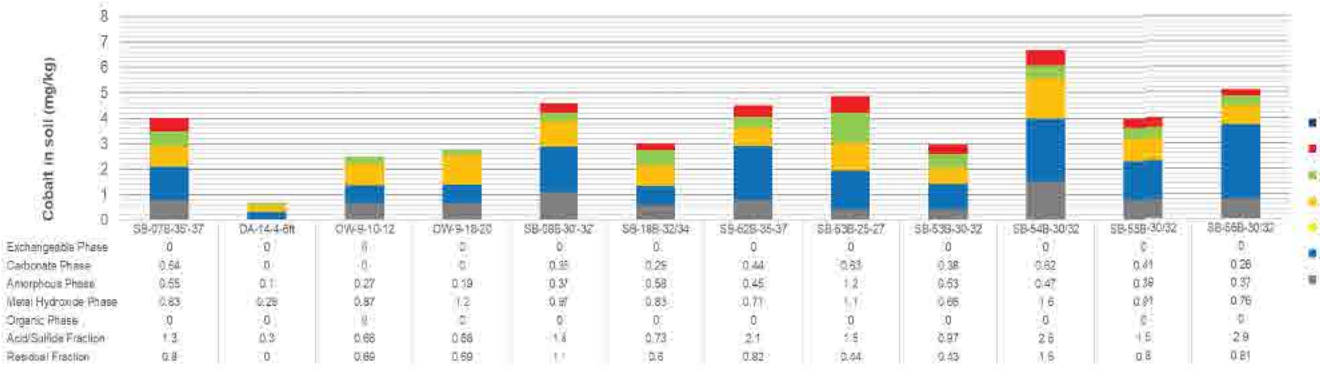
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

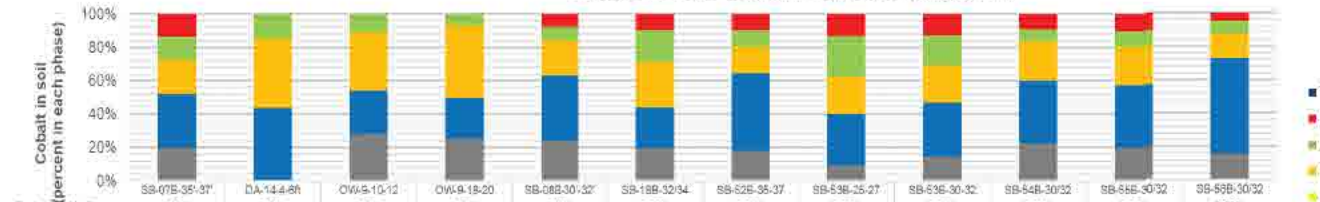
TITLE
Arsenic Sequential Extraction Results

PROJECT NO.	PHASE	REV.	FIGURE
19121567	152	A	11



	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-55B-30/32
Exchangeable Phase	0	0	0	0	0	0	0	0	0	0	0	0
Carbonate Phase	0.64	0	0	0	0.33	0.25	0.44	0.83	0.38	0.62	0.41	0.26
Amorphous Phase	0.55	0.1	0.27	0.19	0.3'	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	0.9'	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	0.68	0.56	1.4	0.73	2.1	1.5	0.97	2.6	1.5	2.9
Residual Fraction	0.8	0	0.69	0.69	1.1	0.6	0.82	0.64	0.43	1.6	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-55B-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%	7.65%	9.57%	9.75%	12.94%	12.79%	9.27%	10.22%	6.10%
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	20.85%	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%	46.48%	30.80%	32.66%	37.37%	37.41%	56.86%
Residual Fraction	19.90%	0.00%	27.71%	25.00%	23.97%	18.80%	18.14%	9.03%	14.48%	22.42%	19.95%	15.88%

Borehole and depth below ground surface (Cobalt in percent of total)

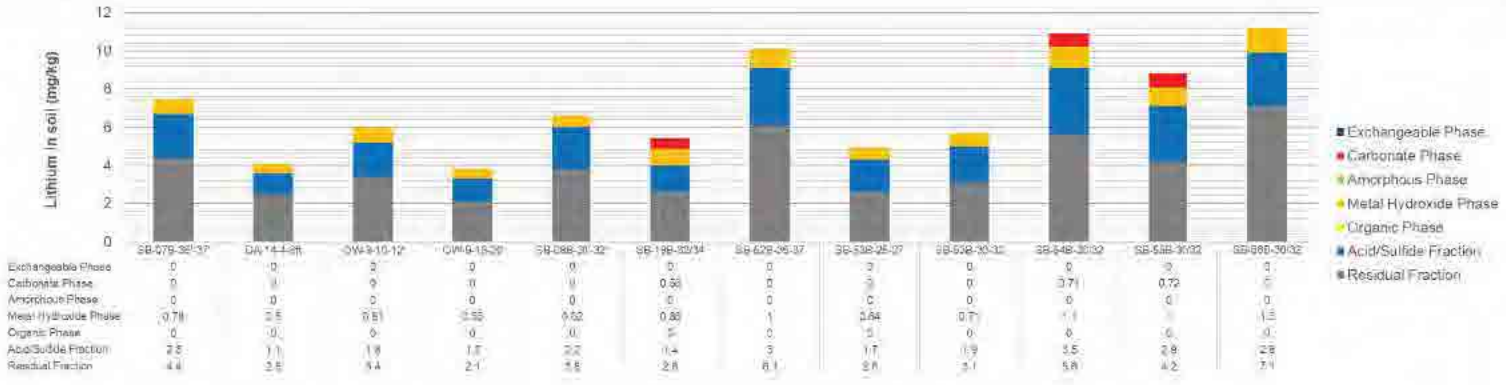
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

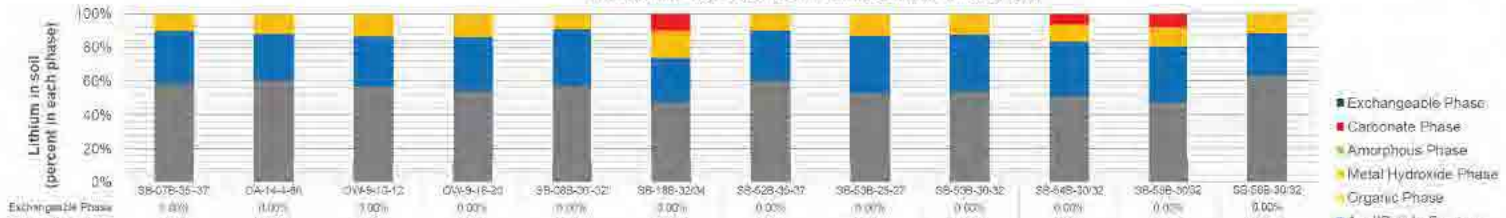
TITLE
Cobalt Sequential Extraction Results

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	12



	SB-07B-35-37	DA-14-4-6ft	OW9-10-12	OW9-18-20	SB-08B-30-32	SB-19B-32/34	SB-62B-35-37	SB-53B-25-27	SB-53B-30-32	SB-64B-30/32	SB-59B-30/32	SB-66B-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	0.51	0.55	0.52	0.89	1	0.84	0.71	1.1	1	1.3
Organic Phase	0	0	0	0	0	0	0	0	0	0	0	0
Acid/Sulfide Fraction	2.8	1.1	1.8	1.5	2.2	1.4	3	1.7	1.9	3.5	2.8	2.8
Residual Fraction	4.4	2.5	3.4	2.1	3.8	2.8	6.1	2.8	3.1	5.8	4.2	7.1

Borehole and depth below ground surface (Lithium in mg/kg soil)



	SB-07B-35-37	DA-14-4-6ft	OW9-10-12	OW9-18-20	SB-08B-30-32	SB-19B-32/34	SB-62B-35-37	SB-53B-25-27	SB-53B-30-32	SB-64B-30/32	SB-59B-30/32	SB-66B-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%	16.67%	9.90%	12.86%	12.43%	10.09%	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	38.75%	26.83%	26.25%	31.17%	32.23%	25.83%	29.70%	34.41%	33.21%	32.08%	32.68%	25.00%
Residual Fraction	58.82%	60.98%	56.67%	54.55%	57.40%	47.07%	60.40%	52.63%	54.29%	51.33%	47.02%	63.39%

Borehole and depth below ground surface (Lithium in percent of total)

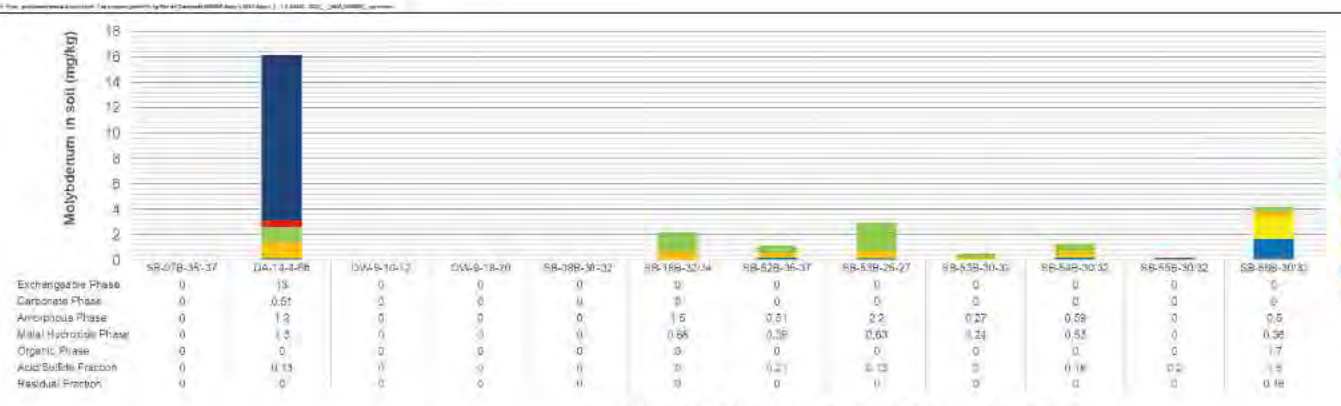
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

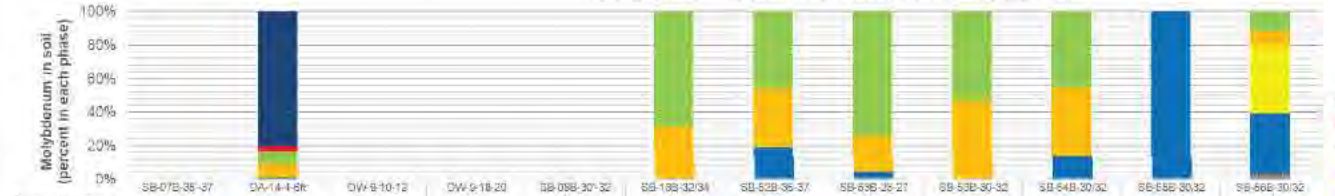
TITLE
Lithium Sequential Extraction Results

PROJECT NO.	PHASE	REV.	FIGURE
19121567	152	A	13



	SB-07B-35-37	DA-14-4-5R	OW-9-10-12	OW-9-18-20	SB-09B-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-66B-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	0.69	0	0.5
Metal Hydroxide Phase	0	1.5	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	0.19	0.2	1.5
Residual Fraction	0	0	0	0	0	0	0	0	0	0	0	0.18

Borehole and depth below ground surface (Molybdenum in mg/kg soil)



	SB-07B-35-37	DA-14-4-5R	OW-9-10-12	OW-9-18-20	SB-09B-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-66B-30/32
Exchangeable Phase	0.00%	80.66%	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%	45.39%	0.00%	11.65%
Metal Hydroxide Phase	0.00%	9.05%	0.00%	0.00%	0.00%	31.19%	35.14%	21.28%	47.06%	46.77%	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)

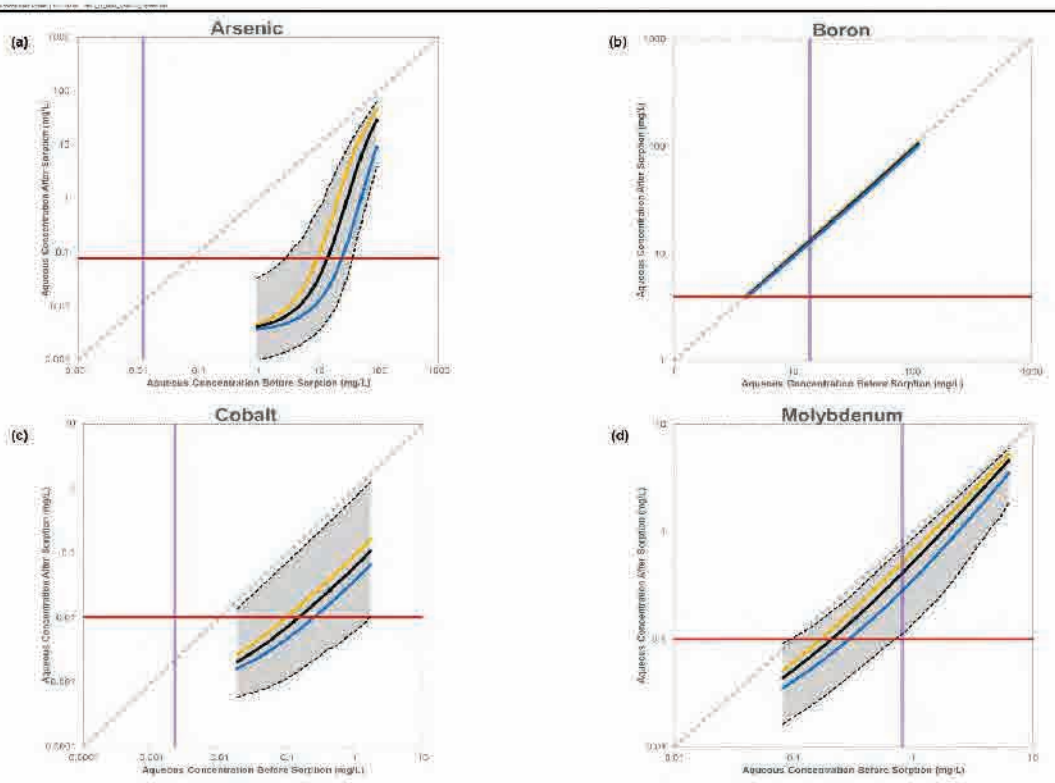
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Molybdenum Sequential Extraction Results

PROJECT NO.	PHASE	REV.	FIGURE
19121567	152	A	14



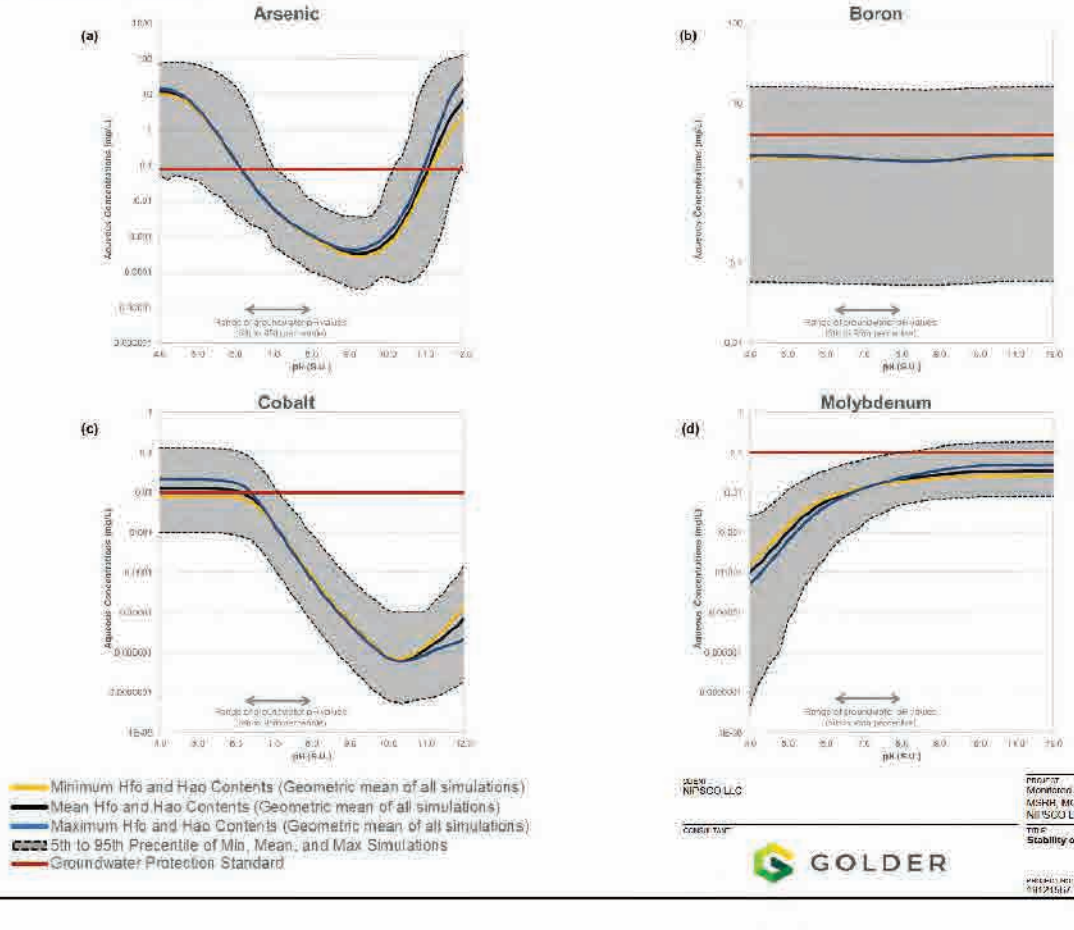
CLIENT
NRGCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSHH, MCWH, and Laying Area
NRGCO 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

PROJECT NO. 19121557 | PHASE 150 | REV. A | FIGURE 15



CLIENT
NRGCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSWF, IMCWF, and Laying Area
NRGCO LLC/ R. M. Schahfer Generating Station

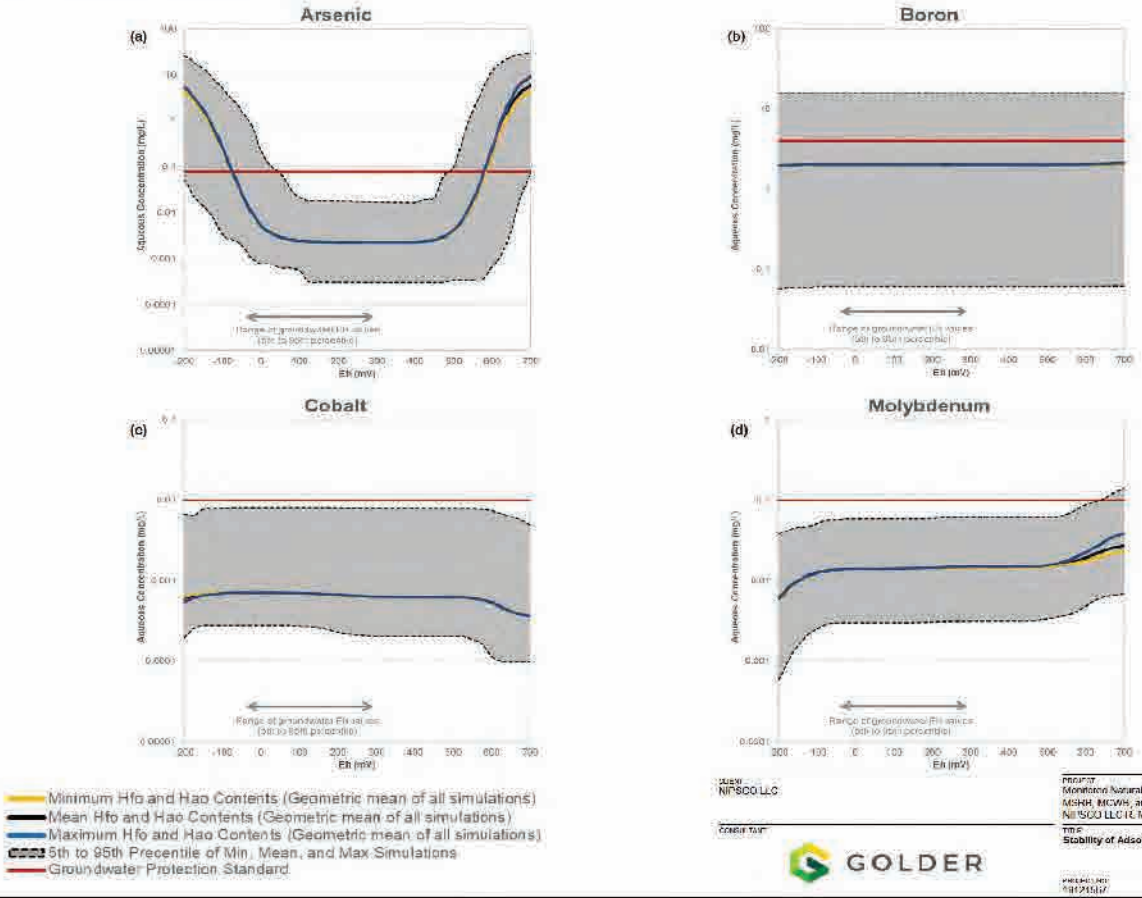
TITLE
Stability of Adsorbed Constituents Versus pH

PROJECT NO.
19121567

PHASE
100

REV.
A

FIGURE
16



CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSWF, IMCWF, and Haying Area
NIPSCO LLC R. M. Schahfer Generating Station

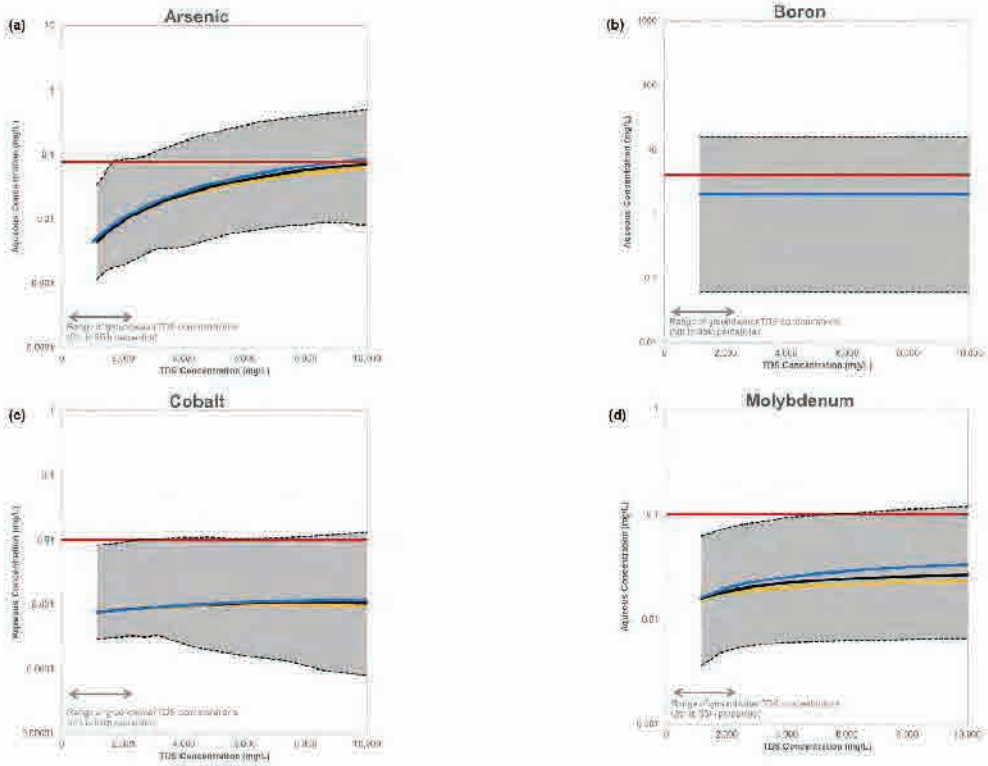
TITLE
Stability of Adsorbed Constituents Versus Eh

PROJECT NO.
19125507

PHASE
150

REV.
A

FIGURE
17



CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSWF, MCWF, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Stability of Adsorbed Constituents Versus TDS

PROJECT NO.
19121560

PHASE
150

REV.
A

FIGURE
18

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 Generat ng Station
Wheatfield ndiana

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
Samp e Type		N	N	N	FD	N	N	N	N	N	N	FD	N	FD	N	N	N	N
Chemical Name	Un t																	
CCR Appendix I I I																		
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
Ca cium	mg/L	110	230	300	270	240	230	220	200	200	140			140	140	210	130	190
Ch oride	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
Su fate	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																		
Ant mony	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
L thium	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																		
Alkal nity Bicarbonate (HCO3)	mg/L																	
Alkal nity Carbonate (CO3)	mg/L																	
Alkal nity Hydrox de (OH)	mg/L																	
Alkal nity Total	mg/L															230	190	270
Ferr c 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 Potent al	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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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
Samp e Type		N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N	N	N	N
Chemical Name	Un t																			
CCR Appendix I I I																				
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
Ca cium	mg/L	170	190	200	170	170	190	220	190	220	220		210	230	220	180	370	430	380	400
Ch oride	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
Su fate	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																				
Ant mony	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
L thium	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																				
Alkal nity Bicarbonate (HCO3)	mg/L																180			
Alkal nity Carbonate (CO3)	mg/L																5 U			
Alkal nity Hydrox de (OH)	mg/L																5 U			
Alkal nity Total	mg/L													260	270	250	180	180	170	170
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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
Samp e Type		N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	FD	N	N	N
Chemical Name	Un t																				
CCR Appendix I I I																					
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
Ca cium	mg/L	310	310	300	260	270	310	340	270	290		360	230	250	280		380		370	350	340
Ch oride	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
Su fate	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																					
Ant mony	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
L thium	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																					
Alkal nity Bicarbonate (HCO3)	mg/L															160	160				
Alkal nity Carbonate (CO3)	mg/L															5 U	5 U				
Alkal nity Hydrox de (OH)	mg/L															5 U	5 U				
Alkal nity Total	mg/L												350	380	380	160	160	160	160	130	160
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nepheloметric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.
UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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
Samp e Type		N	N	N	N	FD	N	FD	N	N	N	N	N	N	N	FD	N	N
Chemical Name	Un t																	
CCR Appendix I I I																		
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
Ca cium	mg/L	320	240	210	210	200	200	220	240	270	280	220		220	220	200	200	150
Ch oride	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
Su fate	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																		
Ant mony	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
L thium	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																		
Alkal nity Bicarbonate (HCO3)	mg/L																	
Alkal nity Carbonate (CO3)	mg/L																	
Alkal nity Hydrox de (OH)	mg/L																	
Alkal nity Total	mg/L														150	110	100	110
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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
Samp e Type		FD	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	FD	N	N
Chemical Name	Un t																		
CCR Appendix I I I																			
Boron	mg/L	24	25	25	16	11	11	11	12	16	16	16		14	12	12		14	8
Ca cium	mg/L	260	280	270	190	200	170	170	180	180	180	160		160	150	180		150	150
Ch oride	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
Su fate	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																			
Ant mony	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
L thium	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																			
Alkal nity Bicarbonate (HCO3)	mg/L														190				
Alkal nity Carbonate (CO3)	mg/L														5 U				
Alkal nity Hydrox de (OH)	mg/L														5 U				
Alkal nity Total	mg/L														190	200	200	200	170
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m ligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.
UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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
Samp e Type		N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N
Chemical Name	Un t															
CCR Appendix I I I																
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
Ca cium	mg/L	100	130	120	100	82	81	95	160	150	77		170	120	140	100
Ch oride	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
Su fate	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																
Ant mony	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
L thium	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		0.0617		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																
Alkal nity Bicarbonate (HCO3)	mg/L															
Alkal nity Carbonate (CO3)	mg/L															
Alkal nity Hydrox de (OH)	mg/L															
Alkal nity Total	mg/L													180	180	170
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

Location		GAMW158																
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	
Samp e Type		N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	FD	N
Chemical Name	Un t																	
CCR Appendix I I I																		
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
Ca cium	mg/L	160	160	160	180	160	170	190	170	73		230		200	210	280		280
Ch oride	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
Su fate	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																		
Ant mony	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
L thium	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																		
Alkal nity Bicarbonate (HCO3)	mg/L												180	180				
Alkal nity Carbonate (CO3)	mg/L												5 U	5 U				
Alkal nity Hydrox de (OH)	mg/L												5 U	5 U				
Alkal nity Total	mg/L												180	180	200	200	180	180
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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	
Samp e Type		N	N	N	N	N	N	N	N	N	N	N	FD	N	N	FD	N
Chemical Name	Un t																
CCR Appendix I I I																	
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
Ca cium	mg/L	230	180	170	120	160	210	220	240	57		220	160	160	210		210
Ch oride	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
Su fate	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																	
Ant mony	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
L thium	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																	
Alkal nity Bicarbonate (HCO3)	mg/L																
Alkal nity Carbonate (CO3)	mg/L																
Alkal nity Hydrox de (OH)	mg/L																
Alkal nity Total	mg/L													180	200	5 U	210
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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	
Samp e Type		N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	FD	N
Chemical Name	Un t																	
CCR Appendix I I I																		
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
Ca cium	mg/L	230	190	180	180	210	210	270	220	260	100		250	310	350	350	300	280
Ch oride	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
Su fate	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																		
Ant mony	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
L thium	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																		
Alkal nity Bicarbonate (HCO3)	mg/L													200				
Alkal nity Carbonate (CO3)	mg/L													5 U				
Alkal nity Hydrox de (OH)	mg/L													5 U				
Alkal nity Total	mg/L													200	210	190		200
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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	
Samp e Type		N	N	N	N	N	N	N	N	N	FD	N	FD	N	N	N	N	
Chemical Name	Un t																	
CCR Appendix I I I																		
Boron	mg/L	12	12	11	11	11	8.9	7.6	12	12			5.8	5.8	16	7.7	4.9	
Ca cium	mg/L	150	160	170	180	200	180	120	150	64			110	110	200	130	120	
Ch oride	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	
Su fate	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																		
Ant mony	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	
L thium	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																		
Alkal nity Bicarbonate (HCO3)	mg/L																	
Alkal nity Carbonate (CO3)	mg/L																	
Alkal nity Hydrox de (OH)	mg/L																	
Alkal nity Total	mg/L														190	160	160	
Ferr c 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	
Spec f c 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	
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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
Samp e Type		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Chemical Name	Un t															
CCR Appendix I I I																
Boron	mg/L	18	19	19	21	22	20	16	13	11		13	10	12	12	9.4
Ca cium	mg/L	230	250	240	250	270	250	240	160	57		180	150	150	180	150
Ch oride	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
Su fate	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																
Ant mony	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
L thium	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																
Alkal nity Bicarbonate (HCO3)	mg/L												210			
Alkal nity Carbonate (CO3)	mg/L												5 U			
Alkal nity Hydrox de (OH)	mg/L												5 U			
Alkal nity Total	mg/L												210	230	300	190
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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
Samp e 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	Un t																						
CCR Appendix I I I																							
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
Ca cium	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
Ch oride	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
Su fate	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																							
Ant mony	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
L thium	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																							
Alkal nity Bicarbonate (HCO3)	mg/L																		230				
Alkal nity Carbonate (CO3)	mg/L																		5 U				
Alkal nity Hydrox de (OH)	mg/L																		5 U				
Alkal nity Total	mg/L															240	190	250	230		230	210	200
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m ligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
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UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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	
Samp e 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	Un t																						
CCR Appendix I I I																							
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
Ca cium	mg/L	56	14	28	25 J-	25	25	23	27	25	58	58	56	52	58	49	56	75		59	52		72
Ch oride	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
Su fate	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																							
Ant mony	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
L thium	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																							
Alkal nity Bicarbonate (HCO3)	mg/L																	210					
Alkal nity Carbonate (CO3)	mg/L																	5 U					
Alkal nity Hydrox de (OH)	mg/L																	5 U					
Alkal nity Total	mg/L			82					73			140					130	210	180	190	170	190	190
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.
UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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
Samp e 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	Un t																						
CCR Appendix I I I																							
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
Ca cium	mg/L	160	160	110	130	45	53	17	25	180		190	150	140	93	88	93	81	210		220	200	240
Ch oride	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
Su fate	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																							
Ant mony	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
L thium	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																							
Alkal nity Bicarbonate (HCO3)	mg/L	220				120				250					150				240				
Alkal nity Carbonate (CO3)	mg/L	5 U				5 U				5 U					5 U				5 U				
Alkal nity Hydrox de (OH)	mg/L	5 U				5 U				5 U					5 U				5 U				
Alkal nity 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
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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
Samp e Type		FD	N	FD	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N
Chemical Name	Un t																		
CCR Appendix I I I																			
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
Ca cium	mg/L	260	250	270	260	180	250	250	260	210	210	130	110	91	120	140	140	150	150
Ch oride	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
Su fate	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																			
Ant mony	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
L thium	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																			
Alkal nity Bicarbonate (HCO3)	mg/L		240					230				370				370			
Alkal nity Carbonate (CO3)	mg/L		5 U					5 U				5 U				5 U			
Alkal nity Hydrox de (OH)	mg/L		5 U					5 U				5 U				5 U			
Alkal nity Total	mg/L		240		240	230		230	220	230	230	370	370	300	330	370	410	330	270
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nepheloметric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.
UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Prepared by: DFSC
Checked by: KMC
Rev ewed 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 he result was not detected above the method detection limit (MDL) for the sample; he 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

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List of Attachments:

Attachment A Model Grid

Attachment B Cross Section of Model Grid

Attachment C Boundary Conditions

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Attachment E Active Pumping Wells

Attachment F Model Calibration – September 2019

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Table B-2 Site Pumping Test Results

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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



NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRD, MCWD, AND DRYING AREA
MICHIGAN CITY GENERATING STATION

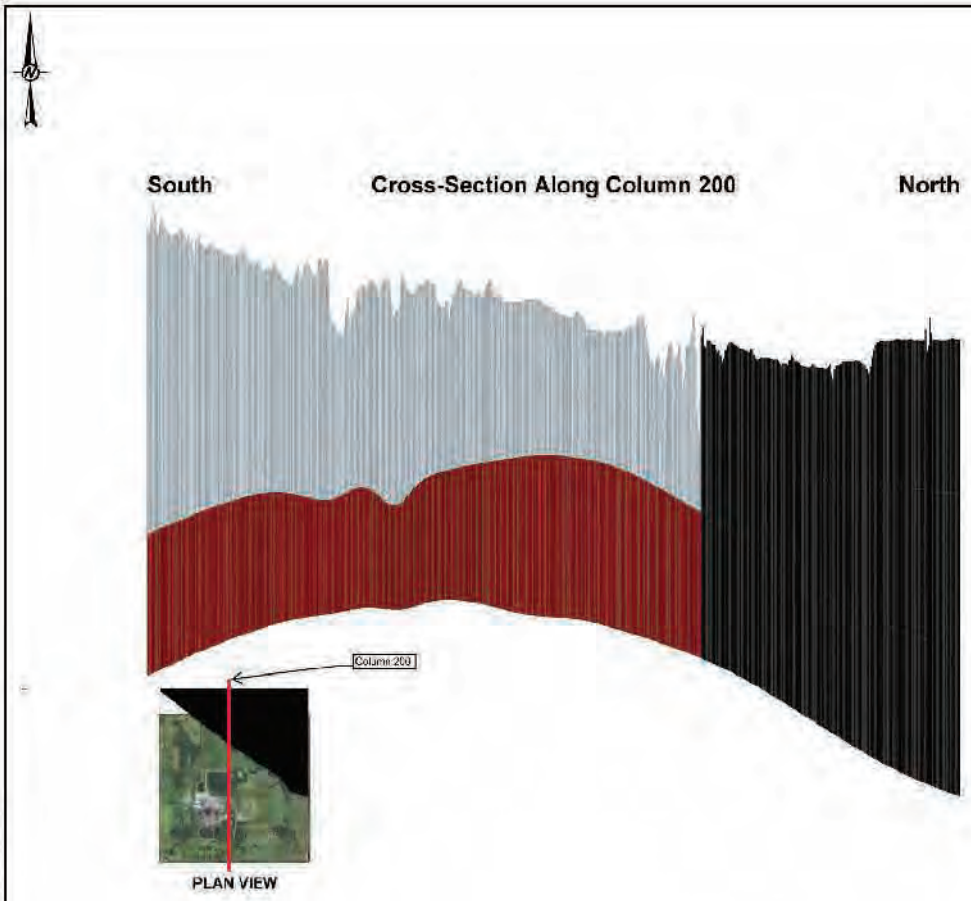
MODEL GRID

GOLDER

DESIGNED RWB

APPROVED RWB

19121587 A



CLIENT
NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

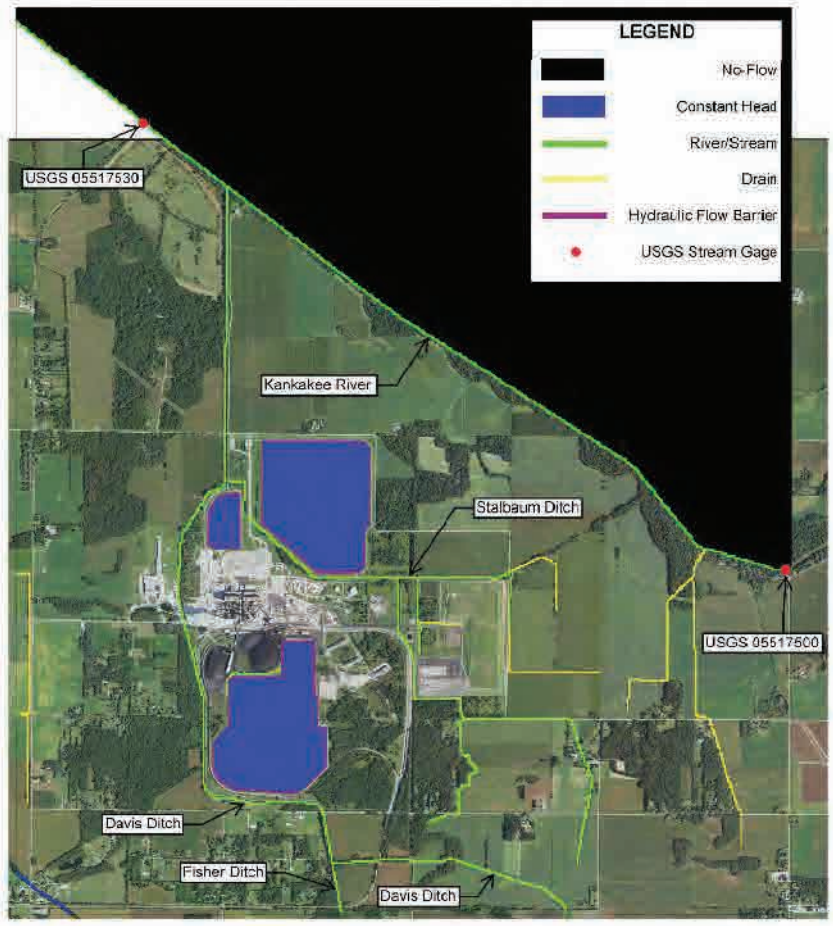
PROJECT
GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRD, MCWD, AND DRYING AREA
NIPSCO R.M. SCHAHFER GENERATING STATION

TITLE
CROSS SECTION OF MODEL GRID

CONSULTANT
GOLDER

DESIGNED	RWB
PREPARED	SR
REVIEWED	BP
APPROVED	RWB

PROJECT NO. 19121587 | B



NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

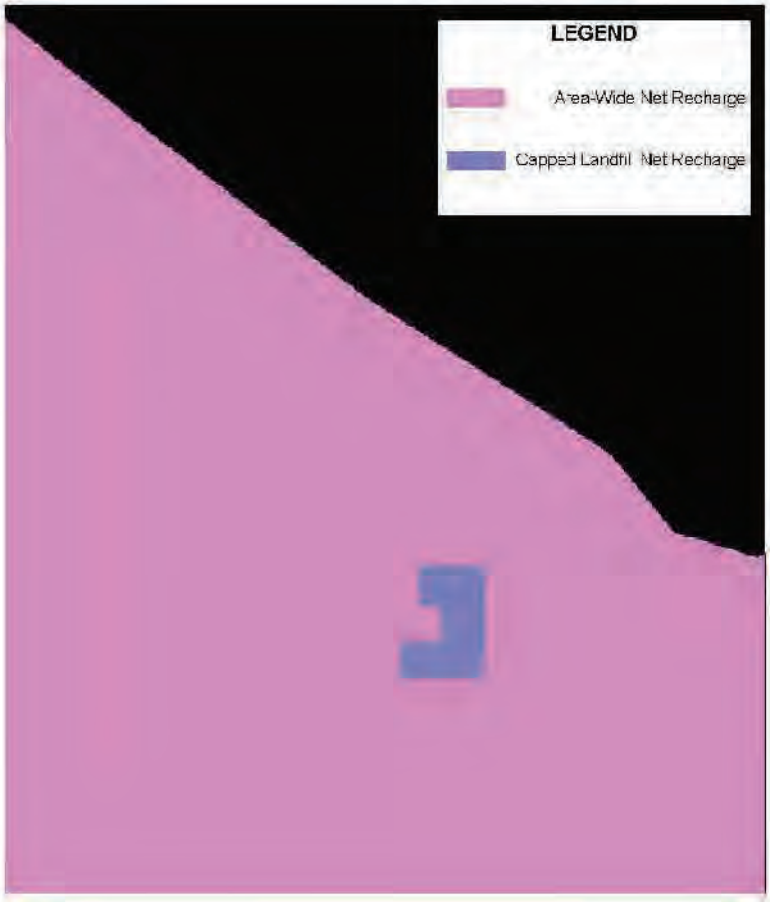
GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRB, MCWD, AND DRYING AREA
MICHIGAN CITY GENERATING STATION

BOUNDARY CONDITIONS

GOLDER

DESIGNED: RWB

PROJECT NO.: 19431587 | CONTROL: - | REV: - | C



NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRD, MCWD, AND DRYING AREA
MICHIGAN CITY GENERATING STATION

PRECIPITATION RECHARGE ZONES

GOLDER

DESIGNED RWS

APPROVED MKG

19121587 D



LEGEND

Well Location

0 700 1,400

Feet

1:1 - 1,667 (at)

NOTE(S)

1. DASTON MODEL VER. 2018.

REFERENCE(S)

1. COORDINATE SYSTEM: NAD 1983 STATE PLANE INDIANA WEST FIPS 1302 FEET
2. 2019 NAIP IMAGERY RETRIEVED FROM ESRI ARCGIS ONLINE IMAGERY SERVICE LAYER

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRD, MCWD, AND DRYING AREA
NIPSCO R.M. SCHAHFER GENERATING STATION

TITLE

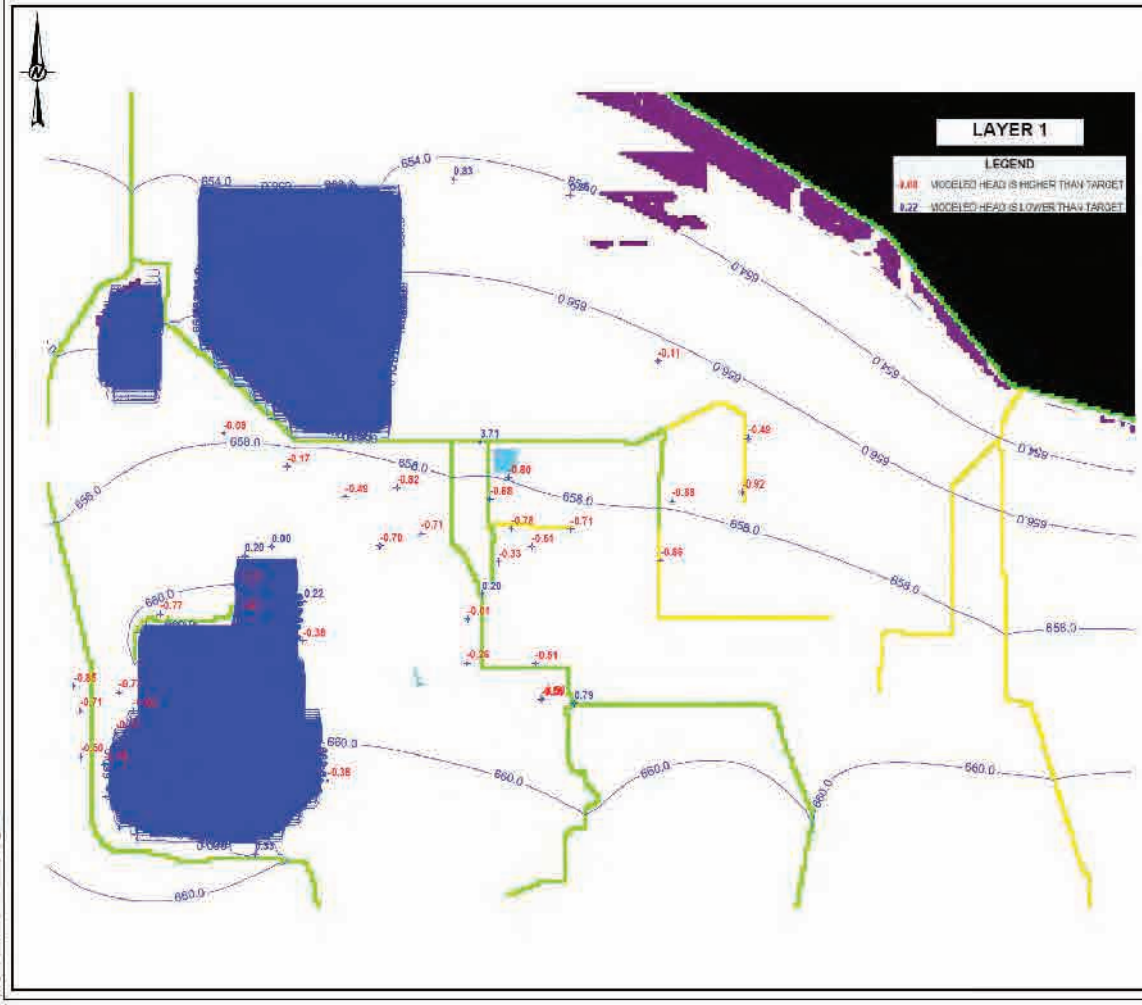
ACTIVE PUMPING WELLS

CONSULTANT

GOLDER

YYYY-MM-DD	2020-12-09
DESIGNED	RWS
PREPARED	SR
REVIEWED	RP
APPROVED	DAH

PROJECT NO. 19121567 | CONTROL - | REV. - | FIGURE NO. E



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, MCWD, AND DRYING AREA
NIPSCO R.M. SCHAHFER GENERATING STATION

TITLE:
MODEL CALIBRATION - SEPTEMBER 2019

CONSULTANT:
GOLDER

YYYY-MM-DD	2020-12-22
DESIGNED	RWB
PREPARED	SR
REVIEWED	RP
APPROVED	RWB

PROJECT NO.: 19121567 | CONTROL: - | REV.: - | FIG. NO.: F



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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:

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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)

Tab e 2: Analytical Results for MCU Monitoring Wells
N IPSCO Rollin M. Schahfer Generat ng 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	2021-0 -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 I II Parameters																												
Boron		4	mg/L	.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.	1.1	0.36	0 35		
Calcium			mg/L	10	230	300 O	270	240	230	220	200	200	140			140	140	210	130	190	115	112	90.3	178	108	107		
Chlor de			mg/L	2.2	27	69 O	13	14	13	.4	12	13	4.5			3.7 J	4.4	10	3.7	9.5	2	2	9	6.2	3.7	3 6		
Fluor de	4	4	mg/L	.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		
Sulfate			mg/L	40 J-	460	480 O	460	470	390	70	370	440	250			220	210	530	260	490	136	139	82 1	375	116	121		
Total D ssolved Sol ds			mg/L	20	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	.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	.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	0.00 1	0 0036		
Barium	2	2	mg/L	.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 05	0.079	0.057	0 056		
Bery lium	0 004	0.004	mg/L	.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	.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	.002 U	0 002 U	0 00036 JO	0 00036 J	0.0052 JO	0.002 U	.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		
Coba t		0.006	mg/L	.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		
Fluor de	4	4	mg/L	.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	.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	.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	.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	.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	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	.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	.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	.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		
Ox dation Reduct on Potential			m llivolts	9 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		0.1 9		
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.		
Specif c Conductivity			uS/cm	95	1345	1681		1109	910	137	911	1153	813		562		770	1311	549	866		681	521	950		595		
Temperature			deg C	3	17.3	16.3		10.5	8.05	0.2	13.1	15.9	16.1		7 55		3.5	15 5	4.2	13.2		9.8	16.2	9.2		15 9		
Turbidity			NTU	.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	.67		7 06		

Notes:
DEM RCG= Ind ana Department of Environmental Management
Remed al on Closure Guidance Table A-6 Screening Leve s - 2021 Revision

MCL= Maximum Contaminant Level
mg/L = mil igrams per iter
SU = standard units
pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.

J = Indicates the result is estimated.

J- = Indicates the result is estimated and may be biased low.

J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.

O = Indicates te result was dentif ed as an outlier and removed from the da a set.

Table 2: Analytical Results for 2021 Monitoring Wells
NIPSCO Rolls M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GMW07																				GMW07B								
				2013-10-21	2014-04-28	2014-10-21	2015-04-15	2015-10-07	2016-04-13	2016-10-19	2017-04-26	2017-10-18	2018-04-23	2018-10-15	2019-04-22	2019-10-21	2020-04-20	2020-10-26	2021-04-19	2013-10-21	2014-04-28	2014-10-21	2015-04-15	2015-10-07	2016-04-13	2016-10-19	2017-04-26	2017-10-18	2018-04-23	2018-10-15	2019-04-22	2019-10-21	2020-04-20	2020-10-26	2021-04-19
				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	N	N	N	N
Appendix III Parameters																																	
Boron		4	mg/L	1.2	1	0.91	0.9 J	1	0.88	0.87	0.88	0.71 J	0.72		1.2	1.2	0.83	0.85	0.87	0.87	1.1	0.81	0.91	0.89	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Calcium			mg/L	570	590	580	620	570	590	590	590	590	590		610	590	590	595	610	196	210	196	210	202	206	206	206	206	206	206	206	206	206
Chloride			mg/L	6.8	6.6	5.8	6	7.6	7.8	8.1	8.2 J	8.3	8.4 J		8.7 J	8.5	8.5	7.8	8.3	12.3	11.7	11.9	12	10.6	9.8	17.8	13.6	11.3	21	58	80.3	58	80.3
Fluoride	4	4	mg/L	0.23 J+	0.23 J	0.16 J	0.15 J	0.18 J	0.17 J	0.17 J	0.16 J	0.1 J	0.13 J	0.15 J	0.17 J	0.17 J	0.17	0.17	0.17	0.64	0.68	0.64	0.68	0.66	0.65	0.76	0.75	0.73	0.77	0.73	0.77	0.73	0.77
pH			SU	7.63	7.27	7.91	8.13	7.1	7.12	6.97	7.2		7.2	7.25	7.32	7.31	7.2	7.41	7.2	7.3	6.88	7.14	7.14	7.14	6.98	6.78	7.58	7.15	7.22	7.28	7.44	7.56	7.28
Sulfate			mg/L	1100 J+	1100	1200	1200	1200	1200	1200	1200	990	990	990	1100	1100	1100	1100	1100	396	408	402	399	408	402	402	402	402	402	402	402	402	402
Total Dissolved Solids			mg/L	2700	2800	2800	2700	2700	2800	2800	2800	2800	2800		2900	2800	2800	2800	2800	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
Appendix IV Parameters																																	
Antimony	0.006	0.006	mg/L	0.00093 J	0.00019 J	0.00093 J	0.00038 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	0.001 U	0.001 U	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	0.0013 J	0.0026 J	0.0019 J	0.0021 J	0.0026 U	0.0026 U	0.0026 U	0.0026 J				0.0026 U		0.0034 J	0.0031 J	0.0031 U	0.0031 U	0.0031 U	0.0031 U	0.0031 U	0.0031 U	0.0031 U	0.0031 U	0.0031 U	0.0031 U	0.0031 U	0.0031 U	0.0031 U	0.0031 U	0.0031 U
Barium	2	2	mg/L	0.055	0.055	0.056	0.047	0.05	0.05	0.056	0.055				0.056		0.064	0.057	0.045	0.04	0.047	0.046	0.055	0.049	0.072	0.061	0.065	0.045	0.044	0.038	0.041	0.037	
Beryllium	0.004	0.004	mg/L	0.00013 J	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U				0.0001 U		0.0001 U	0.0001 U	0.0001 U	0.00005 U	0.00005 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 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		0.0004 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	0.0002 U	0.0002 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	0.0005 J	0.0016 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	0.0009	0.0007	0.0005	0.0008	0.0004	0.0005	0.001	0.0005				0.05		0.0007	0.0006	0.0003	0.0006	0.0008	0.0008	0.0008	0.0006	0.0007 J	0.001 U	0.0003 U	0.0003 U	0.0003 U	0.0003 U	0.0003 U	0.0003 U	0.0003 U
Fluoride	4	4	mg/L	0.73 J+	0.61 J	0.83 J	0.82 J	0.66 J	0.75 J	0.79 J	0.86 J	1.1 J	0.98 J	0.58 J	0.77 J	0.73	0.07 J	0.08	0.69 J	0.64 J	0.68	0.66	0.85	0.85	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 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	0.00007 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	0.0043 J	0.008 U	0.008 U	0.0023 J	0.0031 J	0.0041 J	0.0027 J	0.0038 J				0.0021 J		0.0051 J	0.0041 J	0.0023 J	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.0089	0.0019 J	0.0045 J	0.0047 J	0.0023 J	0.008 U	0.008 U	0.008 U	0.013
Mercury	0.002	0.002	mg/L	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U				0.00007 U		0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U
Molybdenum		0.2	mg/L	0.0085 J	0.0088 J	0.0085 J	0.01 U	0.01 U	0.01 U	0.01 U	0.0083 J	0.0062 J			0.01 U		0.0085 J	0.0072 J	0.0085 J	0.0078	0.0078	0.01 U	0.01 U	0.01 U	0.01 U	0.025	0.012	0.025	0.026	0.026	0.038	0.028	0.033
Selenium (2h + 20)	50		mg/L	0.58	0.56	0.545	0.47 J1	0.42 U	0.42 U	0.42 U	0.45	0.39			0.42 U		0.42 U		0.37 U	0.37 U		0.37 U				0.61	0.6 J+	0.7		1.6 U		2.1 U	
Silver	0.05	0.05	mg/L	0.005 U	0.005 U	0.005 J	0.005 J	0.005 U	0.005 U	0.005 U	0.005				0.0058 J		0.0016 J	0.0045 J	0.0015 J	0.0018 J	0.0015 U	0.0068 J	0.0064 J	0.0056 J		0.0012 J	0.0062 U	0.005 U	0.0025 U	0.001 U	0.0011 U	0.0011 U	0.001 U	
Thallium	0.002	0.002	mg/L	0.00013 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002 U				0.0013 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	0.45	1.31	0.58	0.53	0.57	0.58	0.69	0.44		0.48	0.6	0.57	0.56	0.61	0.38		0.34	0.47	0.19		0.25	0.16	0.67	0.19	0.2	0.5	0.19	0.23	0.26
Oxidation Reduction Potential			millivolts	113.2	65.2	6.0	71.3	45.5	25.0	29.1	8.5		93.1	55	98.2	233.8	133	151.8		185.2	209.4	56.6		91	107.6	235.2	51.9	156.2	128.1	73.9	124.1	0.374	
pH			SU	7.63	7.27	7.08	7.35	7.1	6.97	6.97	7.2		7.2	7.25	7.32	7.31	7.2	7.41	7.2	7.3	6.88	7.14	7.14	7.14	6.98	6.78	7.58	7.15	7.22	7.28	7.44	7.56	7.28
Specific Conductivity			uS/cm	3666	3603	3698	3681	3620	3737	3737	3743		3775	3768	3861	3948	3781	3981		1555	1565	1564		1571	1578	1737	1737	1686	2777	2665	1878	2777	
Temperature			deg C	15.4	13.42	19.7	12.9	19.83	12.4	19.8	15.2		11	19	19	19.05	19.4	20.2		20.3	12.2	21.05		17	13.69	12.4	12.4	13.8	12.7	19.2	12.2	11.7	
Turbidity			NTU	3.8	4.51	1.36	8.2	1.76	2.2	2.87	2.9		0.49	1.5	1.72	0.28	0.72	1.58		5.3	1.34	1.14		2.49	0.28	8.04	5.89	3.41	3.48	1.02	2.81	1.01	

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 – Nephelometric Turbidity Units
"U" – Indicates the result was not detected above the method detection limit (MDL) for the sample, the quantitation limit (QL) is provided
"J" – Indicates the result is estimated.
"J1" – Indicates the result is estimated and may be biased.
"J+" – Indicates the result is estimated and may be biased high.
"J-" – Indicates the result is estimated and may be biased low.
"QL" – Indicates the result was not detected above the MDL, the estimated QL is provided
"C1" – Indicates the result was identified as an outlier and removed from the statistical

Tab e 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generat ng 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	2020-10-28	2021-0 -22	2021-09-2	2018-09-0	2018-10-24	2019-05-03	2019-11-07	020-04-2	2020-10-23	2021-0 -22	2021-09-2
				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 I II Parameters																													
Boron		4	mg/L	.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	8.
Calcium			mg/L	10	310	300	260	270	310	340	270	290		360	230	250	280	309	168	266	260	380	370	350	340	355	203	98	235
Chlor de			mg/L	88	71	89	99	110	86	83	39	87		64	56	49	66	67	26.	50	1 9	240	180	160	180	220	13	78	179
Fluor de	4	4	mg/L	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.	1 6 J	1 5	1.9	1.7	1.5 J-	0.93	.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	7.0	7.0	7 7	7.45	7 57	7.85	7.89	7.95	9	7.
Sulfate			mg/L	770 J-	690	680	610	630	770	800	640	670		800	460	540	670	719	229	77	8 1	1500	1500	1400	1300	1280	769	51	1060
Total Dissolved Sol ds			mg/L	600	1500	1600	1300	1400	1700	2000	1400	1500		1700	1100	1300	1300	1550	636	1120	2380	1900 J	2300	2300	2200	2560	1250	620	20 0
Appendix IV Parameters																													
Antimony	0 006	0.006	mg/L	.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	.001 U	0 001 U
Arsenic	0 01	0.01	mg/L	.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	.001 U	0 001 U
Barium	2	2	mg/L	.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	.039	0 0 6
Bery lium	0 004	0.004	mg/L	.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	.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	.0002 U	0 0002 U
Chromium	0.1	0.1	mg/L	.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	.002 U	0 002 U
Coba t		0.006	mg/L	.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	.001 U	0 001 U
Fluor de	4	4	mg/L	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.	1 6 J	1 5	1.9	1.7	1.5 J-	0.93	.9	0 73
Lead	0 015	0.015	mg/L	.001 U	0 001 U	0 001 U	0.001 U	0.001 U	0.001 U	0 001 U	0.001 U		0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0 001 U	0.001 U	0.001 U	0 001 U	0 001 U	0 001 U	0.001 U	0.001 U	0.001 U	.001 U	0 001 U
Lithium		0.04	mg/L	.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	.012	0 01
Mercury	0 002	0.002	mg/L	.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	.0002 U	0 0002 U
Molybdenum		0.1	mg/L	.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	0.03	0.0 3	0 037	0 039	0 057	0.044	0.05	0.0096	.011	0 011
Radium 226 228	5		pCi/L	.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		.53	
Selenium	0 05	0.05	mg/L	.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	.001 U	0 001 U
Thallium	0 002	0.002	mg/L	.001 U	0 001 U	0 001 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	.001 U	0 001 U
Field Parameters																													
Dissolved Oxygen			mg/L	.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.	1	0.35	0.42	0.12	0 13	2.61	0.12	0.33	.29	0 27
Ox dation Reduct on Potential			millivolts	59.7	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	7.0	7.0	7.7	7.45	7 57	7.85	7.89	7.95	9	7.
Specif c Conductivity			uS/cm	925	1807	1664	1517	1494	2098	1834	1713	1840	1121	1732	1440	1102	1322	2009	10 0	1 32	167 2	2538	2375	2190	1896	3391	1917	151	286.3
Temperature			deg C	5.5	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	1	3	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. 8	3.4	1.63	1 72	2.89	2.91	3.85	.78	3 9

Notes:
DEM RCG= Ind ana Department of Environmental Management
Remed al on Closure Guidance Table A-6 Screening Leve s - 2021 Revision

MCL= Maximum Contaminant Level
mg/L = mil igrams per iter
SU = standard units
pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the result is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

Tab e 2: Analytical Results for MCU Monitoring Wells
N IPSCO Rollin M. Schahfer Generat ng 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	2021-0 -28	2021-09-23
				N	N	N	N	FD	N	FD	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N
Appendix I II Parameters																									
Boron		4	mg/L	_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	20	240	210	210	200	200	220	240	270	280	220		220	220	200	200	150	178	192	168	227	
Chlor de			mg/L	63	55	58	58	75	73	71	67	53	39	64		58	82	46	46	39	54.4	59.8	1.6	5 .7	
Fluor de	4	4	mg/L	_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	0.3	
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	7.15	7 92	8. 8 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	18	509	
Total Dissolved Sol ds			mg/L	500	1100	880	980	1000	990	1000	960	1300	1400	1100		930	1100	970	980	770	772	796	659	10 0	
Appendix IV Parameters																									
Antimony	0 006	0.006	mg/L	_002 U	0 002 U	0 002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 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	_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	0.001 U	
Barium	2	2	mg/L	_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 0 6	0 037	0.053	
Bery lium	0 004	0.004	mg/L	_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	_001 U	0 001 U	0 001 U	0.001 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	_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	
Coba t		0.006	mg/L	_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	
Fluor de	4	4	mg/L	_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	0.3	
Lead	0 015	0.015	mg/L	_001 U	0 001 U	0 001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0 001 U		0.001 U		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	_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	_0002 U	0 0002 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	_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 0	0.058	
Radium 226 228	5		pCi/L	_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 6 9 U		
Selenium	0 05	0.05	mg/L	_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	_001 U	0 001 U	0 001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0 001 U		0.001 U		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	_59	6 69	1.98	6.1		3.41		3.92	5.27	3 24	5.98	6.71	5.43	0.22		6.82	5.54	3 14	3. 3	3. 2	6.2	
Ox dation Reduct on 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. 8	7.51	
Specif c Conductivity			uS/cm	671	736	1110	822		1041		1209	702	1542	1331	600	1156	1274		888	685	774	1218	970	138.	
Temperature			deg C	4.4	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	_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		1 02	2 95	

Notes:
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uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the result is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

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. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

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

Exhibit 25C
Schahfer CCR Part A Demonstration
Addendum, Part 3

Tab e 2: Analytical Results for MCU Monitoring Wells
N IPSCO Rollin M. Schahfer Generat ng 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	2021-0 -20		2021-09-23
				FD	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	FD	N	N	N	N	FD	N	N
Appendix I II 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	8.1	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			
Chlor de			mg/L	210	180	190	130	110	120	130	150	170	160	140		150	180	150	140	140	110	117	107	102	9	113			
Fluor de	4	4	mg/L	.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.	1.	1.	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 9 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	5 0	582 J	10 0 J	773			
Total Dissolved Sol ds			mg/L	2100	2000	2100	1700	1300	1200	1200	1500	1500	1500	1300		990	1300	1200	1200	1200	990	906	1010	1030	982	1 30			
Appendix IV Parameters																													
Antimony	0 006	0.006	mg/L	.002 U	0.002 U	0 002 U	0.002 U	0.002 U	0.002 U	0 002 U	0.002 U	0.002 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	.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	0 003	0.0033	0.003	0 0031			
Barium	2	2	mg/L	.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			
Bery lium	0 004	0.004	mg/L	.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	.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	.002 U	0.002 U	0 002 U	0.002 U	0.002 U	0.002 U	0 002 U	0.002 U	0.002 U	0.002 U		0 002 U		0.002 U	0 002 U	0 002 U	0.002 U	0.002 U	0.002 U	0 002 U	0.002 U	0.002 U	0 002 U			
Coba t		0.006	mg/L	.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			
Fluor de	4	4	mg/L	.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.	1.	1.	1 3			
Lead	0 015	0.015	mg/L	.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	.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	.0002 U	0.0002 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	.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	.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		0.92 U	1.67 U				
Selenium	0 05	0.05	mg/L	.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	.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	0.3		0.2	0 31			
Ox dation Reduct on 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 20			
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. 9	7 56			
Specif c Conductivity			uS/cm		2356	2435	2088	1559	1352	1592	1561		1922	1722	1053	1301	1556	1693		1165	9 24	1419	1513		1 59	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.		13.	16.			
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		26	3 02			

Notes:
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Remed al on Closure Guidance Table A-6 Screening Leve s - 2021 Revision

MCL= Maximum Contaminant Level
mg/L = mil igrams per iter
SU = standard units
pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the result is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.

O = Indicates te result was dentif ed as an outlier and removed from the da a set.

Tab e 2: Analytical Results for MCU Monitoring Wells
N IPSCO Rollin M. Schahfer Generat ng 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	2021-0 -16	2021-09-22
				N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Appendix I II Parameters																							
Boron		4	mg/L	.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. 7 O	8 O	3.5	
Calcium			mg/L	00	130	120	100	82	81	95	160	150	77		170	120	140	100	128	122 O	160 O	136	
Chlor de			mg/L	28	31	31	27	28	27	27	27	25	19		24	21	22	28	25.2	95.7 O	99 3 O	9 8	
Fluor de	4	4	mg/L	.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	60 J-	260	260	150	140	140	160	300	330	260		410	240	380	260	227	153 O	371 O	265	
Total Dissolved Sol ds			mg/L	70	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	.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	.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	0.0 6 O	0.09	
Barium	2	2	mg/L	.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	
Bery lium	0 004	0.004	mg/L	.001 U	0 001 U	0.001 U	0.001 U	0.001 U	0 001 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	.001 U	0 001 U	0.001 U	0.001 U	0.001 U	0 001 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	.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	
Coba t		0.006	mg/L	.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	
Fluor de	4	4	mg/L	.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	.001 U	0 001 U	0.001 U	0.001 U	0.001 U	0 001 U	0 001 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	.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	.0002 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	.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	U	0.479	0.513	0.646 U	0.555 J	0 339 U	0.483 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	.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	.001 U	0 001 U	0.001 U	0.001 U	0.001 U	0 001 U	0 001 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	.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	
Ox dation Reduct on 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	- 5.8	-6 .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	
Specif c Conductivity			uS/cm	779		909	733	594	584	674	9.32	1004	901	581	933	855	730	598	950	9 1	1153	10 .8	
Temperature			deg C	5.3		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	1 38	19 2	
Turbidity			NTU	.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	15	9.82	6.36	

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O = Indicates te result was dentif ed as an outlier and removed from the da a set.

Tab e 2: Analytical Results for MCU Monitoring Wells
N IPSCO Rollin M. Schahfer Generat ng 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	2021-0 -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
Appendix I I I Parameters																												
Boron		4	mg/L	_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	2.5 O	32.7 O	32 5 O	28 1
Calcium			mg/L	60	160	160	180	160	170	190	170	73		230		200	210	280		280	273	6 O	335 O	321 O	352
Chlor de			mg/L	2	58	62	81	64	65	71	64	64		87		89	93	110		80	104	613 O	372 O	396 O	269
Fluor de	4	4	mg/L	_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. 1 O	0.37 O	0 35 O	0. 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	80 J-	390	340	500	390	460	530	540	500		790		720	770	1300		940	912	68 O	596 O	6 3 O	900
Total Dissolved Sol ds			mg/L	830	800	840	1000	890	980	1200	1100	1100		1400		1400	1400	2100		1600	1720	2170 O	17 0 O	1870 O	2030
Appendix IV Parameters																												
Antimony	0 006	0.006	mg/L	_002 U	0 002 U	0 002 U	0.002 U	0.002 U	0.002 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	_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	0.00098 J		0.005 U	0 001 U	0.001 UO	0.001 UO	0 001 UO	0.001 U
Barium	2	2	mg/L	_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
Bery lium	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	_001 U	0 001 U	0 001 U	0.001 U	0.001 U	0.001 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	_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
Coba t		0.006	mg/L	_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
Fluor de	4	4	mg/L	_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. 1 O	0.37 O	0 35 O	0. J-
Lead	0 015	0.015	mg/L	_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	_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	_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	_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	_26	0 594	0 61	1.14 J	0.876 J	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	_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	_001 U	0 001 U	0 001 U	0.001 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	_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
Ox dation Reduct on 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	0.16
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
Specif c Conductivity			uS/cm	834	1049	1060	1237	940	1096	1099	1110	1294	1255	1612		2757	1889	1798		1384	2359	3077		2 91	286 6
Temperature			deg C	2.71	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	_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

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UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

Tab e 2: Analytical Results for MCU Monitoring Wells
N IPSCO Rollin M. Schahfer Generat ng 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	2021-0 -22	2021-09-21	
				N	N	N	N	N	N	N	N	N	N	N	FD	N	N	FD	N	N	FD	N	N	N	
Appendix I II Parameters																									
Boron		4	mg/L	_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	_1
Calcium			mg/L	230	180	170	120	160	210	220	240	57		220	160	160	210		210	302	312 O	313 O	10 O	275
Chlor de			mg/L	3	37	30	28	24	25	28	31	42		58	36	36	28		59	21.9	55 O	155 O	81.1 O	112
Fluor de	4	4	mg/L	_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	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	30 J-	400	320	47 O	300	500	480	630	520		530	340	350	570		530	757	20 O	698 O	1060 O	633
Total Dissolved Sol ds			mg/L	100	810	790	570	670	930	1000	1100	980		1100	740	730	1100		1100	1290	600 O	15 0 O	1850 O	1370
Appendix IV Parameters																									
Antimony	0 006	0.006	mg/L	_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	001 UO	0.001 UO	0 001 UO	0.001 U
Arsenic	0 01	0.01	mg/L	_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	0059 O	0.0058 O	0 00 2 O	0.0088
Barium	2	2	mg/L	_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	097 O	0.097 O	0 07 O	0.06
Bery lium	0 004	0.004	mg/L	_001 U	0 001 U	0 001 U	0.001 U	0.001 U	0.001 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	0002 U	0.0002 UO	0 0002 UO	0.0002 U
Cadmium	0 005	0.005	mg/L	_001 U	0 001 U	0 001 U	0.001 U	0.001 U	0.001 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	0002 U	0.0002 UO	0 0002 UO	0.0002 U
Chromium	0.1	0.1	mg/L	_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	002 UO	0.002 UO	0 002 UO	0.002 U
Coba t		0.006	mg/L	_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	0039 O	0.00 O	0 006 O	0.0038
Fluor de	4	4	mg/L	_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	5 O	0.5 O	0 39 O	0.57
Lead	0 015	0.015	mg/L	_001 U	0 001 U	0 001 U	0.001 U	0.001 U	0.001 U	0 001 U	0.001 U		0.001 U		0.001 U	0 001 U	0.001 U		0.001 U	0.001 U	001 UO	0.001 UO	0 001 UO	0.001 U
Lithium		0.04	mg/L	_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	008 UO	0.008 UO	0 008 UO	0.011
Mercury	0 002	0.002	mg/L	_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	0002 U	0.0002 UO	0 0002 UO	0.0002 U
Molybdenum		0.1	mg/L	_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	019 O	0.019 O	0 027 O	0.019
Radium 226 228	5		pCi/L	_68	0 543	0 527 U	0.829 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	_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 2 O	0.0 3 O	0 001 UO	0.001 U
Thallium	0 002	0.002	mg/L	_001 U	0 001 U	0 001 U	0.001 U	0.001 U	0.001 U	0 001 U	0.001 U		0.001 U		0.001 U	0 001 U	0.001 U		0.001 U	0.001 U	001 UO	0.001 UO	0 001 UO	0.001 U
Field Parameters																									
Dissolved Oxygen			mg/L	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. 8	0 27	0.29
Ox dation Reduct on 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
Specif c Conductivity			uS/cm	331	1112	927	751	821	1257	1123	1406	1254	1029	1239		1046	1001		1014	1680		2098	2025	185
Temperature			deg C	5.02	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.	15.08	25
Turbidity			NTU	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	65	1.79

Notes:
DEM RCG= Ind ana Department of Environmental Management
Remed al on Closure Guidance Table A-6 Screening Leve s - 2021
Revision

MCL= Maximum Contaminant Level
mg/L = mil igrams per iter
SU = standard units
pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.

J = Indicates the resul t is estimated.

J- = Indicates the result is estimated and may be biased low.

J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.

O = Indicates te result was dentif ed as an outlier and removed from the da a set.

Table 2: Analytical Results for MW21 Monitoring Wells
WBSGD Rolla M. Schaefer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GMW10B																		GMW10BR		
				2012-10-18	2016-10-26	2016-10-26	2017-04-10	2017-10-12	2018-04-26	2018-10-24	2019-04-25	2019-10-23	2020-04-29	2020-10-13	2020-10-13	2021-04-07	2021-04-20	2021-10-26	2021-10-26	2021-04-08	2021-04-08	2016-10-27	2017-04-24	2021-04-20
				N	N	FD	N	N	N	N	N	N	N	N	FD	N	N	N	FD	N	FD	N	N	N
Appendix III Parameters																								
Boron		1	mg/L	0.6	0.6	0.6	0.7	0.8	0.8	0.9	0.8	0.8	0.8	0.8		0.8	0.8	0.8		0.7	0.7	0.6	0.6	0.6
Calcium			mg/L	530	540	560	550	550	540	530	540	530		540		550	540	540		190	190	190	190	190
Chloride			mg/L	65	50	52	55	52	47	51	51	170	26			140	100	130		190	190	220	210	210
Fluoride	4	4	mg/L	0.2 J+	0.2 J	0.2 J	0.2 J	0.24 J	0.2 J	0.2 J	0.2 J	0.2 J		0.2 J		0.2 J	0.2 J	0.2 J		0.4	0.4	1	1	0.9 J
pH			SU	7.26	7.47		7.11	7.23	7.55	7.5	7.23	7.15	7.21	7.6		7.03	7.07			7.63	7.59		7.35	7.28
Sulfate			mg/L	500 J+	490	500	440	59 D	470	490	480	530				590	490	510		990	940	1500	1300	1300
Total Dissolved Solids			mg/L	1100	1000	1000	1000	1000	1000	1000	1000	1200	1100	1000		1400	20 UD	1000		1800	1800	2400	2100	1800
Appendix IV Parameters																								
Antimony	0.006	0.006	mg/L	0.002 U	0.002 U	0.00027 J	0.002 UJ	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U			0.00003 J		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	0.00094	0.0004	0.0013	0.0013	0.00102	0.00065	0.0012	0.00056	0.00147			0.00004	0.00067	0.00133			0.00102	0.00106	0.00076	0.00106	0.0008
Barium	2	2	mg/L	0.072	0.04	0.036	0.035	0.0258	0.029	0.065	0.041	0.0249			0.1059	0.035	0.0768		0.021	0.0179	0.0185	0.254	0.0147	0.041
Beryllium	0.004	0.004	mg/L	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U			0.00017 U		0.0001 U			0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U
Cadmium	0.005	0.005	mg/L	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U			0.00007 J		0.0001 U			0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U
Chromium	0.1 D	0.1	mg/L	0.002 U	0.002 U	0.00029 J	0.002 UJ	0.00029 J	0.002 U	0.002 U	0.002 U	0.002 U			0.0002 U		0.002 U			0.002 U	0.002 U	0.002 U	0.002 U	0.0024
Cobalt		0.006	mg/L	0.001 U	0.00016 J	0.00018 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.00003 J		0.0001 U			0.001 U	0.001 U	0.001 U	0.001 U	0.00117
Fluoride	4	4	mg/L	0.2 J+	0.2 J	0.6 D	0.23 J	0.0253	0.872	0.83 J	0.76 J	0.78 J	0.2		0.83 J	0.76 J	0.753 J		0.61	0.76	1	1	0.78 J	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	0.001 U	0.001 U
Lithium		0.04	mg/L	0.00053 J	0.005 U	0.0032 J	0.0022 J	0.00038 J	0.0015 J	0.0072 J	0.005 U	0.0006 J			0.0073 J		0.0039 J		0.0025 J	0.0073 J	0.0025 J	0.0025 J	0.008 U	0.013 D
Mercury	0.002	0.002	mg/L	0.00005 U	0.00013 U	0.00005 U	0.00005 U	0.00005 U	0.00005 U	0.00005 U	0.00005 U	0.00005 U			0.00005 U		0.00005 U		0.00005 U	0.00005 U	0.00005 U	0.00005 U	0.00005 U	0.00005 U
Molybdenum		0.1	mg/L	0.012	0.011	0.012	0.012	0.0122	0.014	0.0105	0.015	0.013			0.0106	0.015	0.0122		0.012	0.013	0.013	0.012	0.009	0.012
Selenium 206 + 204	0.05		mg/L	0.19	0.05	0.0965	0.0748	0.0588 J+	0.172	0.23	0.065	0.28			0.11 J+	0.09	0.1 J+		0.0414 J+	0.0494		0.5	0.5 U	0.0813
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.0006 J	0.005 UJ	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	0.00181
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.001 UJ	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			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	0.21	1.61		0.19	0.23	0.77	0.32	0.27	0.19	0.05	0.08	0.25	1.09	4.01	0.21		7.41	0.14	0.47	0.28	0.31
Oxidation Reduction Potential			millivolts	122.6	89		126.9	118.5	157.3	133.2	175.1	207.7	185.8	215.5	177.8	101.5	166.9	21.2		99.5	139.6	211.2	161	212
pH			SU	7.26	7.42		7.47	7.49	7.76	7.5	7.51	7.28	7.54	7.26	7.69	7.62	7.07	7.49		7.65	7.26	7.2	7.21	7.5
Specific Conductance			uS/cm	1142	1102		1186	1201	1193	1645	1035	1663	1461	1147	1465	1044	1766	1667		2743	2835	2661	2515	2285
Temperature			deg C	10.08	14.44		15.07	13.6	13.07	10.3	12.65	14.2	15	15.6	12.8	12	17.4	11.2		14.63	12	11.2	12.84	11.6
Turbidity			NTU	3.6	8.29		0.8	2.76	1.21	1.58	0.37	0.48	0.8	0.98	0.2	1.66	0.49	0.22		0.81	0.6	0.53	0.17	0.19

Notes:
IDEM RCG - Indiana Department of Environmental Management
Remediation Closure Guidance Table A-5 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 - Nephelometric Turbidity Units

"U" - Indicates the result was not detected above the method detection limit (MDL) for the sample. The associated limit (LOQ) is presented.
"D" - 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 MDL is provided.
"R" - Indicates the result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MW31 Monitoring Wells
WTPSOD Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GMW31																					
				2014-10-13	2015-05-04	2015-11-05	2016-05-03	2016-10-26	2017-05-08	2017-10-24	2018-04-30	2018-10-29	2019-04-30	2019-10-01	2019-10-31	2019-11-26	2020-05-04	2020-10-26	2021-04-26	2021-10-26	2021-11-04	2021-11-18	2021-12-02	2021-12-16	2021-12-30
				N	N	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	8.8	7.6	12	12				5.8	5.9	10	7.2	7.0	7.0	4.2	4.3	12.5	
Calcium			mg/L	638	1400	530	1400	1400	1200	1300	1500	ns				1100	1100	1400	1300	1200	1200	1400	1400	1300	1400
Chloride			mg/L	110	1200	130	1500	1400	61	170	1400	1600				98	98	1500	90	92	92	78.4	77	170	170
Fluoride	4	4	mg/L	0.81 J+	0.91 J	0.7	0.91 J	1.6 J	1.2 J	0.97 J	0.91 J	0.94 J	0.8 U	1.0 U		0.91 J	0.9 J+	1.7	1.6 J	1.7	1.7	1.6	1.5	1.6	1.6
pH			SU	7.56	7.27	7.24	7.33	7.55	7.23	7.4	7.46	7.35			7.68		7.82	6.85	7.23	7.35	7.34	6.38	7.0	7.16	
Sulfate			mg/L	330 J+	310	290	290	290	260	320	320	360				440	420	430	420	450	450	450	390	360	460
Total Dissolved Solids			mg/L	910	910	840	1000	1100	920	1000	1000	1000				630	650	1100	800	860	860	1120	1000	938	1180
Appendix IV Parameters																									
Antimony	0.006	0.0005	mg/L	0.00081 J	0.00032 J	0.00032 J	0.002 U	0.00028 J	0.001 U	0.002 U	0.001 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	0.0104	0.0108	0.0107 J	0.0135	0.0161	0.0154	0.0126 J	0.0139 J			0.0101 U	0.0101 U			0.0104 U	0.0107 U	0.0109 U	0.0109 U	0.0101 U	0.0022	0.0024	0.0027
Barium	2	2	mg/L	0.047	0.058	0.054	0.05	0.054	0.041	0.054	0.06			0.041	0.039		0.073	0.071	0.041	0.052	0.052	0.071	0.054	0.049	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	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 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	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chromium	0.1	0.1	mg/L	0.0015 J	0.002 U	0.0018 J	0.003 U	0.0012 J	0.0012 J	0.002 U	0.002 U			0.0022 J	0.0017 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 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
Fluoride	4	4	mg/L	0.81 J	0.91 J	0.8	0.91 J	1.6 J	1.2 J	0.99 J	0.91 J	0.94 J	0.8 U	1.0 U		0.91 J	0.9 J+	1.7	1.6 J	1.7	1.7	1.6	1.5	1.6	1.6
Lead	0.015	0.015	mg/L	0.0001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U	0.001 U			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	0.0036 J	0.0017 J	0.0041 J	0.0015 J	0.0028 J	0.0076 J			0.008 U	0.0032 J			0.0066 J	0.0032 J	0.0032 J	0.008 U	0.008 U	0.008 U	0.008 U	0.021
Mercury	0.002	0.002	mg/L	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U			0.00007 U	0.00007 U			0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U	0.00007 U
Molybdenum		0.1	mg/L	0.025	0.031	0.013	0.05 U	0.03	0.032	0.018	0.021			0.021	0.023			0.02	0.017	0.017	0.017	0.02	0.018	0.015	0.014
Selenium 2% + SM	0.05		mg/L	0.559	0.457 U	0.44 U	0.571 U	0.478 U	0.422 U	0.446 U	0.75			0.574 U	0.574 U			0.515 U	0.57 U	0.571 U		0.573 U		0.571 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			0.0071	0.011			0.015	0.023	0.0012 J	0.011	0.0011	0.0042	0.011	0.0036
Thallium	0.002	0.002	mg/L	0.001 U	0.001 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U			0.001 U	0.001 U			0.001 U	0.001 U	0.0005 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																									
Dissolved Oxygen			mg/L	0.71	1.7	1.6	1.01	0.35	1.11	1.78	4.01	1.1			4.49		1	1.46	0.15	0.47	1.31	1.24	2.02	3.75
Oxidation Reduction Potential			millivolts	29.8	875.6	6.1	83.3	6.6	69.9	23.3	8	70.9			79.2		70.2	237	33.6	35	97.9	334.5	25.8	18.2	
pH			SU	7.56	7.27	7.21	7.31	7.55	7.21	7.4	7.46	7.35			7.68		7.82	6.85	7.23	7.35	7.34	6.38	7.3	7.16	
Specific Conductivity			uS/cm	1889	1907	1447	1972	1924	1795	1969	2135	1953			1935		975	1815	1914	1961	1917	1870	1952	1958	
Temperature			deg C	17.22	20.6	19.86	17.9	19.46	19.4	17.71	14.41	20.2			19.8		23.4	20	12.6	13.62	9.41	20.4	11.95	21.9	
Turbidity			NTU	1.56	1.29	0.58	5.38	0.41	2.23	1.02	1.01	2.21			0.51		0.19	0.75	0.41	0.86	0.73	0.15	1.25	1.41	

Notes:
IDEM RCG - Indiana Department of Environmental Management
Remediation Closure Guidance Table A.5 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 - Nephelometric Turbidity Units

"U" - Indicates the result was not detected above the method detection limit (MDL) for the sample, the associated limit (LOQ) is presented
"N" - Indicates the result is estimated.
"J" - Indicates the result is estimated and may be biased.
"J+" - Indicates the result is estimated and may be biased high.
"UJ" - Indicates the result was not detected above the MDL, the estimated MDL is provided
"R" - Indicates the result was identified as an outlier and removed from the statistical

Table 2: Analytical Results for MW31 Monitoring Wells
WPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMMA LTB																			
				MW-31-181	MW-31-181	MW-31-181	MW-31-181	MW-31-181	MW-31-181	MW-31-181	MW-31-181	MW-31-181	MW-31-181	MW-31-181	MW-31-181	MW-31-181	MW-31-181	MW-31-181	MW-31-181	MW-31-181	MW-31-181	MW-31-181	MW-31-181
				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	38	35	20	32	22	30	26	23	18			35	35	42	42	32	37	37	18.2	23
Calcium			mg/L	230	200	140	200	210	210	240	240	240			180	200	240	230	230	240	240	152	164	192
Chloride			mg/L	160	120	100	90	200	200	71	91	130			110	120	110	130	110	110	110	105	105	100
Fluoride	4	4	mg/L	0.18 J+	0.58 U	0.58 U	0.58 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.55 U		0.58 U	0.58 U	0.64 U	0.61 U	0.62 U	0.62 U	0.62 U	0.61 U	0.63 U	0.49 J+
pH			SU	7.45	7.37	7.1	7.34	7.41	7.42	7.25	7.43	7.36	7.48		7.39	7.38	7.28	7.1	7.45	7.56	7.53	6.93	7.19	7.6
Sulfate			mg/L	1,100 J+	900	700	740	730	900	840	880	920			590	650	860	740	850	850	850	814	918	880
Total Dissolved Solids			mg/L	1600	1400	1100	1200	1700	1700	1600	1600	1600			1100	1200	1400	1300	1400	1500	1500	1330	1360	1400
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	0.001 U	0.001 U	0.001 U
Arsenic	0.01	0.01	mg/L	0.00494 J	0.00472 J	0.00436 J	0.00457 J	0.00503 J	0.00524 J	0.00478 J	0.00486 J			0.00572 J			0.0072 J	0.00524 J	0.00703 J	0.00736 J	0.00726 J	0.00125	0.0022	0.0021
Barium	2	2	mg/L	0.078	0.079	0.056	0.062	0.1	0.089	0.068	0.068			0.085	0.095		0.068	0.072	0.11	0.074	0.065	0.051	0.064	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	0.00021 U	0.00021 U	0.00021 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	0.001 U	0.00021 U	0.00021 U	0.00021 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			0.0013 J	0.001 U	0.001 U	0.001 U	0.001 U	0.00105	0.00105	0.00105
Fluoride	4	4	mg/L	0.63 J	0.58 U	0.58 U	0.58 U	0.6 U	0.6 U	2.2 J	2.31	1.2 J		0.29 J	0.58 U		0.81 J	0.71	0.62	0.67	0.68 J	0.61	0.63	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	0.00173 J	0.008 U	0.008 U	0.008 U	0.00616 J	0.0062 J	0.0126 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	0.001	mg/L	0.00067 U	0.00068 U	0.00069 U	0.00032 U	0.00069 U	0.00067 U	0.00069 U	0.00067 U			0.00067 U			0.00059 U	0.00067 U	0.00067 U	0.00067 U	0.00067 U	0.00016 U	0.00016 U	0.00016 U
Molybdenum		0.2	mg/L	0.005	0.005	0.005	0.005	0.005	0.0051	0.005	0.005			0.0041 J	0.005	0.005	0.005	0.005	0.0074 J	0.01	0.013	0.0065	0.0052	0.013
Selenium 2m + 20	5		mg/L	0.29	0.28	0.53	0.58	0.25	0.56	0.55	0.8			0.64 J+	0.71		0.42	0.46 J+	0.24		0.28		0.15 U	
Selenium	0.05	0.05	mg/L	0.005 U	0.005 U	0.005 U	0.00033 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	0.005 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	0.00122 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Field Parameters																							
Dissolved Oxygen			mg/L	0.31	0.24	5.67	0.36	0.11	0.31	0.76	0.14	0.59	0.16	0.71	0.2	0.09	0.21	4.5	0.2	0.4	0.21	0.29	
Oxidation Reduction Potential			millivolts	110	651	109.8	113.6	91.8	107.3	98.6	91	129.4	93.2	131.5	79.5	240.5	11.9	3.6	99.1	69.7	137.5	0.317	
pH			SU	6.48	7.16	6.1	6.24	6.46	6.82	6.75	6.79	7.16	6.89	7.19	7.61	7.4	6.75	6.86	7.22	8.21	7.84	7.6	
Specific Conductivity			uS/cm	1525	1734	1560	1710.9	1951	1958	1490	1944	1932	1738	1468	1977	1308	1068	890	968	1094	1727	1501	
Temperature			deg C	10.29	10.26	15.77	9.9	9.96	9.45	10.61	9.63	10.8	13.27	13.9	10.35	10.3	9.49	13.16	13.12	15.8	15.09	10.7	
Turbidity			NTU	5.09	2.48	0.05	0.92	0.38	2.11	2.35	1.89	2.45	3.76	8.88	8.75	1.85	8.61	2.68	4.58	8	1.44	1.72	

Notes:
IDEM RCG - Indiana Department of Environmental Management Remediation Closure Guidance Table A-5 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 - Nephelometric Turbidity Units

"J" - Indicates the result was not detected above the method detection limit (MDL) for the sample. The associated limit (RL) is presented.
"UJ" - 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.
"U" - Indicates the analyte was not detected above the MDL. The associated RL is provided.
"R" - Indicates the result was identified as an outlier and removed from the data set.

Tab e 2: Analytical Results for MCU Monitoring Wells
N IPSCO Rollin M. Schahfer Generat ng 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	2021-0 -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 I II Parameters																									
Boron		4	mg/L	.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	20	610 O	370	360	330	280	210	280	290	300	380 J	64 J		320	230	320	360	294	3 1	36	56
Chlor de			mg/L	7	39	17	17	9.3	5	4.3	10	10	11	23	23		7.3	22	12	27	16.7	5 8	0 3	97
Fluor de	4	4	mg/L	.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	.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	.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	65	1310	1160
Total Dissolved Sol ds			mg/L	300	2200	1500	1500	1200	1000	730	1100	1100	1300	1600	1500		2400	1100	1400	1500	1130	50	1 0	2020
Appendix IV Parameters																									
Antimony	0 006	0.006	mg/L	.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	.001 U	0 001 U	0.001 U
Arsenic	0 01	0.01	mg/L	.0014 J	0 0023 J	0 0014 J	0.00091	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	.001 U	0 001 U	0.001 U
Barium	2	2	mg/L	.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	.053	0 0	0.057
Bery lium	0 004	0.004	mg/L	.001 U	0 001 U	0 001 U	0.001 U	0.001 U	0.001 U	0 001 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	.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	.0002 U	0 0002 U	0.0002 U
Chromium	0.1	0.1	mg/L	.002 U	0 002 U	0 00067 J	0.00048 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	.002 U	0 002 U	0.002 U
Coba t		0.006	mg/L	.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	.001 U	0 001 U	0.0011
Fluor de	4	4	mg/L	.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	.19	0.16	0.16 J-
Lead	0 015	0.015	mg/L	.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	.001 U	0 001 U	0.001 U
Lithium		0.04	mg/L	.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	.008 U	0 008 U	0.011
Mercury	0 002	0.002	mg/L	.0002 U	0 0002 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	.0002 U	0 0002 U	0.0002 U
Molybdenum		0.1	mg/L	.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	.079	0 082	0.1
Radium 226 228	5		pCi/L	U	0 803	0.474	0.449	0.581 U	0.398 U	0 384 U	0.493	0.327 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	.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	.03	0 0 2	0.028
Thallium	0 002	0.002	mg/L	.001 U	0 001 U	0 001 U	0.001 U	0.001 U	0.001 U	0 001 U	0.001 U	0.001 U	0.001 U			0.001 U		0.001 U	0.001 U	0 001 U	0 001 U	.001 U	0 001 U	0.001 U
Field Parameters																									
Dissolved Oxygen			mg/L	.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
Ox dation Reduct on 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	-6 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	.1	10 36	7.1
Specif c Conductivity			uS/cm	474	2362		1740	1255	986	970		1299	1414		1760	905	1170	1230	1060	1338	995	921	1699	2 5 9
Temperature			deg C	6.3	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	7	10 29	21.
Turbidity			NTU	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	8	2 8	3.7

Notes:
DEM RCG= Ind ana Department of Environmental Management
Remed al on Closure Guidance Table A-6 Screening Leve s - 2021 Revision

MCL= Maximum Contaminant Level
mg/L = mil igrams per iter
SU = standard units
pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the result is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

Tab e 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generat ng 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	2021-0 -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	2021-0 -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	
Appendix III Parameters																												
Boron		4	mg/L	3	12	13	14	11	10.9	9	8	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	
Chlor de			mg/L	50	140	140	170	140	117	11	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	
Fluor de	4	4	mg/L	.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. 3	7 51		7 3			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	100	1000	1100	1100	840	1220	12 0	1260	1100	1120			55 O	34	30		28	29	30	27	24.7	23 9	33 J	31 8	
Total Dissolved Sol ds			mg/L	2100	2000	2000	2100	1500	2060	1830	33 0	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	.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	.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	.048	0 035	0.039	0.039	0.024	0.041	0 032	0.0 1	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	0.00 6	0.005	0.00	
Bery lium	0 004	0.004	mg/L	.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	.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	.002 U	0 002 U	0.002 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	0.002 U	0.0014 J	0.002 U	0 002 U	0.002 U	0.002 U	0.002 U	
Coba t		0.006	mg/L	.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	
Fluor de	4	4	mg/L	.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	.001 U	0 001 U	0.001 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	.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	.0002 U	0 0002 U	0.0002 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	.024	0 014	0.015	0.026	0.011	0.039	0 05	0.07	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	.7	1 28	1.46			1.7 U		2.1					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	.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	.001 U	0 001 U	0.001 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	.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	.78	1.59	1.26	
Ox dation Reduct on Potential			millivolts	140.7		-103.4	109.2	-144.8	-77.7	15.9	-10 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. 3	7.51		7 3			7.93	8.17	8.23	7.52	8 15	7.9	7.81	7.77	8 64	8.67	8.36	8.16	
Specif c Conductivity			uS/cm	311		2147	1902	1475	1897	26 6	2 9		2 7.3			367	155	161	179	153	153	152	132	208	175.1	238.2	238	
Temperature			deg C	5.39		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	19		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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J = Indicates the result is estimated.
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J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

Tab e 2: Analytical Results for MCU Monitoring Wells
N IPSCO Rollin M. Schahfer Generat ng 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	2021-0 -27	2021-09-15	2018-09-10	2018-10-3	2019-05-09	019-11-1	2020-04-30	2020-10-22	2021-0 -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 I II Parameters																							
Boron		4	mg/L	.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	5 .3	51	75	59	52	72	48.3	71.	59.9	62 5
Chlor de			mg/L	O	7.9	7.9		7.2	8	7 1	6.9	5.5	6	5 5	5.	34	9.1	5.5	37	8.2	9.1	18.7	15 9
Fluor de	4	4	mg/L	.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 Sol ds			mg/L	50 O	260	290		240	220 J	250	240	209	197	190	2 3	400	250	240	350	205	336	269	276
Appendix IV Parameters																							
Antimony	0 006	0.006	mg/L	.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	.0015 JO	0 0012 J	0 00076 J	0 006 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	.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	0.01	0.011	0 01
Bery lium	0 004	0.004	mg/L	.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	.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	.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
Coba t		0.006	mg/L	.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
Fluor de	4	4	mg/L	.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	.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	.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	.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	.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	.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 1	0.53 U		1.64 U		0.23 U	
Selenium	0 05	0.05	mg/L	.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	.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	.59	0 08	1.9	0.3	1.4	1.25	0 31	0.3	0.17	1.1	0 6	0 2	0.48	0.21	6.42	2.2	6.9	0.35	0.91	0 56
Ox dation Reduct on Potential			millivolts	29.4	111.9	-111.1	-133 1	-93.9	-119.9	33.7	-229 6	-137.1	- 0 5	-101.3	-2 1	-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
Specif c Conductivity			uS/cm	211	268	294	282	274	284	260	242	405	358 9	351	388	0.896	448	308	320	389	6 1	5 5	501
Temperature			deg C	1.3	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	.45	3 26	4 3	3.25	3.11	1.15	4 16	2.84	4.02	69	58	3	0.45	0.83	0.42	0.74	1.57	1.09	1.79	1 39

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deg C = degrees Celsius
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U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
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J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

Tab e 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generat ng 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	2021-0 -16	2021-09-30	2018-09-11	2018-10-30	2019-04-30	2019-11-14	2020-05-01	2020-10-23		2021-0 -16	2021-09-30
				N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N
Appendix I II Parameters																				
Boron		4	mg/L	.75	0 8	1	1.3	0.77	1.7	1 2	0.6	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	60	160	110	130	129	1 .2	9 .9	120	45	53	17	25	32	16.9	17	17.5	28.3
Chlor de			mg/L	30	470	380	370	496	2 .8	131	135	4.9	4.6	1.9	3.6	4.3	1.8	2	2.	2 7
Fluor de	4	4	mg/L	0 U	0.18	0 21 J	0.23	0.26	0.26	0 2	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. 6	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	196	51	56	37	36	32 6	26 6	28 2	35.2	9.
Total Dissolved Sol ds			mg/L	500	1300	1100	1100	1260	982	673	667	240	250	130	160	161	89	99	97	1 7
Appendix IV Parameters																				
Antimony	0 006	0.006	mg/L	.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	.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	0.001	0 001	0.0012	0 0012
Barium	2	2	mg/L	.32	0 31	0 25	0.28	0.29	0.23	0.15	0.1	0.027	0.028	0 019	0.026	0.023	0.022	0 023	0.027	0 033
Bery lium	0 004	0.004	mg/L	.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	.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	.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
Coba t		0.006	mg/L	.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
Fluor de	4	4	mg/L	0 U	0.18	0 21 J	0.23	0.26	0.26	0 2	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	.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	.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	.0002 U	0 0002 U	0 0002 U	0.0002 U	0.0002 U	0.0002 U	0 0002 U	0.0002 U	0.0002 U	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	.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	.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	.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	.001 U	0 001 U	0 001 U	0.001 U	0.001 U	0.001 U	0 001 U	0.001 U	0.001 U	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	.44	0.1	0.15	0.19	0.09	1.02	0. .2	0.28	0.53	0.86	3.11	0.84	1.39		1.16	1.99	0 92
Ox dation Reduct on Potential			millivolts	214.9	-103.5	6 31	-102.9	-104.2	-1 1 6	-123.5	0.2 1	-24.6	-199.5	43.7	-54.8	168		122.8	111.7	9 .9
pH			SU	8.3	7.1	7.42	7.34	7.6	7.29	7. 6	7.57	6	6.47	5.93	6.21	6.42		5.88	5.76	6.17
Specif c Conductivity			uS/cm	934	2005	1652	1353	2424	1 00	1159	110.	307	400	125	155	260		1	173	20
Temperature			deg C	7.26	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.
Turbidity			NTU	.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	.56	51

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pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the resul t is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

Tab e 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generat ng Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW53B								GAMW54							
				2018-09-11	2018-10-3	2019-04-30	2019-11-14	2020-05-01	2020-10-23	2021-0 -16	2021-09-30	2018-09-10	2018-10-31	2019-04-30	2019-11-14	2020-05-04	2020-10-23	2021-0 -19	2021-10-01
				N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Appendix I II 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	80	190	150	140	180	136	1 .2	128	93	88	93	81	131	15	16	11
Chlor de			mg/L	90	85	81	74	107	8 .6	8 .8	66	15	10	10		12.3	50.3	53.9	2 6
Fluor de	4	4	mg/L	.52 J	0.46	0.51	0.7	0.46	0 58	0.	0. 6	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. 8	6 24	7 92	6.82	7.08	6 74	6.21	6.52	6.82
Sulfate			mg/L	30	510	340	320	488	327	30	295	190	150	190	76	284	3 .1	92	191
Total Dissolved Sol ds			mg/L	100	1100	900	770	1060	730	7 8	802	500	400	470	50	618	689	735	506
Appendix IV Parameters																			
Antimony	0 006	0.006	mg/L	.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	.00079 J	0 00083 J	0.001 J	0.0016 J	0.0028	0 001 U	0.001 U	0 001	0 0024 J	0.0028 J	0.0022 J	0.0045 J	0 0045	0.0038	0.0075	0.02
Barium	2	2	mg/L	.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	0.0 8
Bery lium	0 004	0.004	mg/L	.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	.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	.002 U	0 002 U	0.002 U	0.002 U	0.002 U	0 002 U	0.002 U	0 002 U	0 002 U	0.002 U	0.002 U	0.002 U	0 002 U	0.002 U	0.002 U	0.002 U
Coba t		0.006	mg/L	.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
Fluor de	4	4	mg/L	.52 J	0.46	0.51	0.7	0.46	0 58	0.	0. 6	0.18 J	0.17	0.14	0.28	0 18	0.28	0.2	0.3
Lead	0 015	0.015	mg/L	.001 U	0 001 U	0.001 U	0.001 U	0.001 U	0 001 U	0.001 U	0 001 U	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	.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	.0002 U	0 0002 U	0.0002 U	0.0002 U	0.0002 U	0 0002 U	0.0002 U	0 0002 U	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	.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	.69	0.48 J	1.26		1.73		1.21 U		0 5	1.08 J	0.393 U		1 51 U		0.69 U	
Selenium	0 05	0.05	mg/L	.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	0.00	0.001 U
Thallium	0 002	0.002	mg/L	.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	.26	0 8	0.36	0 09	0.12	0 65	0.39	0 2	0 61	1.41	0.72	.26	0 65	1.0	0.68	0.29
Ox dation Reduct on Potential			millivolts	183.2	-168	27.7	-75 3	-118.9	-111 8	-10	-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. 8	6 24	7 92	6.82	7.08	6 74	6.21	6.52	6.82
Specif c Conductivity			uS/cm	954	1620	1160	870	1634	1091	1227	125 6	675	630	493	74	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	03	3.27	3 62	2 03	1	3.24	2.31	4.9	2. 5	6.79	3.79

Notes:
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MCL= Maximum Contaminant Level
mg/L = mil igrams per iter
SU = standard units
pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the result is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

Tab e 2: Analytical Results for MCU Monitoring Wells
N IPSCO Rollin M. Schahfer Generat ng Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW54B								GAMW55				GAMW55R				
				2018-09-10	018-10-3	2019-05-01	2019-11-15	020-05-0	2020-10-23	2021-0 -19	2021-10-01	2018-09-10		2018-10-29		2019-11-15	2020-05-05	2020-10-28	2021-0 -20	2021-10-01
				N	N	N	N	N	N	N	N	FD	N	FD	N	N	N	N	N	N
Appendix I II Parameters																				
Boron		4	mg/L	.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
Chlor de			mg/L	00	95	110	120	68.3	9 2	83 9	70	58	59	69	70	61	46 3	8 2 J-	51.	.1
Fluor de	4	4	mg/L	.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. 6	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. .5	7 6	7.27
Sulfate			mg/L	750	730	710	720	470	38	891	501	590	600	630	620	480	345	351	867	389
Total Dissolved Sol ds			mg/L	600	1400	1500	1400	1000	878	1120	1030	1200	1300	1300	1300	950	846	789	8 2	9 8
Appendix IV Parameters																				
Antimony	0 006	0.006	mg/L	.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	.0025 J	0 0032 J	0 0045 J	0.005	0.0042	0 00 2	0.00	0 00	0.00683 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	.098	0 093	0 08	0.084	0.06	0.05	0.063	0 056	0.099	0 097	0 068	0.069	0.035	0.046	0.038	0 032	0.038
Bery lium	0 004	0.004	mg/L	.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	.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	.002 U	0 002 U	0 002 U	0.002 U	0.002 U	0 002 U	0.002 U	0 002 U	0.002 U	0 002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0 002 U	0.002 U
Coba t		0.006	mg/L	.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
Fluor de	4	4	mg/L	.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. 6	0.51
Lead	0 015	0.015	mg/L	.001 U	0 001 U	0 001 U	0.001 U	0.001 U	0 001 U	0.001 U	0 001 U	0.001 U	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	.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	.0002 U	0 0002 U	0 0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0 0002 U	0.0002 U	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	.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. 3		1.4	0 802	0.922 J	1.24 J		1.58 U		1. 7 R	
Selenium	0 05	0.05	mg/L	.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	0.00 6
Thallium	0 002	0.002	mg/L	.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	.42	2.12	0.42	0.31	0.1	0.72	0. .5	0 26		1.73		0.33	0.72	1.95	2.5	1.19	0. .7
Ox dation Reduct on Potential			millivolts	123.4	-315.7	-23.1	-43.3	117.5	-1 3.2	-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. .5	7 6	7.27
Specif c Conductivity			uS/cm	816	1983	1636	1310	0.63	1105	1626	1 9.		1493		1574	1017	1270	99	1319	139.1
Temperature			deg C	7.6	17.29	15.5	15 8	15.6	16 2	1 3	17.3		21.1		19.4	16.7	12 8	17 6	11 3	20.6
Turbidity			NTU	2	1 64	4.49	1.67	4.31	.6	6.7	3 5		1.74		0.66	2.26	2.4	1.2	2 35	1.59

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pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the result is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

Tab e 2: Analytical Results for MCU Monitoring Wells
N IPSCO Rollin M. Schahfer Generat ng Station
Wheatfield, Indiana

Analyte	MCL	IDEM RCG	Unit	GAMW558										GAMW56							
				2018-09-11		2018-10-29	2019-05-01	2019-11-15	2020-05-05		2020-10-28	2021-0 -20	2021-10-01	2018-09-11	2018-10-26	2019-04-29	2019-11-15	020-05-0	2020-10-28	2021-0 -20	2021-10-0
				FD	N	N	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N
Appendix I II 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	25	205	130	110	91	120	115	111	130	108
Chlor de			mg/L	220	220	190	170	150	119	119	120 J-	120	79.	3.1	2.4	3.2	2.1	2.8	3.2 J-	2.9	1 7
Fluor de	4	4	mg/L	.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	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	96	57	63	54	56	56.3	9 6	57 6	6 8
Total Dissolved Sol ds			mg/L	800	1900	1800	1700	1400	1400	1420	1380	1370	1120	470	480	420	440	456	390	80	379
Appendix IV Parameters																					
Antimony	0 006	0.006	mg/L	.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	.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	.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	0.0	0.0 2	0 0
Bery lium	0 004	0.004	mg/L	.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	.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	.002 U	0.002 U	0 002 U	0.002 U	0.002 U	0.002 U	0 002 U	0.002 U	0 002 U	0 002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0 002 U
Coba t		0.006	mg/L	.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 00 5
Fluor de	4	4	mg/L	.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	.001 U	0.001 U	0 001 U	0.001 U	0.001 U	0.001 U	0 001 U	0.001 U	0 001 U	0 001 U	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	.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	.0002 U	0.0002 U	0 0002 U	0.0002 U	0.0002 U	0.0002 U	0 0002 U	0.0002 U	0 0002 U	0 0002 U	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	.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	.35	9.18	9 66 J	2.08		3.06	3 02		1 . 9 U		0.728	0.698 J			1.24 U		0.222 U	
Selenium	0 05	0.05	mg/L	.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	.001 U	0.001 U	0 001 U	0.001 U	0.001 U	0.001 U	0 001 U	0.001 U	0 001 U	0 001 U	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
Ox dation Reduct on 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	-6 .	85 9	-133.7
pH			SU		7.07	7 19	7.31	7.46		7.45	7.56	7 7	7.	6.82	7.17	6.83	7.06	7.05	7.07	7.05	7 09
Specif c Conductivity			uS/cm		2109	2201	1967	1491		2018	1588	1896	162 3	749	835	460	466	782	560	7 0	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	1 . 7	9	17 2
Turbidity			NTU		4.38	1 74	4.77	3.92		4.11	3.22	78	. 8	2.91	2.99	2.31	2.01	2.4	0.83	2.67	3. 8

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pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the result is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

Tab e 2: Analytical Results for MCU Monitoring Wells
NIPSCO Rollin M. Schahfer Generat ng 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	2021-0 -21	2021-10-0
				N	N	N	N	N	N	N	N
Appendix I II Parameters											
Boron		4	mg/L	.2	1 2	2 3	3.2	2.1	2	1 6	1.
Calcium			mg/L	40	140	150	150	141	138	157	160
Chlor de			mg/L	0	36	55	64	50 8	5.7 J-	70 8	73.7
Fluor de	4	4	mg/L	.41 J	0 33	0.4	0.44	0.55	0.51	0. 1	0. 6
pH			SU	6.95	6.91	7 08	7.21	7.52	7. 7	7 55	7.3
Sulfate			mg/L	70	130	260	360	280	275	277	268
Total Dissolved Sol ds			mg/L	740	690	830	860	753	696	738	802
Appendix IV Parameters											
Antimony	0 006	0.006	mg/L	.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	.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	.076	0 072	0 082	0.076	0.071	0.066	0 071	0.081
Bery lium	0 004	0.004	mg/L	.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	.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	.002 U	0 002 U	0 002	0.002 U	0.002 U	0.002 U	0 002 U	0.002 U
Coba t		0.006	mg/L	.001 U	0 001 U	0 001	0.001 U	0.001 U	0.001 U	0 001 U	0.001 U
Fluor de	4	4	mg/L	.41 J	0 33	0.4	0.44	0.55	0.51	0. 1	0. 6
Lead	0 015	0.015	mg/L	.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	.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	.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	.004 J	0 003 J	0 0031	0.0064 J	0.0086	0.0075	0 007	0.0062
Radium 226 228	5		pCi/L	.26	1 28 J			2.11		2 97	
Selenium	0 05	0.05	mg/L	.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	.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	.29	0 26	0.79	0.18	0.09	1. 8	0 23	0.29
Ox dation Reduct on Potential			millivolts	102.8	-44.4	31.8	-105 7	-105.5	-123.9	-110.5	-21 .1
pH			SU	6.95	6.91	7.08	7.21	7.52	7. 7	7 55	7.3
Specif c Conductivity			uS/cm	928	1036	856	741	1179	772	1100	12
Temperature			deg C	13.9	13.8	11.6	12.9	11 8	12 9	12	1 .3
Turbidity			NTU	2.96	1.45	4.77	1.4	4.56	2.39	8.72	.65

Notes:
DEM RCG= Ind ana Department of Environmental Management
Remed al on Closure Guidance Table A-6 Screening Leve s - 2021 Revision

MCL= Maximum Contaminant Level
mg/L = mil igrams per iter
SU = standard units
pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the resul t is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

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

GOLDER
MEMBER OF WSP

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

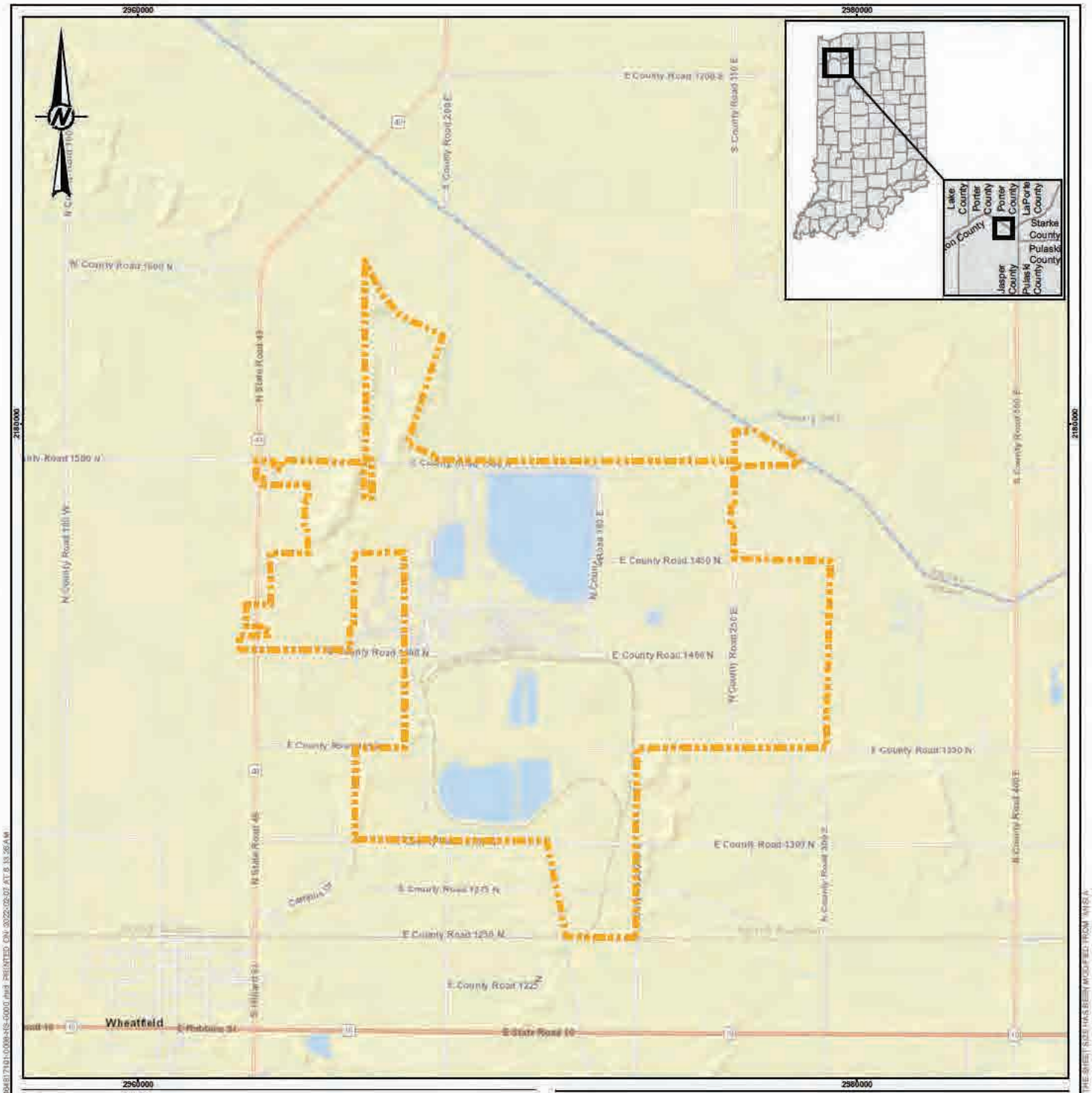
Note:
All alternatives also include impoundment closure by removal with associated dewatering

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 mplementation	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.
nstitutional 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, NTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CH NA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTR BUTORS, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

SITE LOCATION MAP

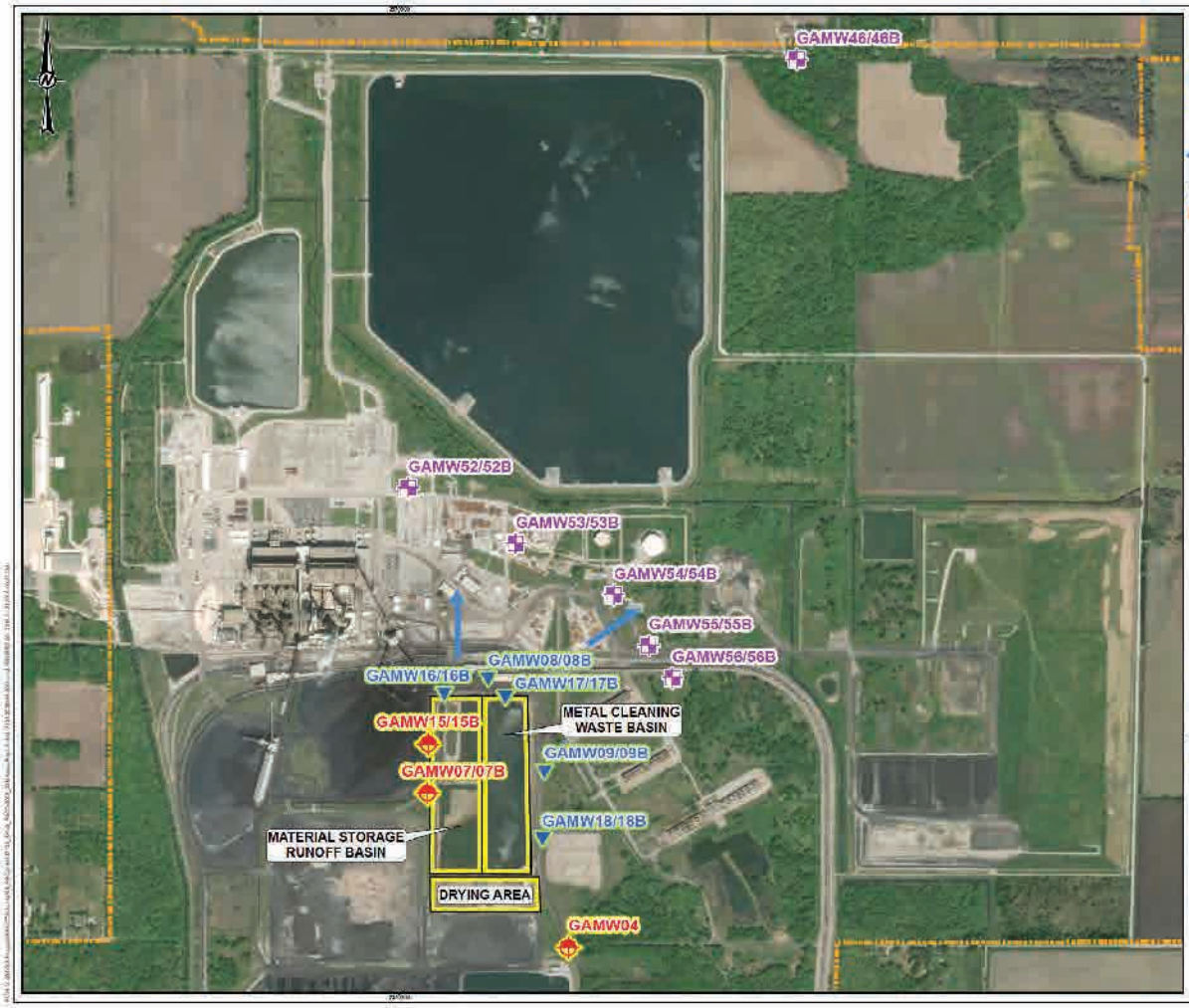
CONSULTANT

GOLDER
MEMBER OF WSP

YYYY-MM-DD	2/7/2022
DESIGNED	DFS
PREPARED	SHL
REVIEWED	JSP
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
20447130	A	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A



Legend

- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- Generalized Groundwater Flow Direction
- CCR Units
- Approximate Property Line

0 850 1,700

1 in = 850 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, AEX, GETMAPPING, 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

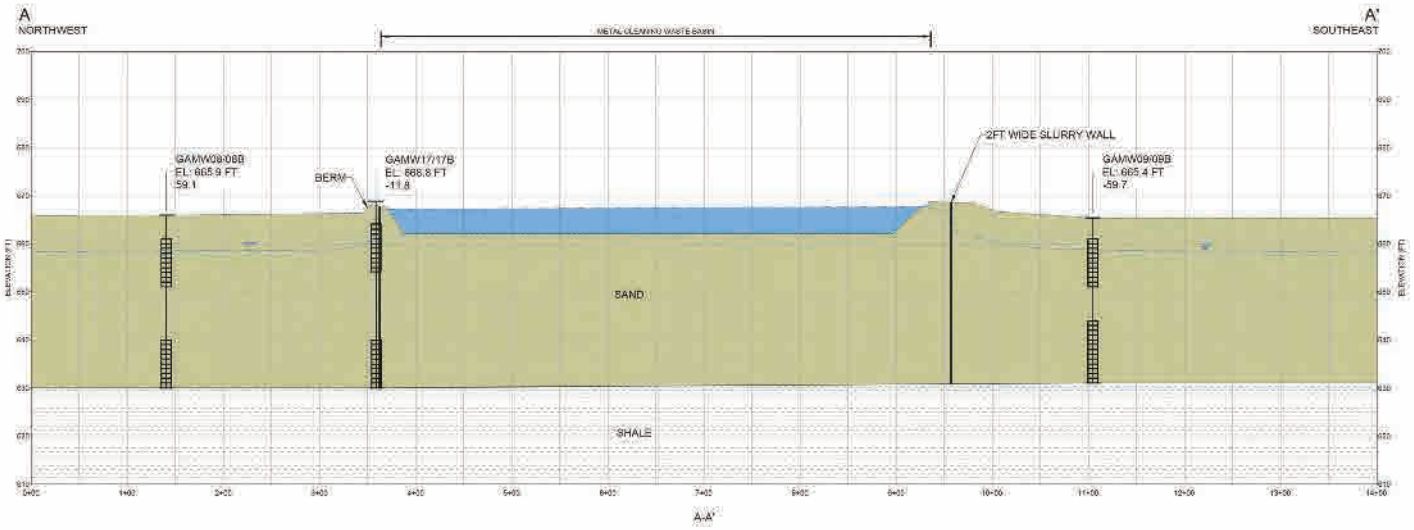
MONITORING WELL LOCATIONS
DRYING AREA, MSRB, AND MCWB

CONSULTANT

GOLDER
MEMBER OF WSP

TYPED/MM/DD	08/22/12
DESIGNED	DPS
PREPARED	SIE
REVIEWED	MAH
APPROVED	MHH

PROJECT NO. 20447130 | CONTROL A | REV. 0 | FIGURE 2





VERTICAL SCALE: 1" = 10' (0, 10, 20 FEET)

HORIZONTAL SCALE: 1" = 50' (0, 50, 100 FEET)

LEGEND

GAMW-23/23B
EL: 663.9
59.1

- WELL ID
- 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

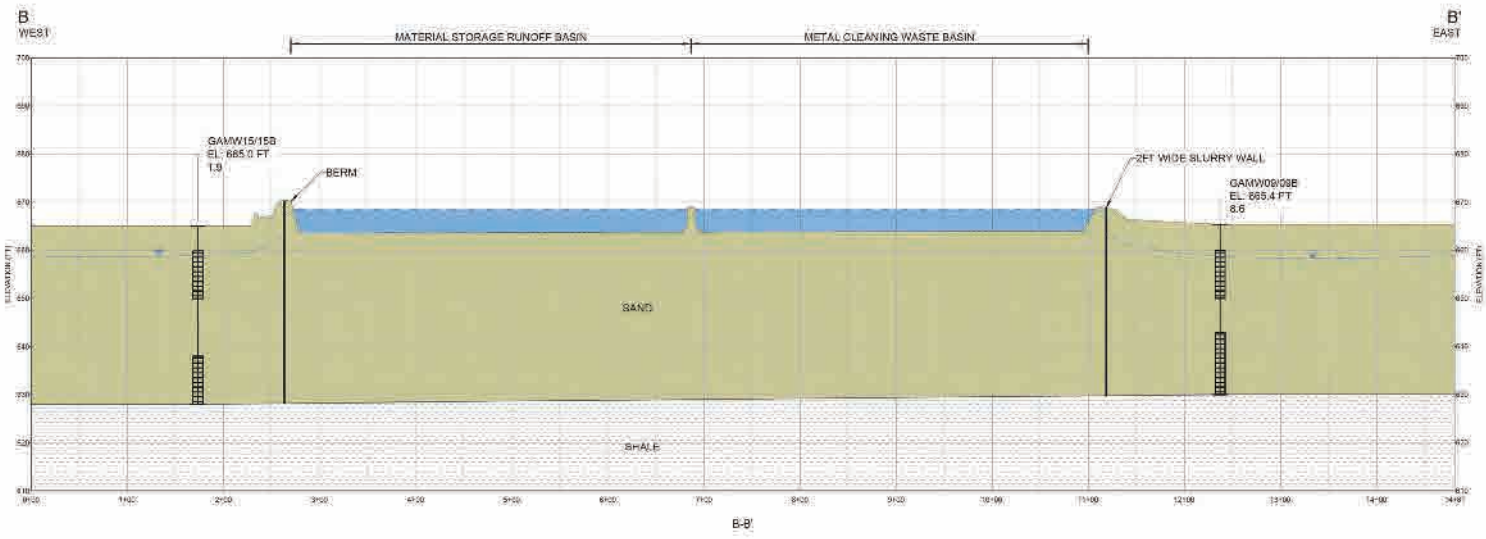
CONSULTANT
GOLDER
ASSOCIATES OF WAR

YYYY-MM-DD	2020-03-31
PREPARED	RWC
REVIEWED	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
20447130	03	0	3





VERTICAL SCALE: 0 10 20 FEET

HORIZONTAL SCALE: 0 50 100 FEET

LEGEND

GAMW-15/15B
EL. 665.0 ft
1.9

- WELL ID
- 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
MEMBER OF WSP

YYYY-MM-DD	2020-03-31
PREPARED	RWC
REVIEWED	RWC
REVIEWED	JBC
APPROVED	MKH

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



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

0 500 1,000

1" = 958 feet

Feet

NOTE(S):

1. THE DIRECTION OF HORIZONTAL GROUNDWATER FLOW AT AND NEAR THE POTENTIOMETRIC SURFACE CAN BE GENERALLY INTERPRETED AS BEING PERPENDICULAR TO THE GROUNDWATER ELEVATION CONTOURS (SOLID OR INFERRED) REPRESENTED ON THIS MAP.
2. THE ACTUAL ELEVATION OF THE POTENTIOMETRIC SURFACE IS LIKELY MORE HETEROGENEOUS THAN SHOWN AND ACTUAL CONDITIONS MAY VARY. OTHER INTERPRETATIONS ARE POSSIBLE. THE DEPTH TO GROUNDWATER IS KNOWN TO VARY WITH TIME.

NOTE(S):

1. "MW" INDICATES LOCATION WAS NOT SURVEYED.
2. "-" INDICATES NOT USED IN CONTOUR NO.

REFERENCE(S):

1. SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, 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

DESIGNED	DPS
PREPARED	NH
REVIEWED	EAA
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
20447130	A	0	5



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

FIGURE NARRATIVE

THIS FIGURE SHOWS THE INTERPRETED COBALT ISOCONCENTRATION CONTOURS WITHIN 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 INTERPRETED DISTRIBUTION OF COBALT IN GROUNDWATER ON THE BASIS OF THE DATA PLOTTED. THE DISTRIBUTION IS LIKELY MORE HETEROGENEOUS THAN SHOWN, AND THE ACTUAL CONDITIONS WILL VARY. ALL INTERPRETATIONS ARE SUBJECT TO CHANGE AS DISTRIBUTION IS 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. BASEMAP LAYER SERVICES SOURCED FROM: IMAGE_SERVICE: ESRI USA10 GEOGRAPHICS, ESRI SWITZERLAND, ESRI, USGS, ESRI GERMANY, ESRI, AND ESRI, DELORME 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

DESIGNED	CMJ
PREPARED	JWJ
REVIEWED	DMJ
APPROVED	AMH

PROJECTION: 20447130 | REVISION: A | REV: 0 | FIGURE: 6

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:

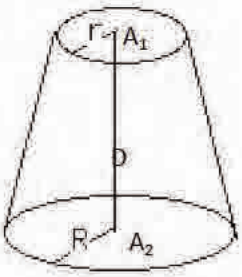
The volume is estimated by the volume with boron concentrations greater than 4 mg/L.
Plume areas are calculated based on the 4 mg/L contours displayed on Figure 6 and Figure 7.

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	7/6/2016	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

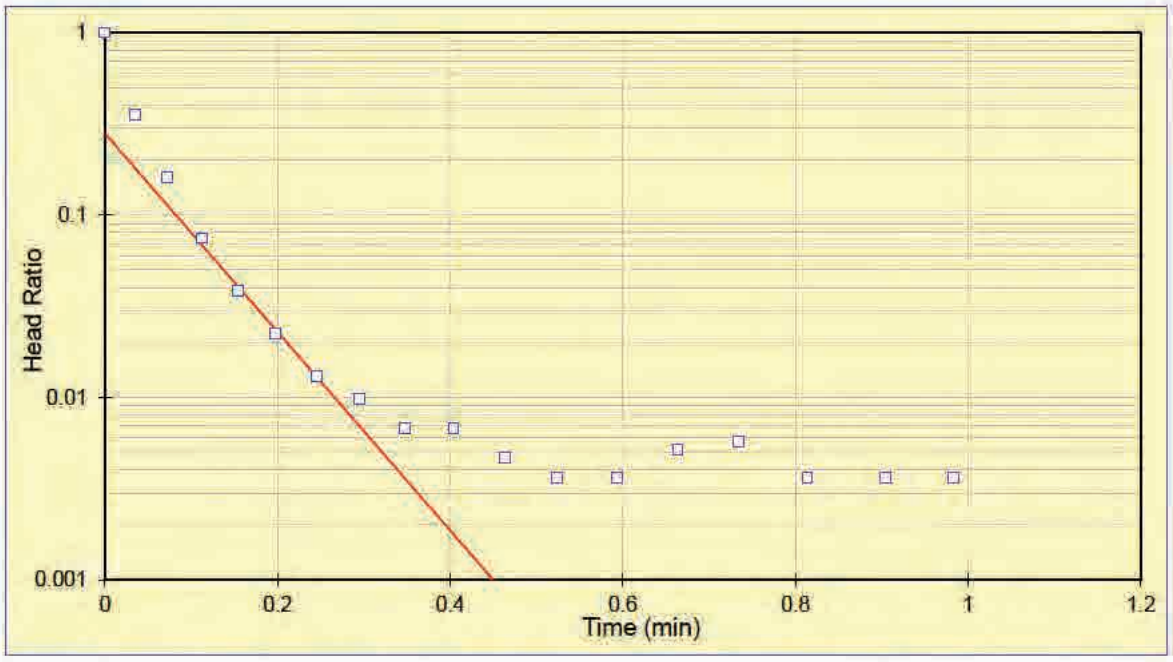
Prepared by: DFS
Checked by: KMC
Reviewed by: MAH

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

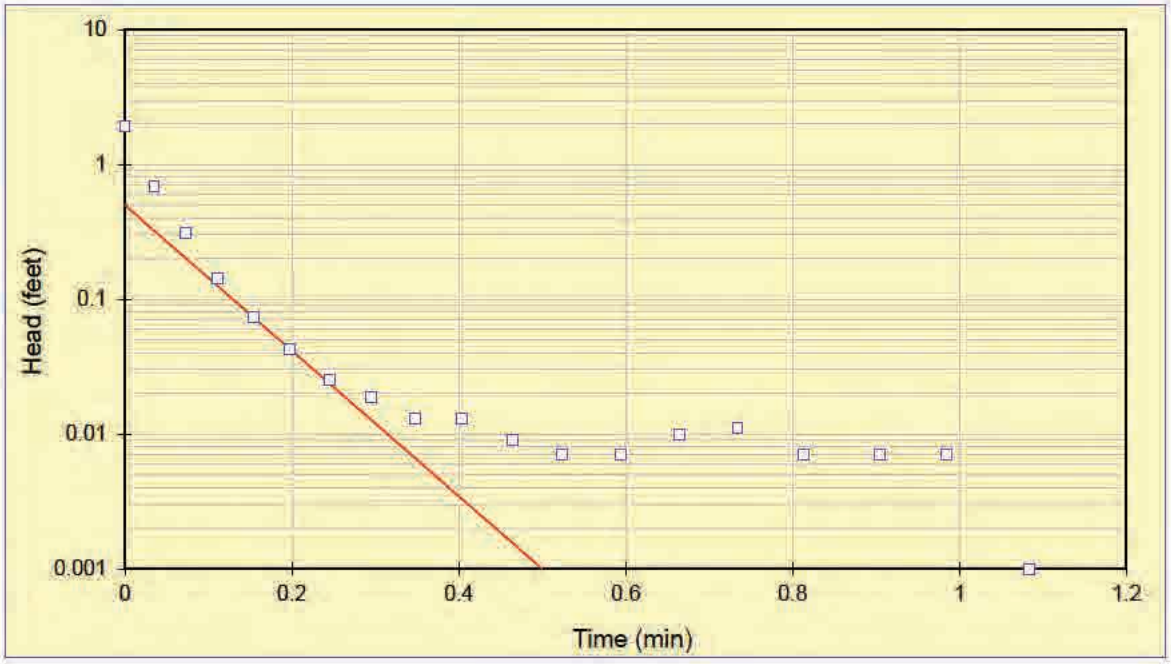
where:

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

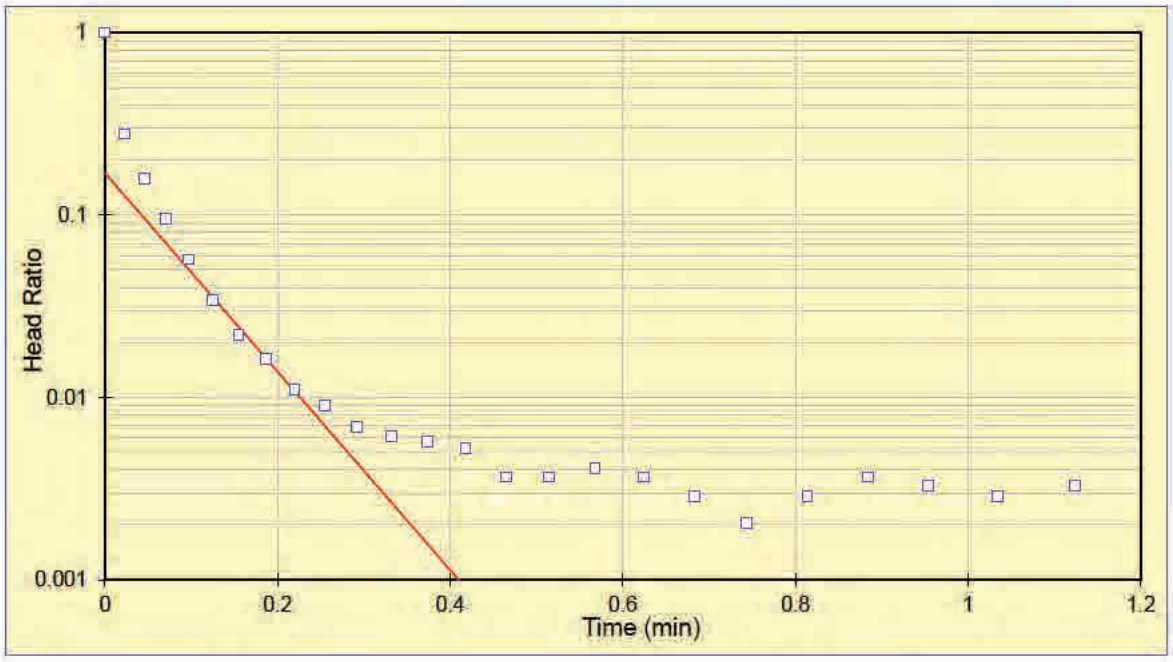
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

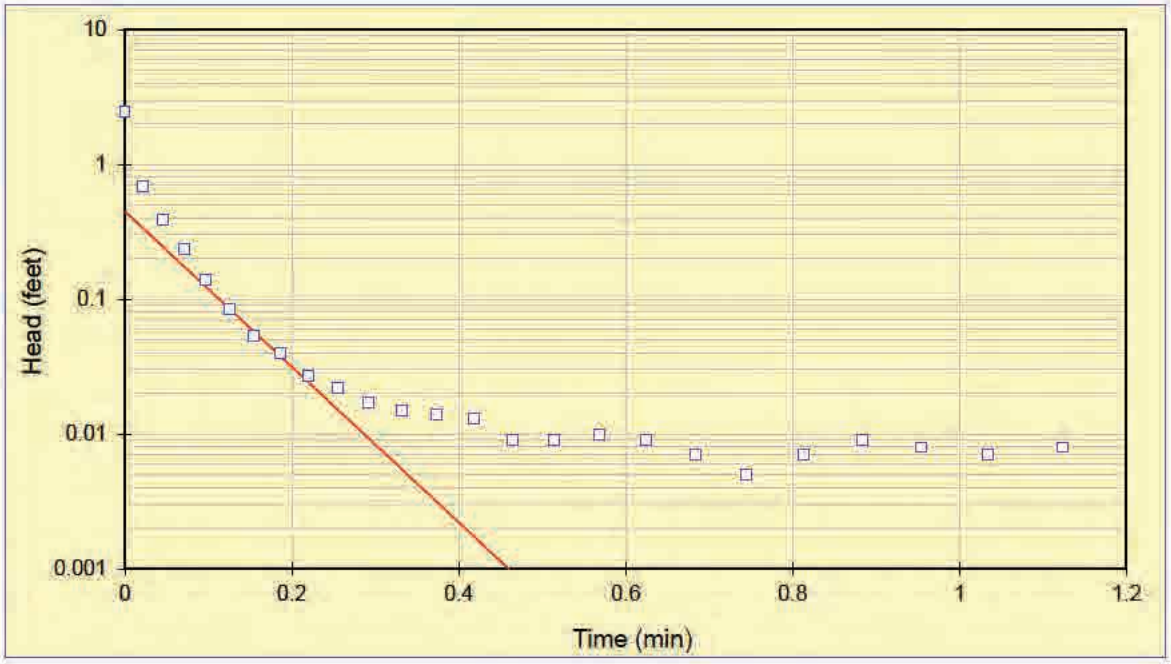
where:

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

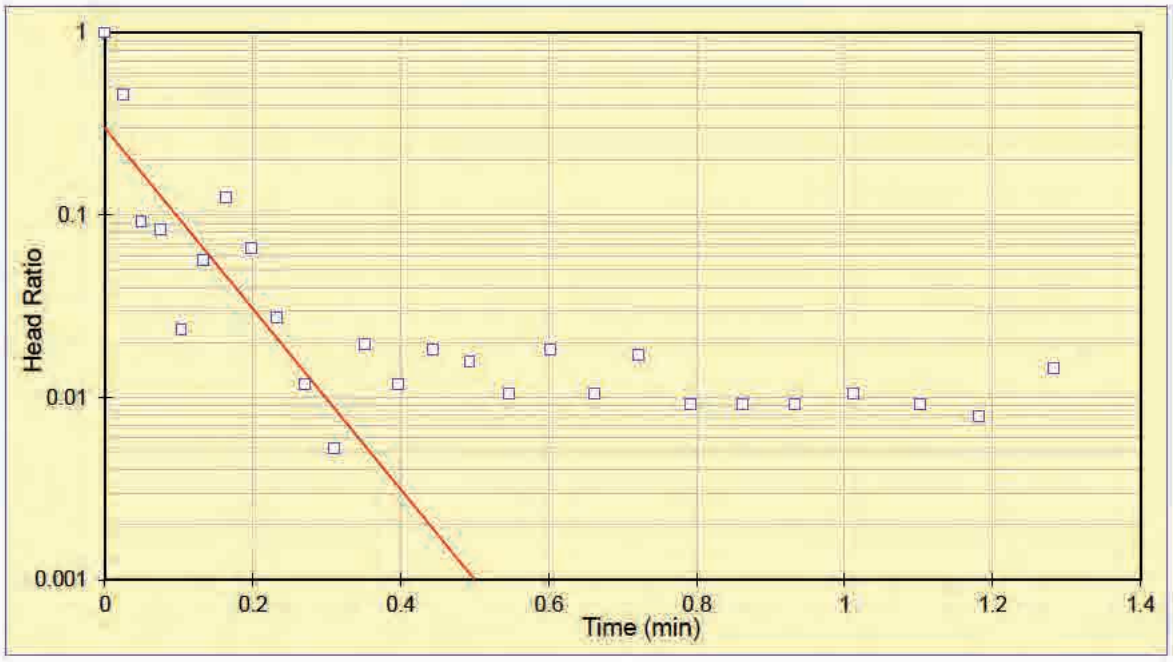
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

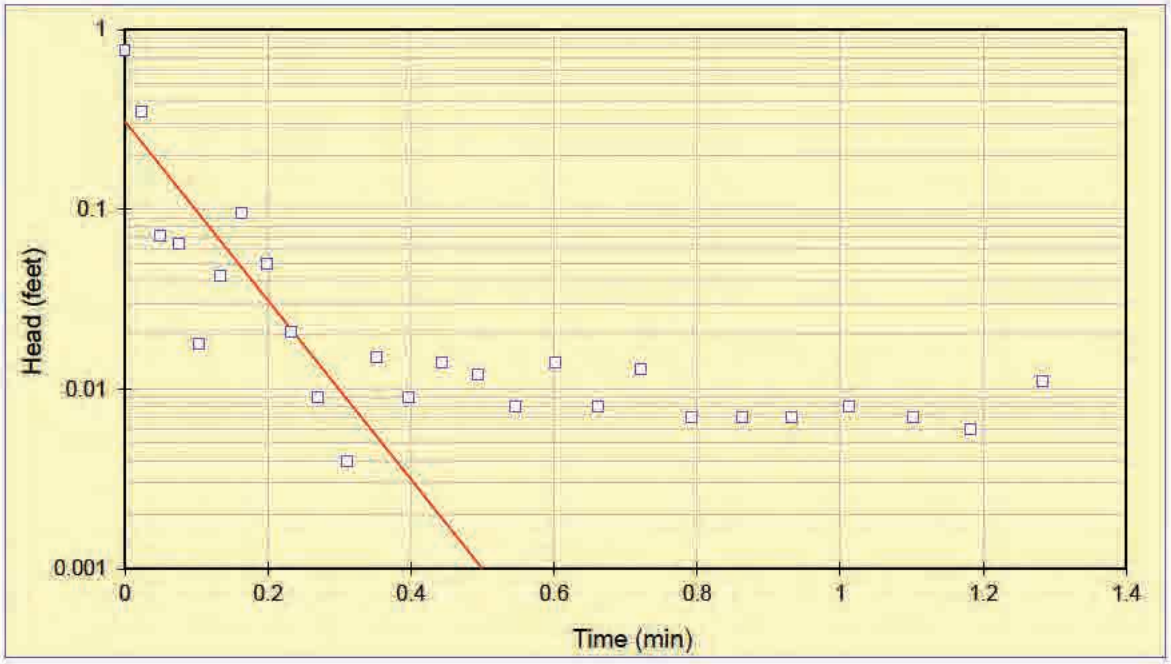
where:

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

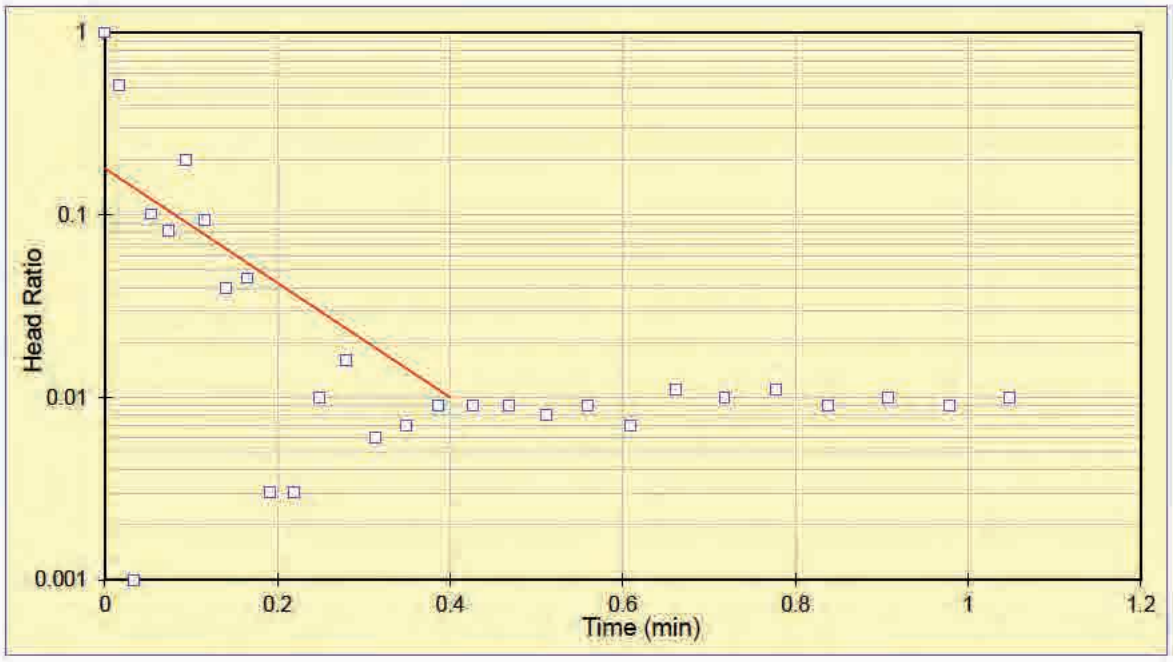
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

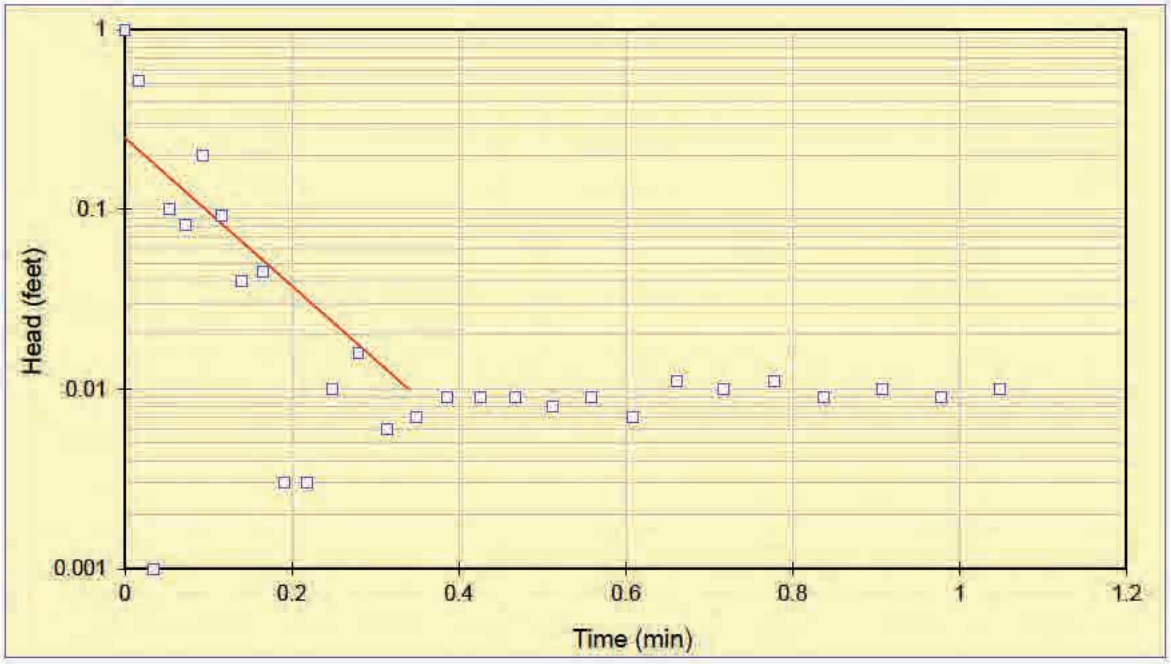
where:

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

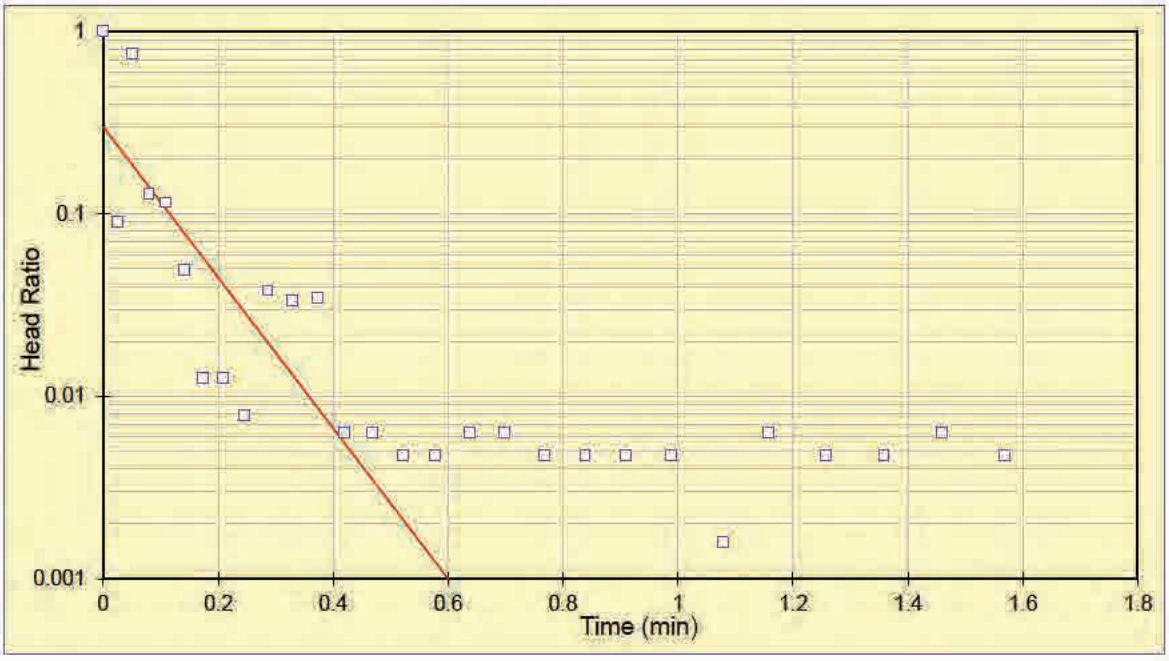
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

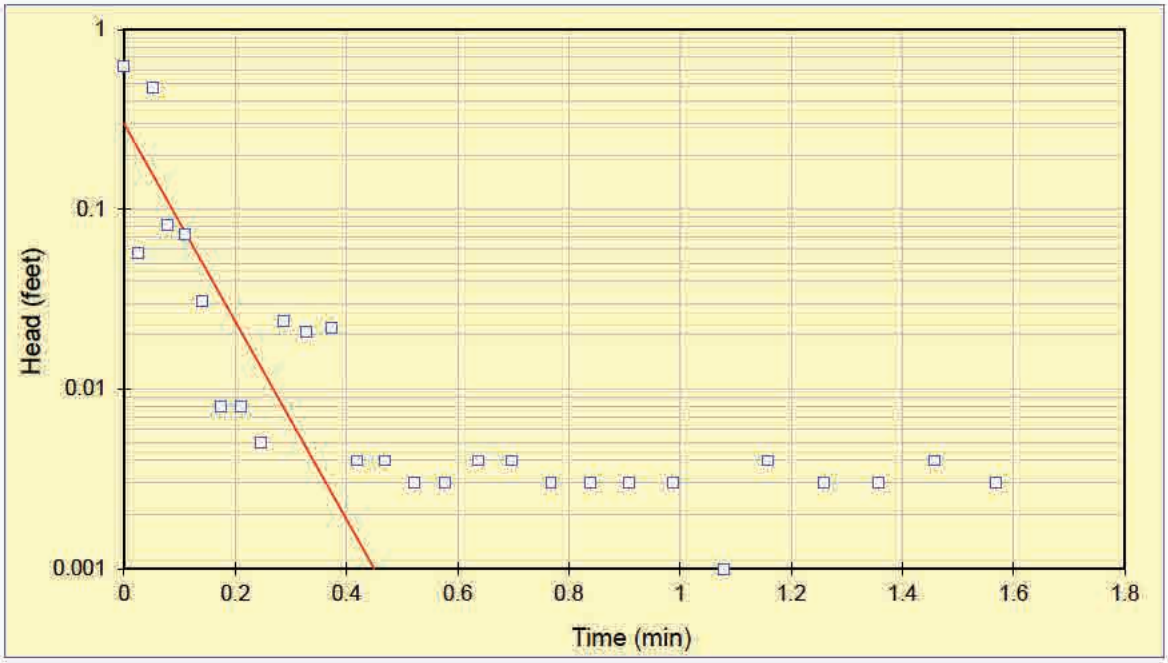
where:

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:

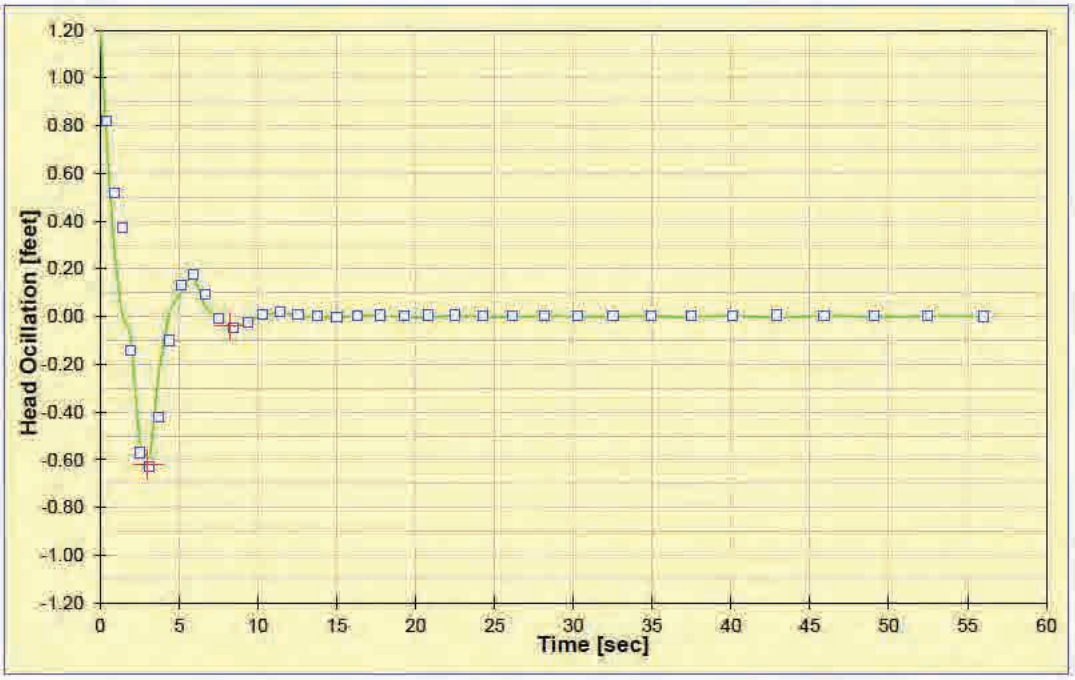
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/(\omega^2 + \gamma^2)$$

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

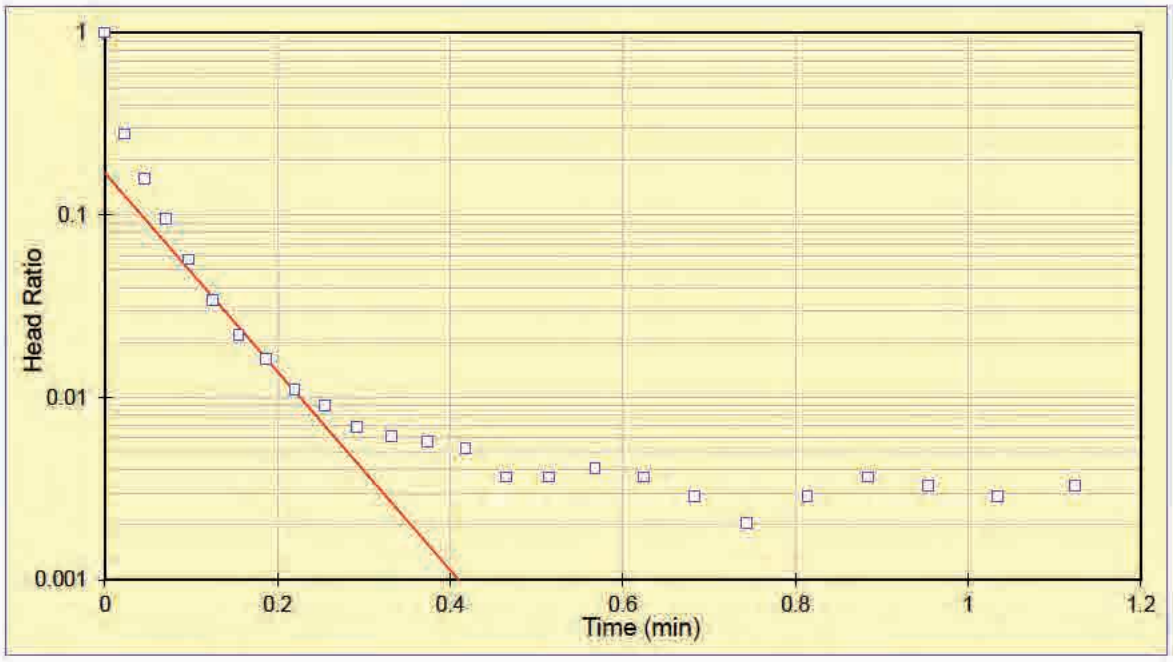
Analysis By: DFS
Checked By: JRS
Analysis Date: 8/8/2016

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

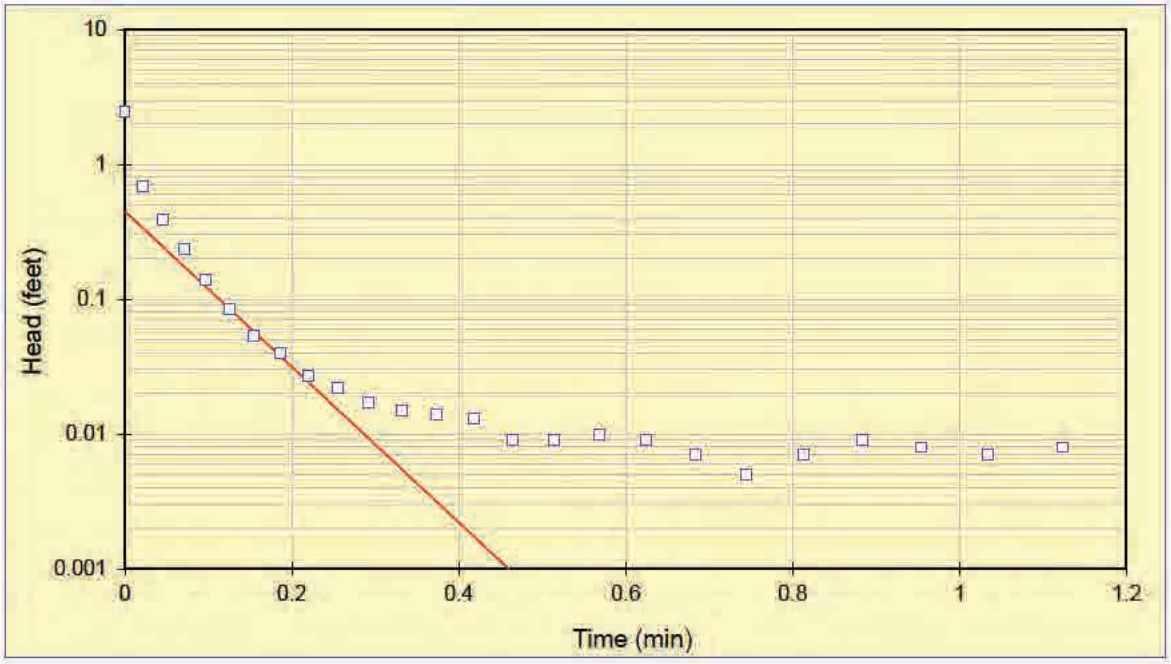
where:

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

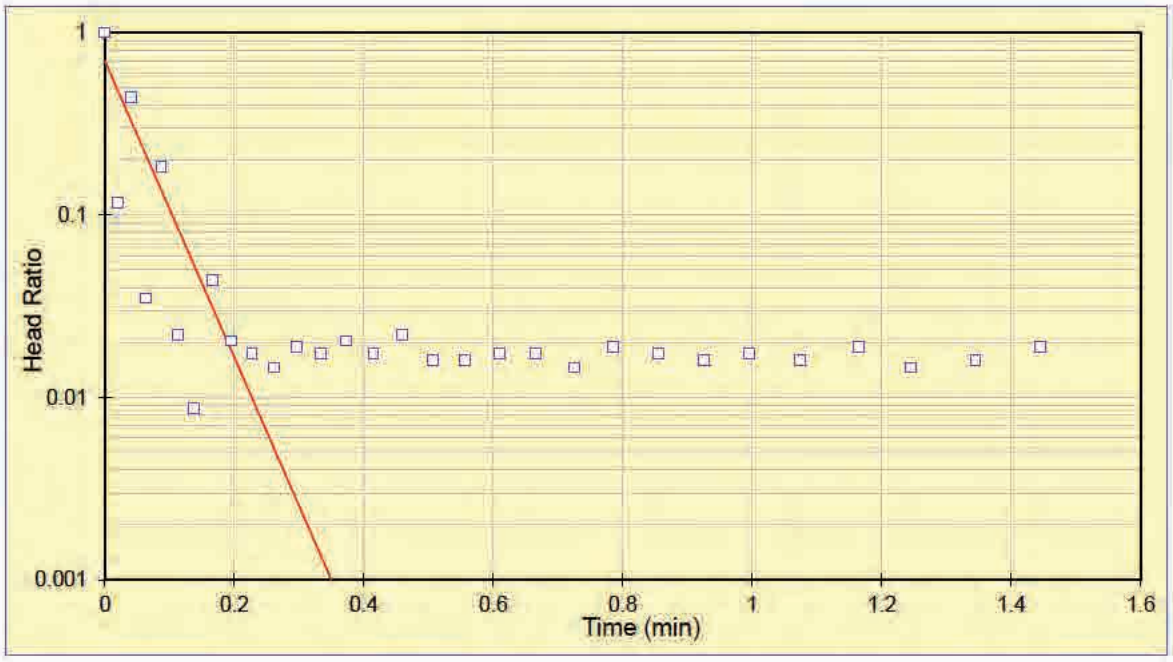
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.11E-02	cm/sec
t_1 =	0	K=	3.15E+01	ft/day
t_2 =	0.35			
h_1/h_0 =	0.70			
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-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

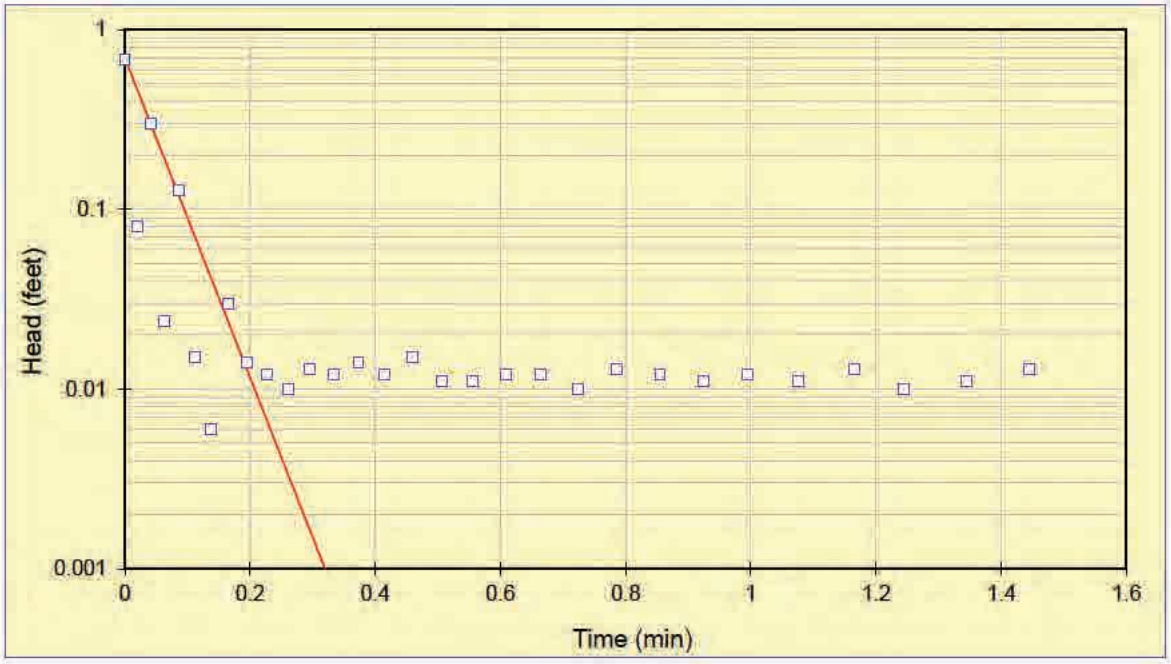
where:

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
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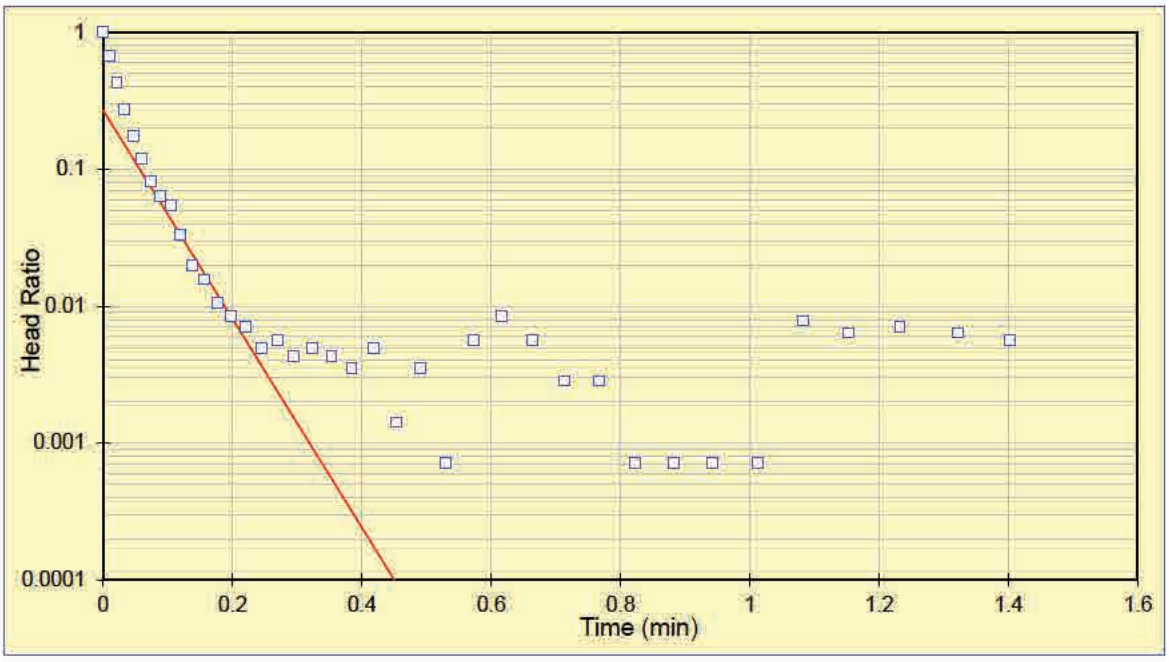
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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			



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Analysis By: DFS
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BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

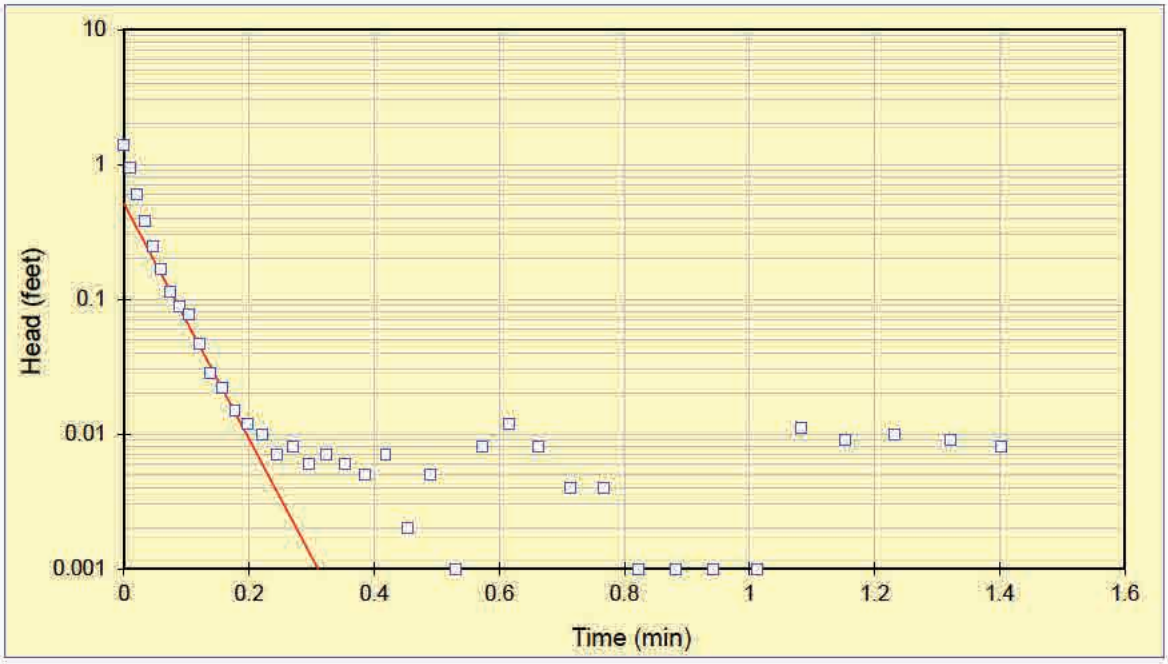
where:

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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Test Date: 07/07/16

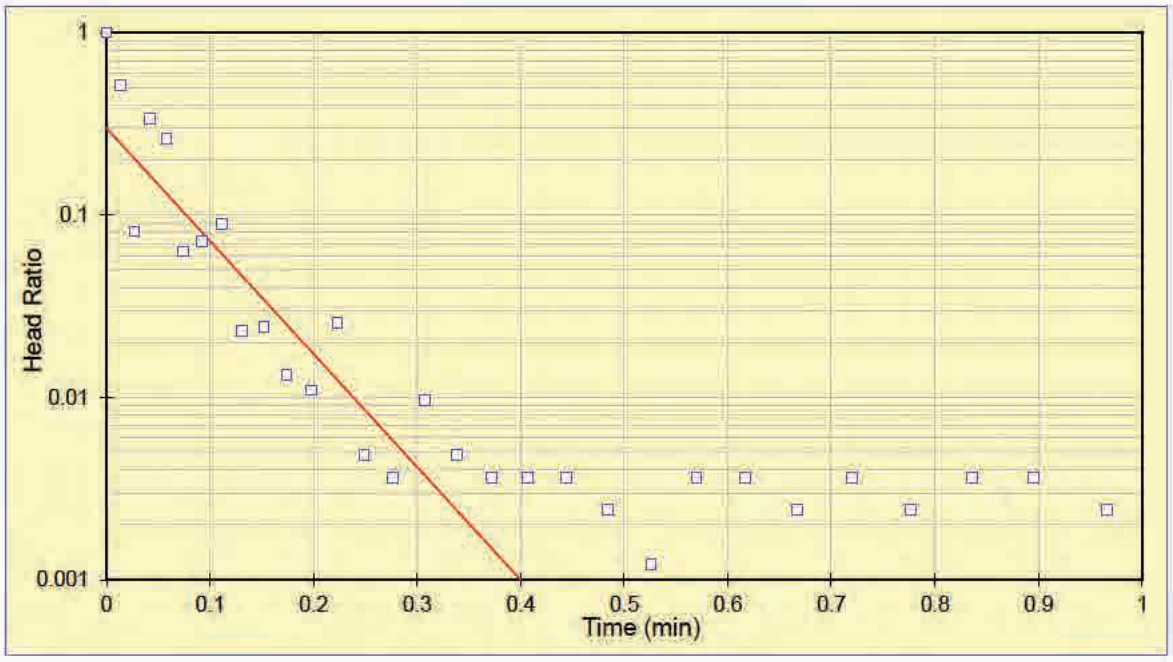
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

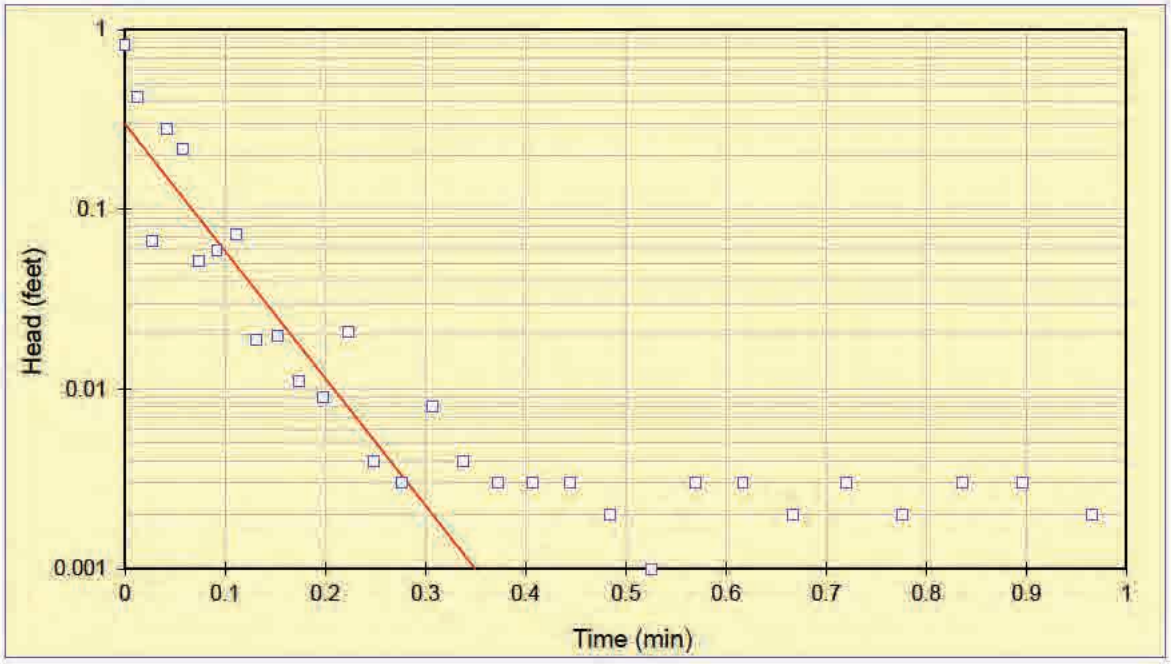
where:

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

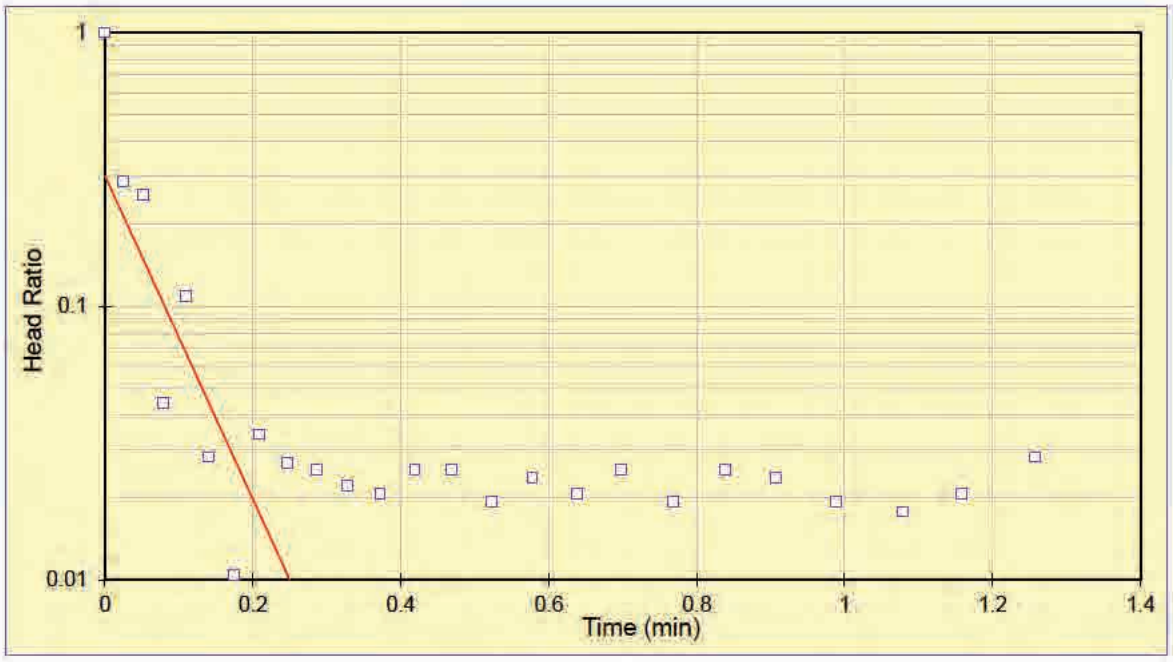
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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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BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

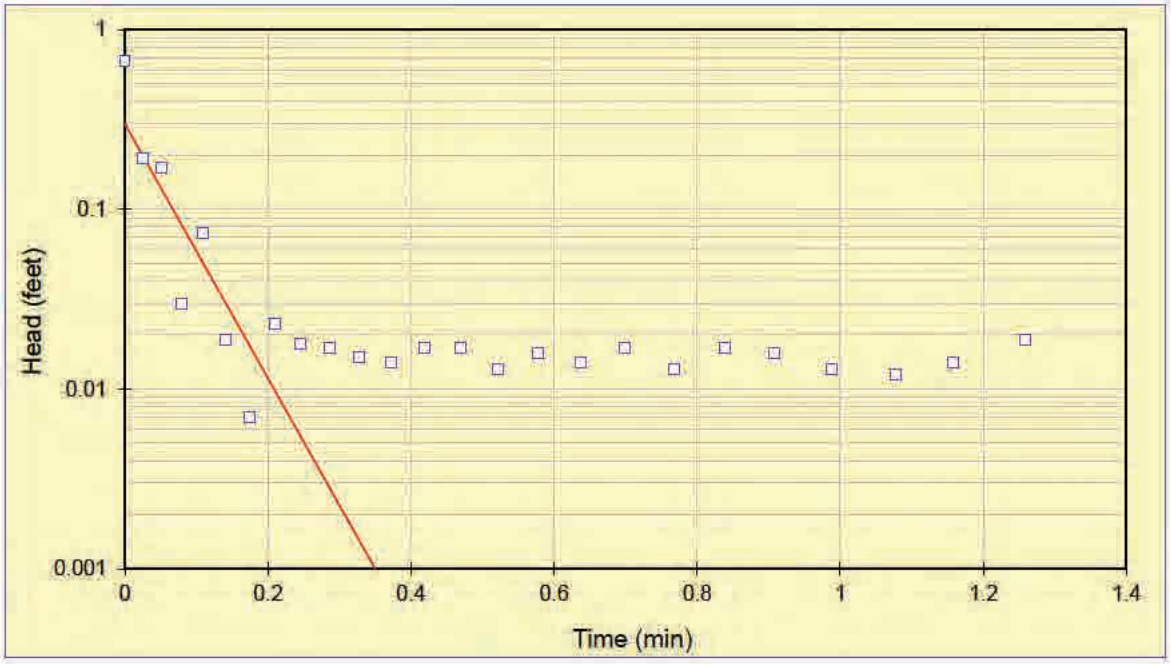
where:

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:

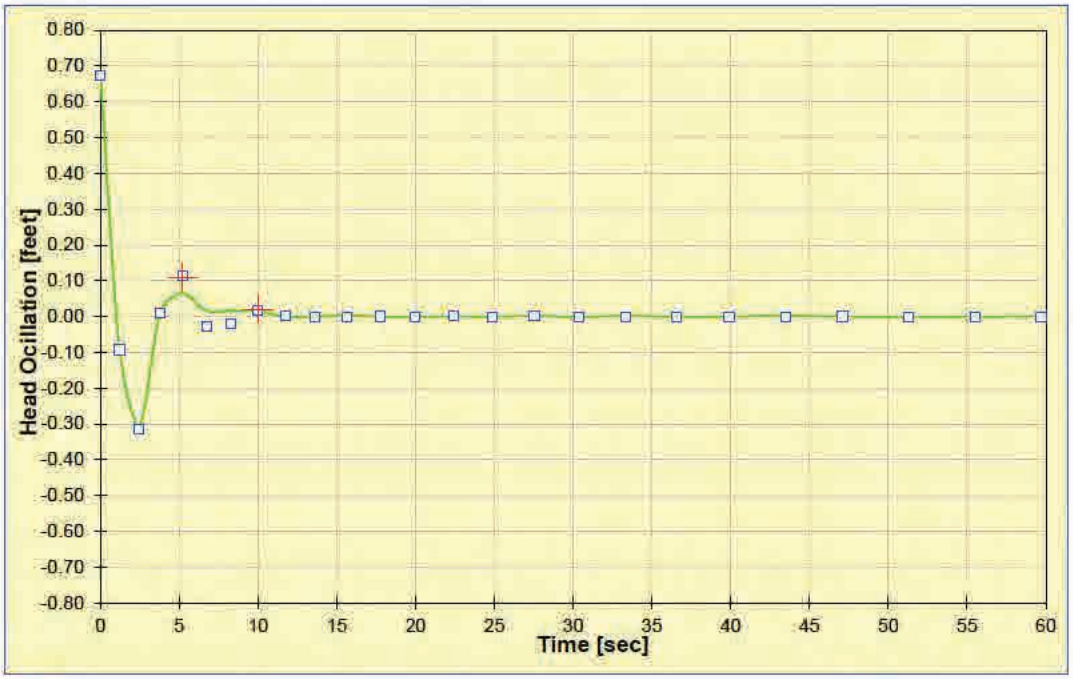
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma/(g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

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

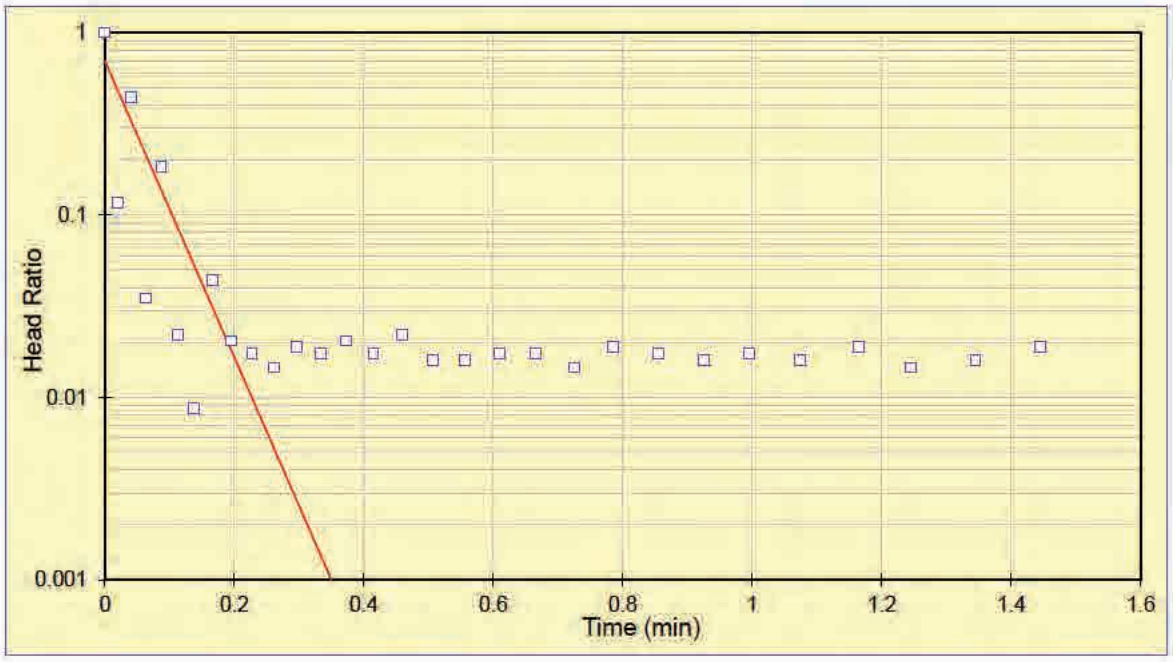
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

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		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.11E-02	cm/sec
t_1 =	0	K=	3.15E+01	ft/day
t_2 =	0.35			
h_1/h_0 =	0.70			
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 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

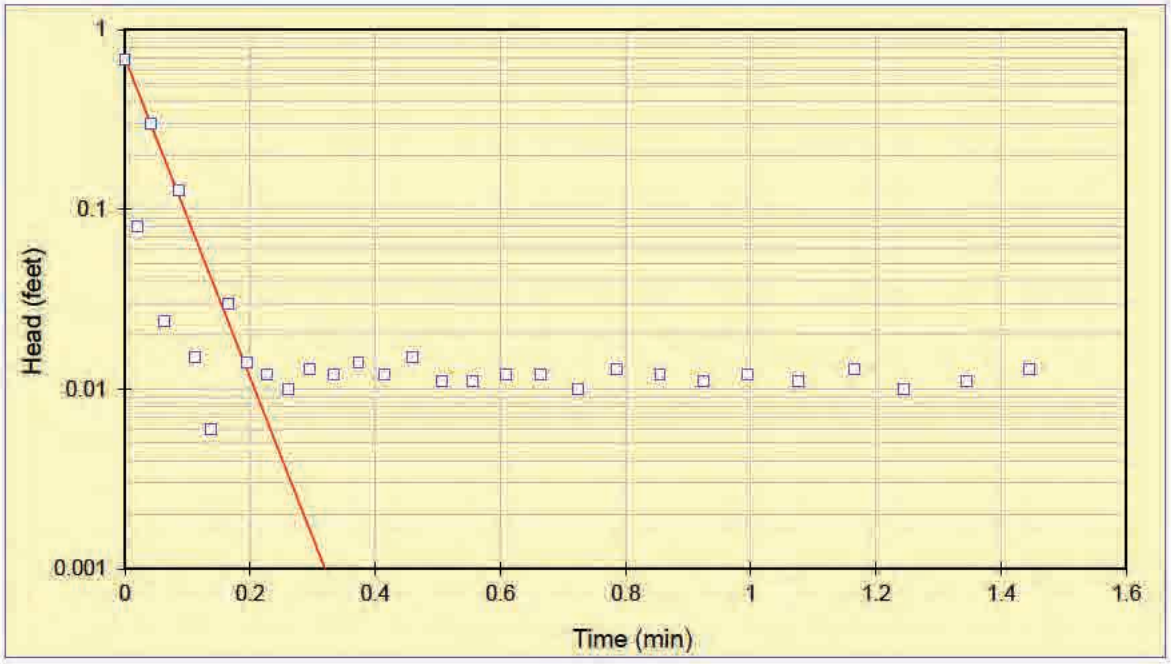
where:

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:

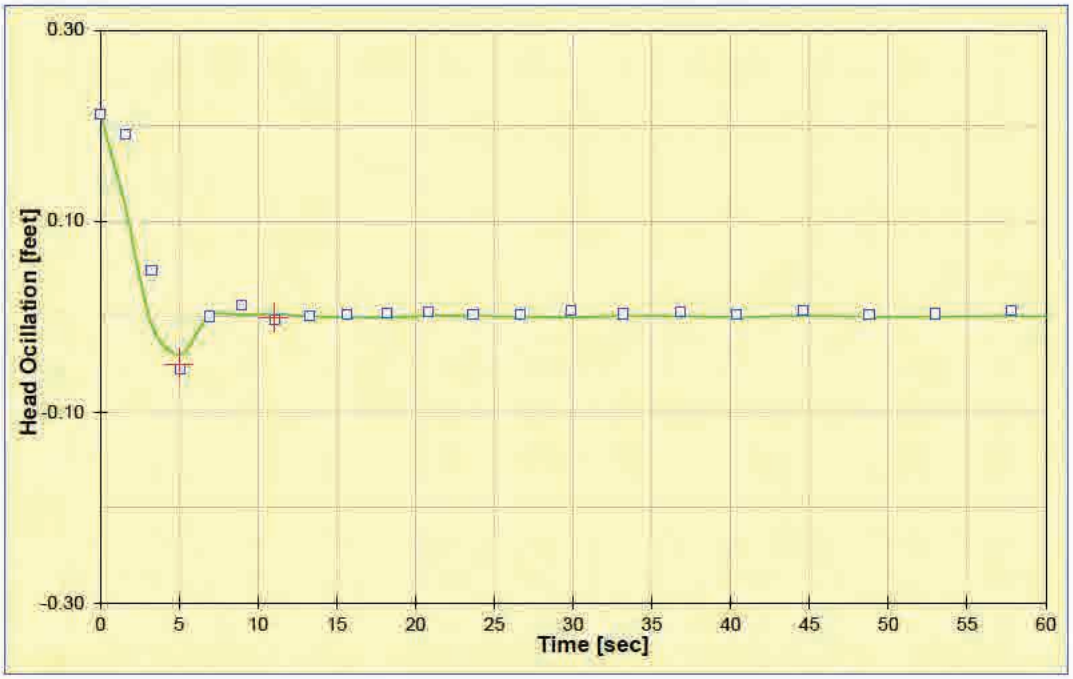
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

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

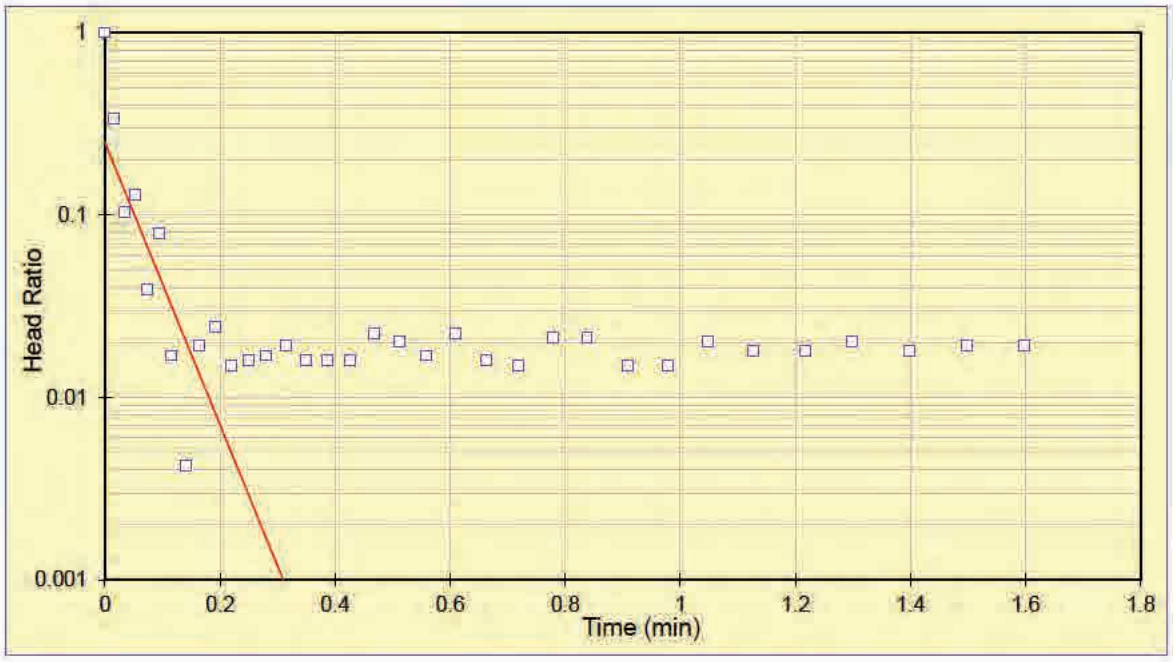
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

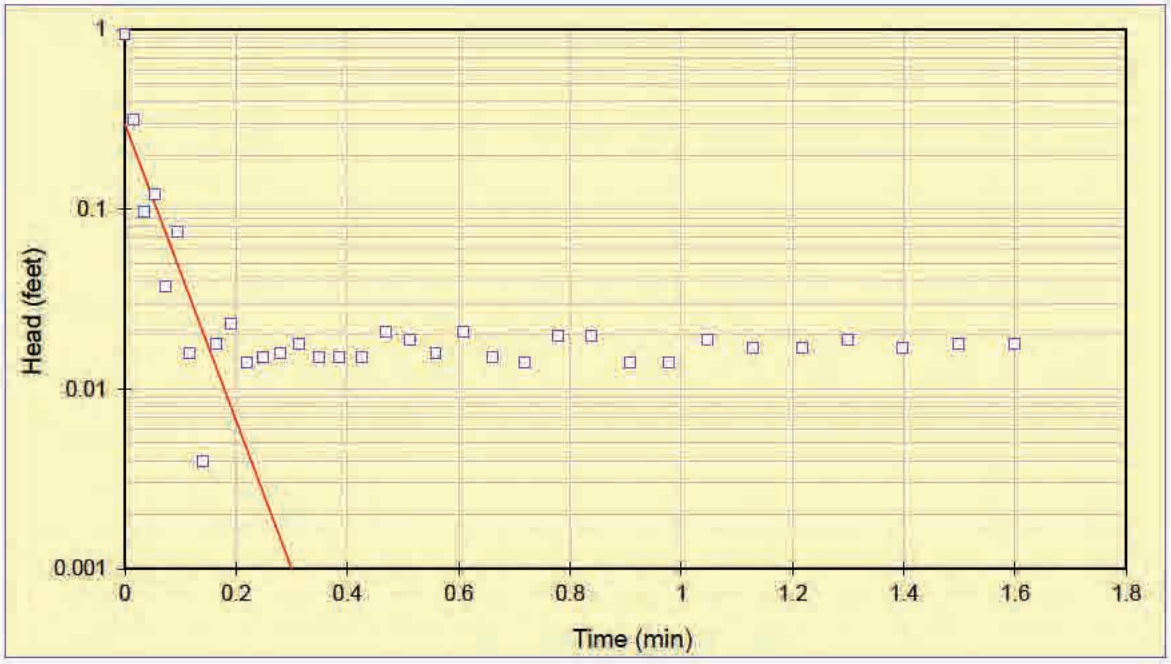
where:

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

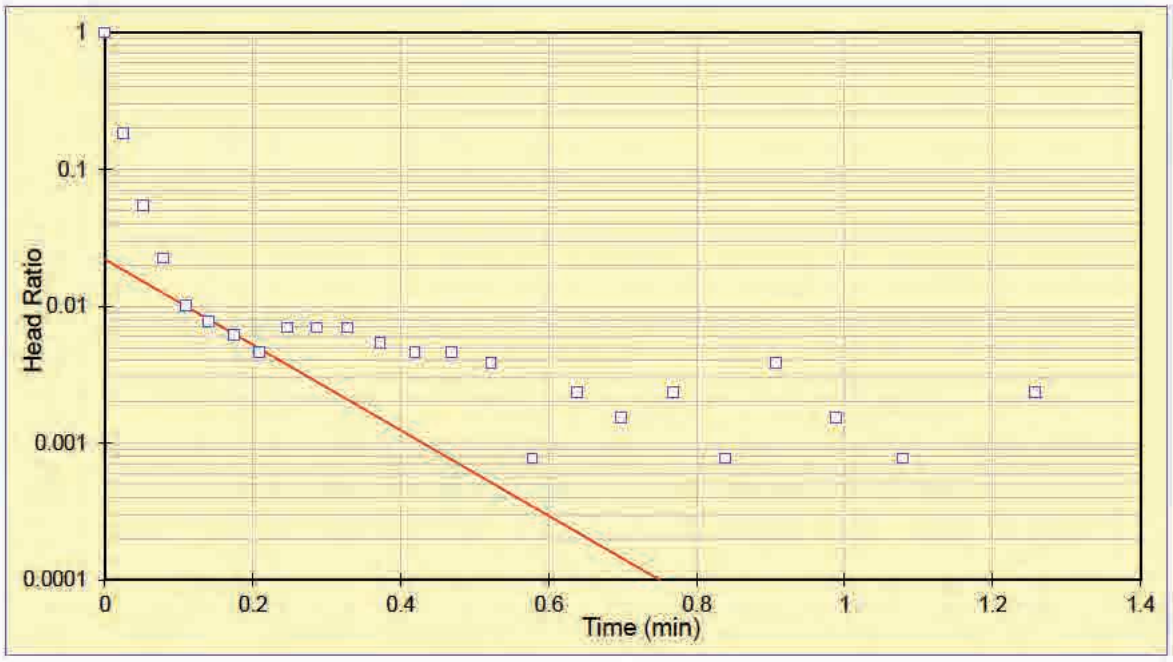
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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
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 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

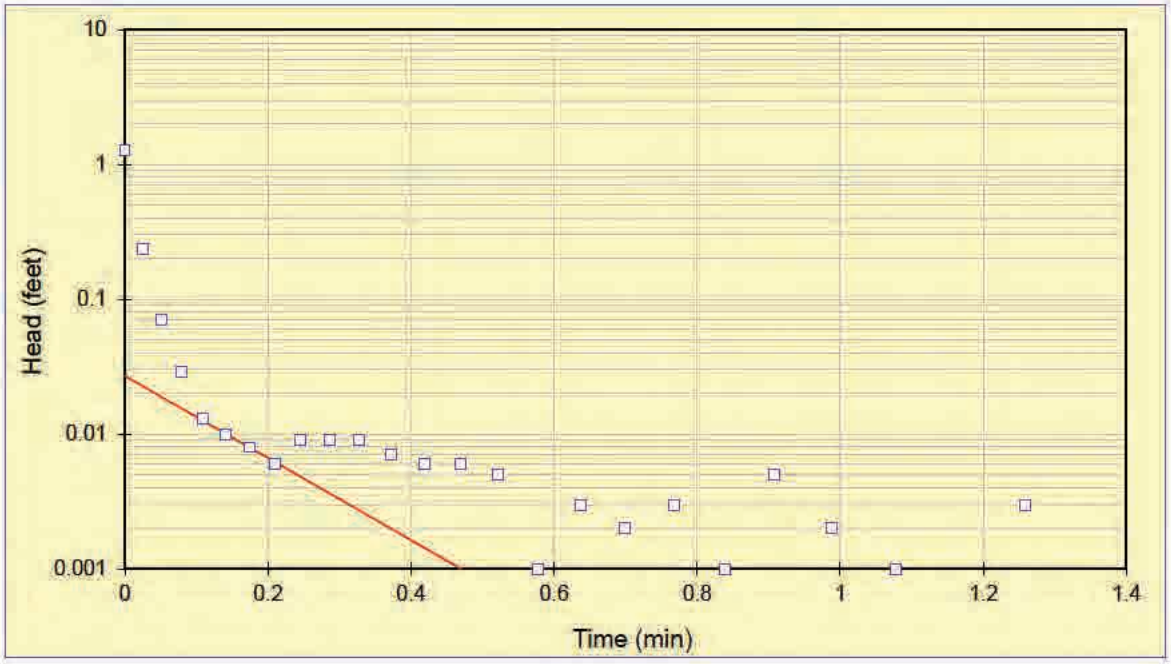
where:

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
Project No.: 164-8171
Test Date: 07/07/16

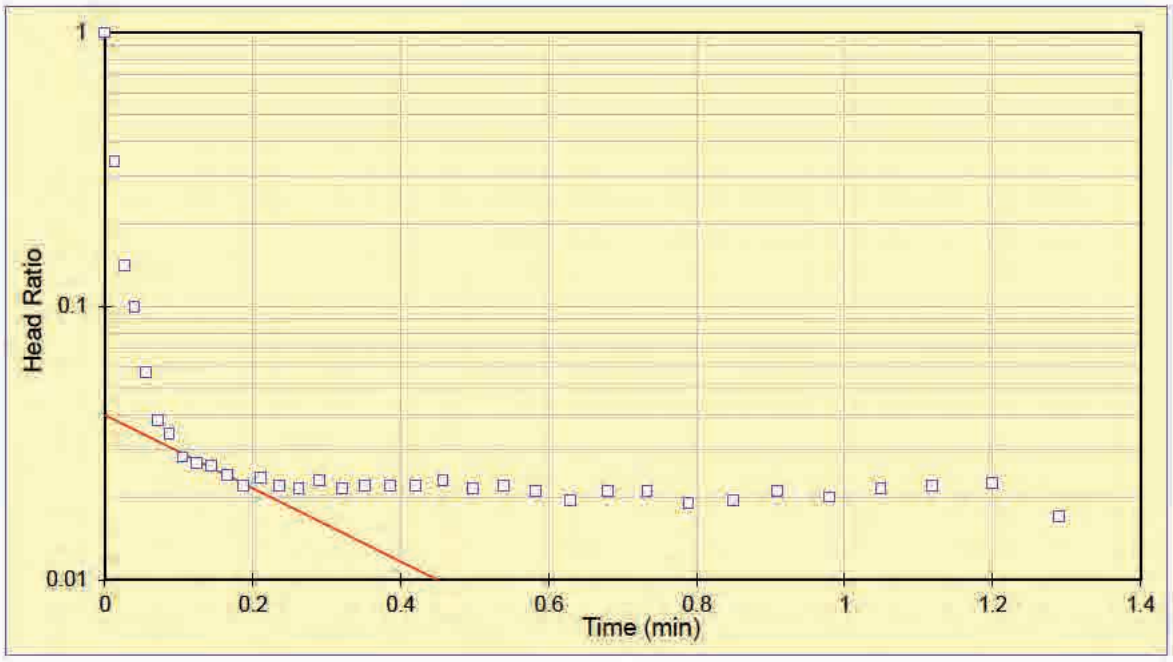
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15 (TEST 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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

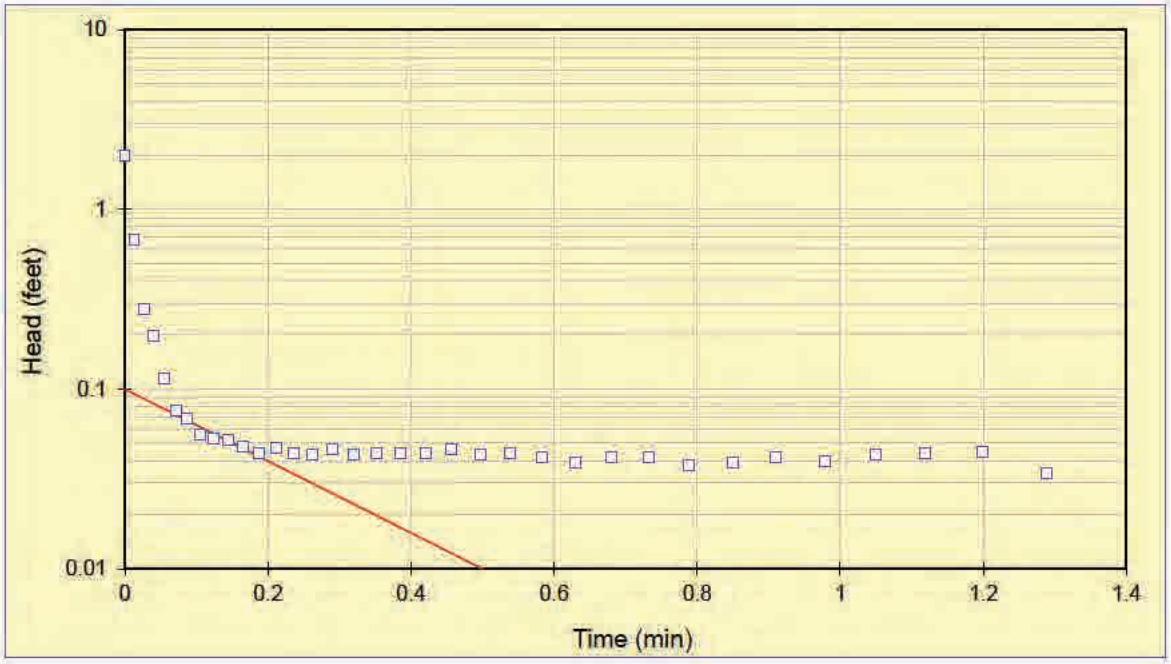
where:

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



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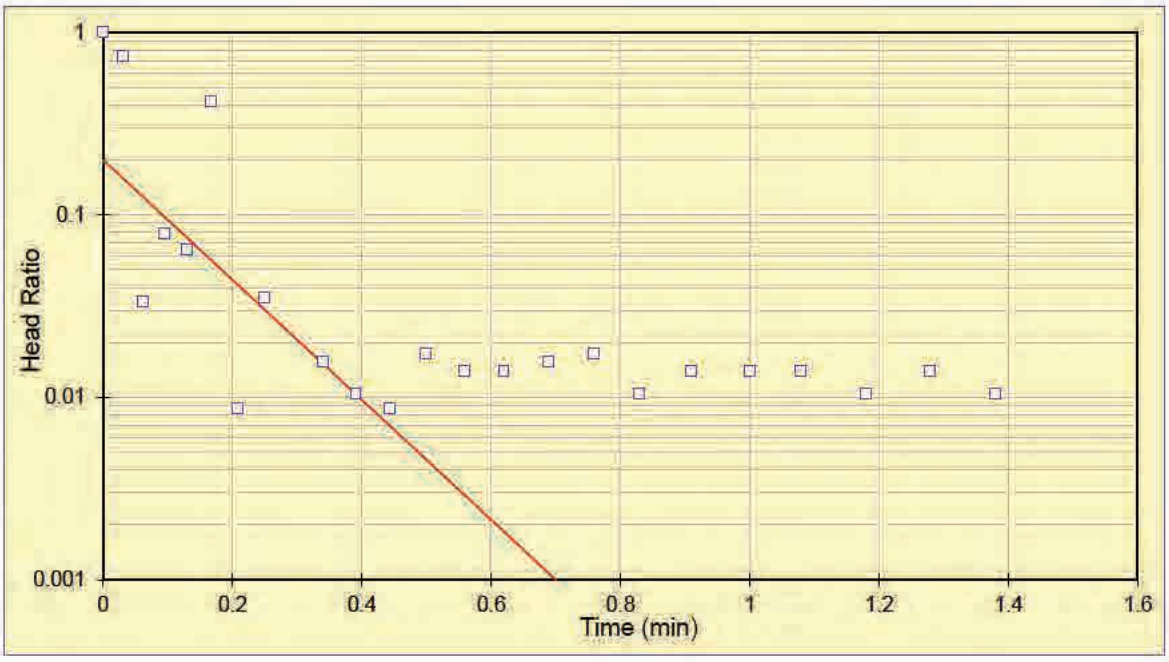
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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			



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BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

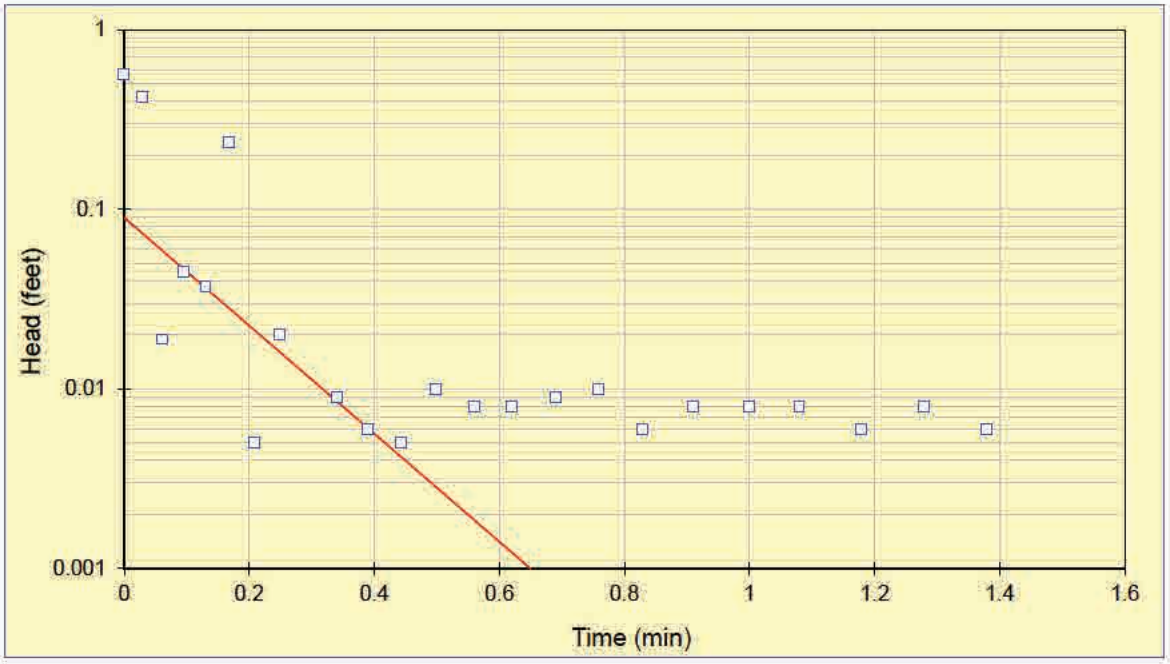
where:

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



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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:

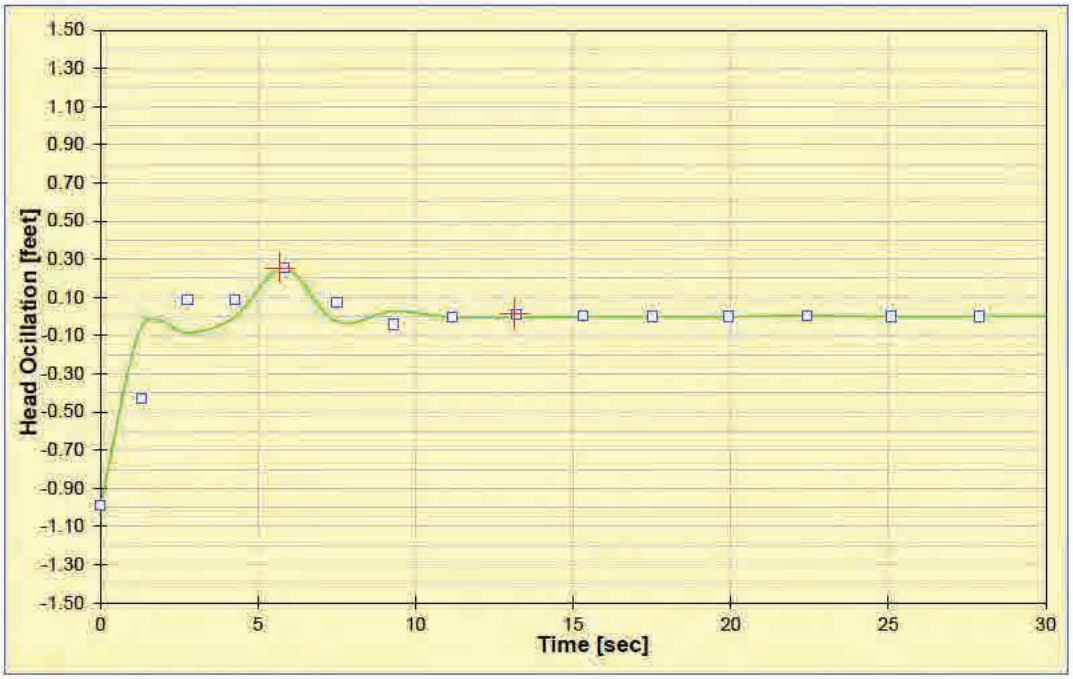
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma/(g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

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



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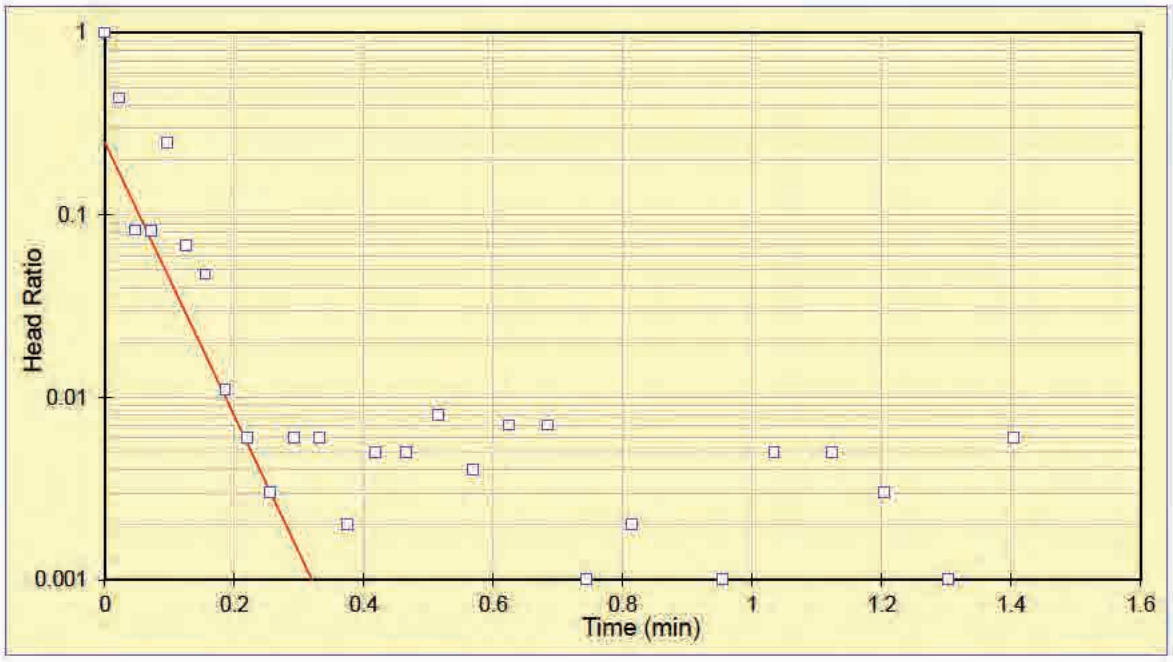
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

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			



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Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

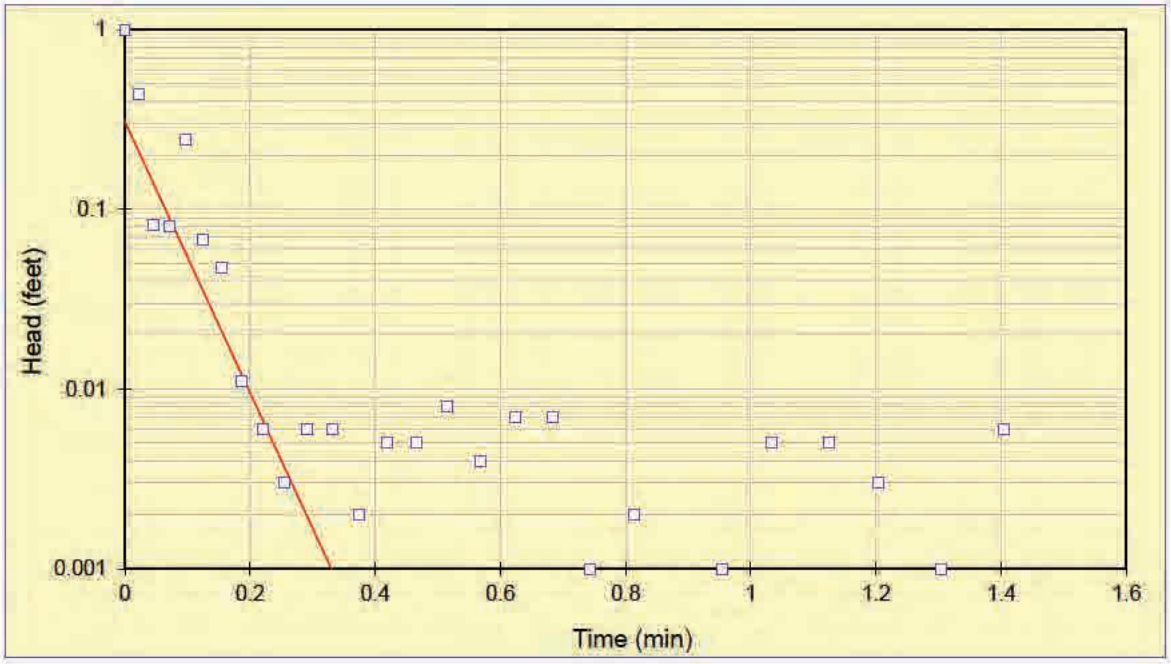
where:

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
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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:

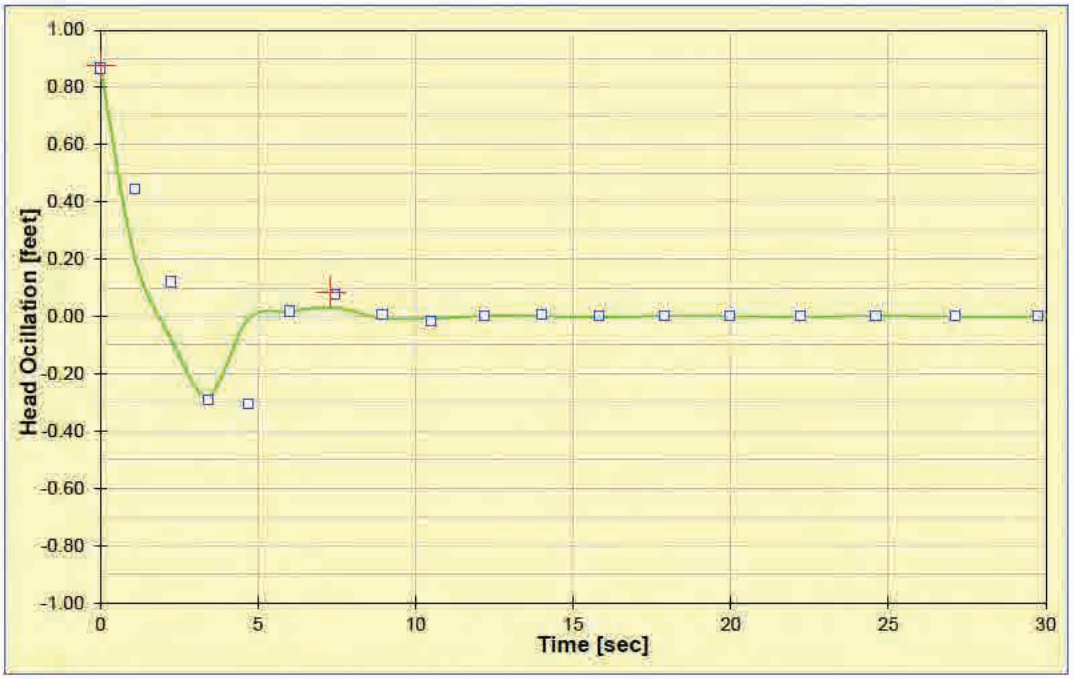
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

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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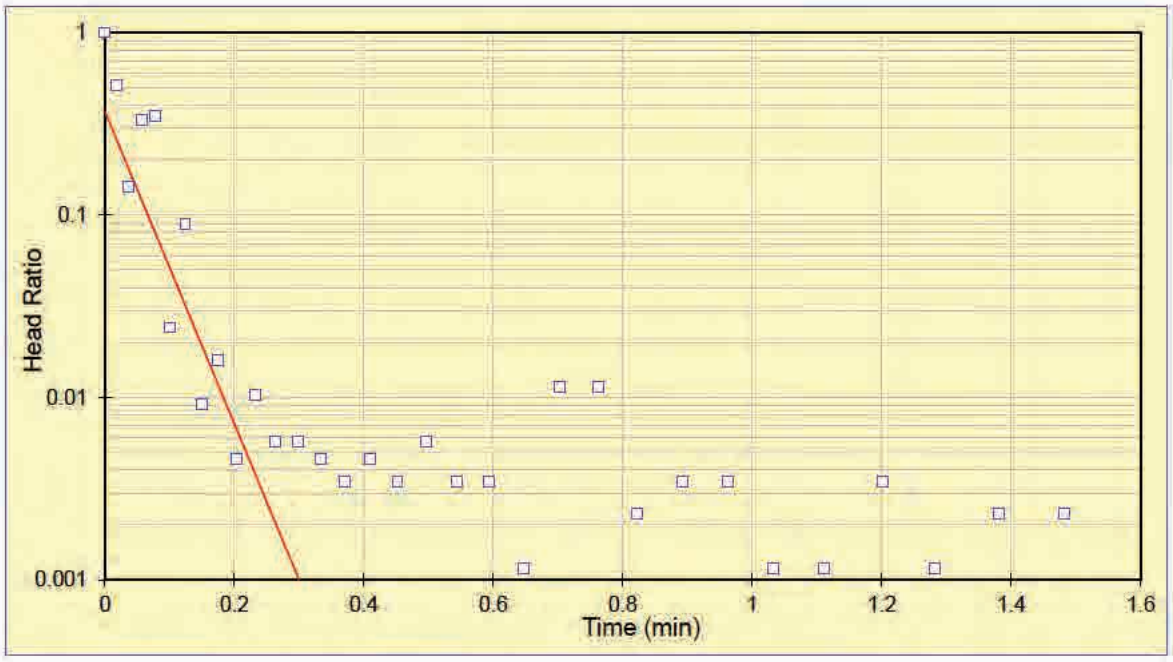
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

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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Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
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BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

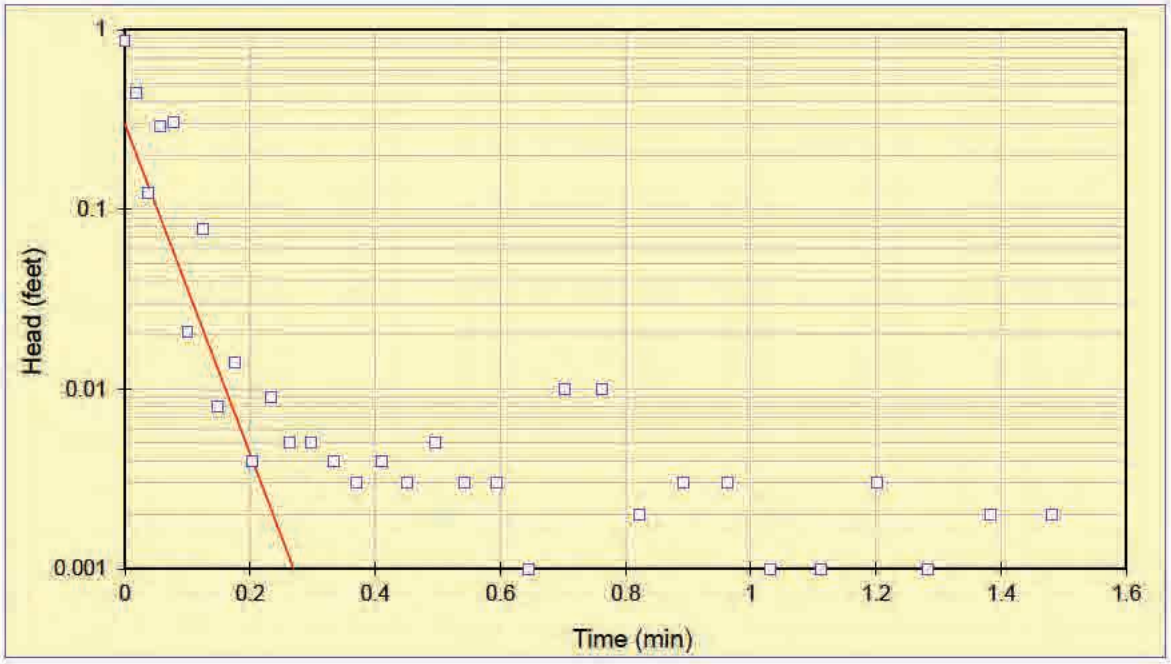
where:

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



Project Name: NIPSCO Schahfer
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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:

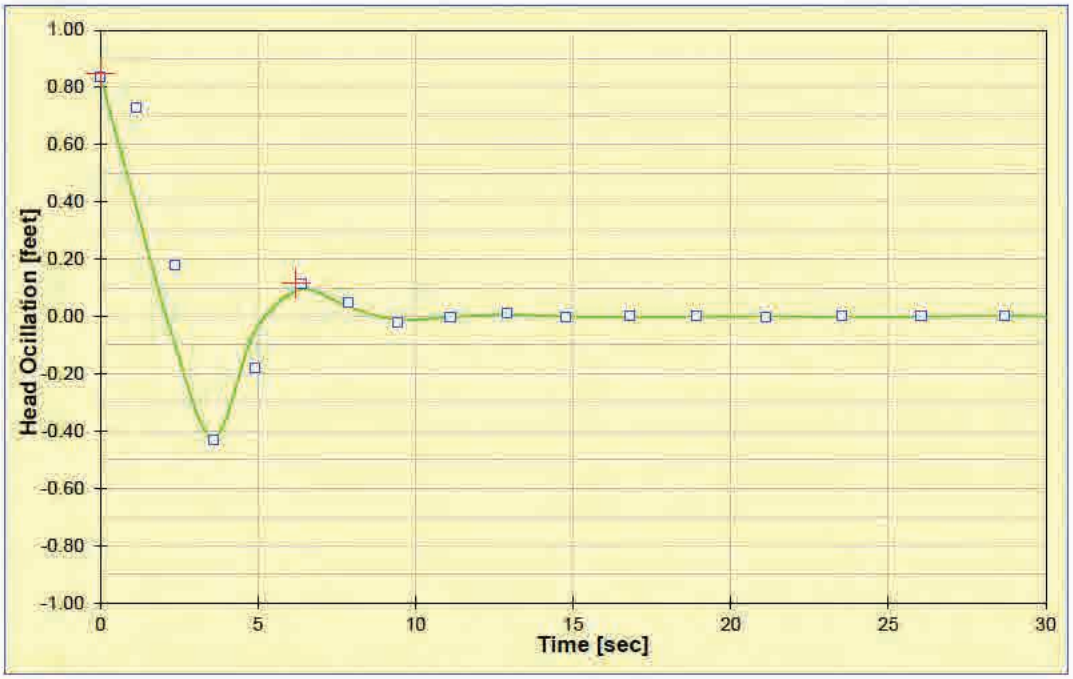
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma/(g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

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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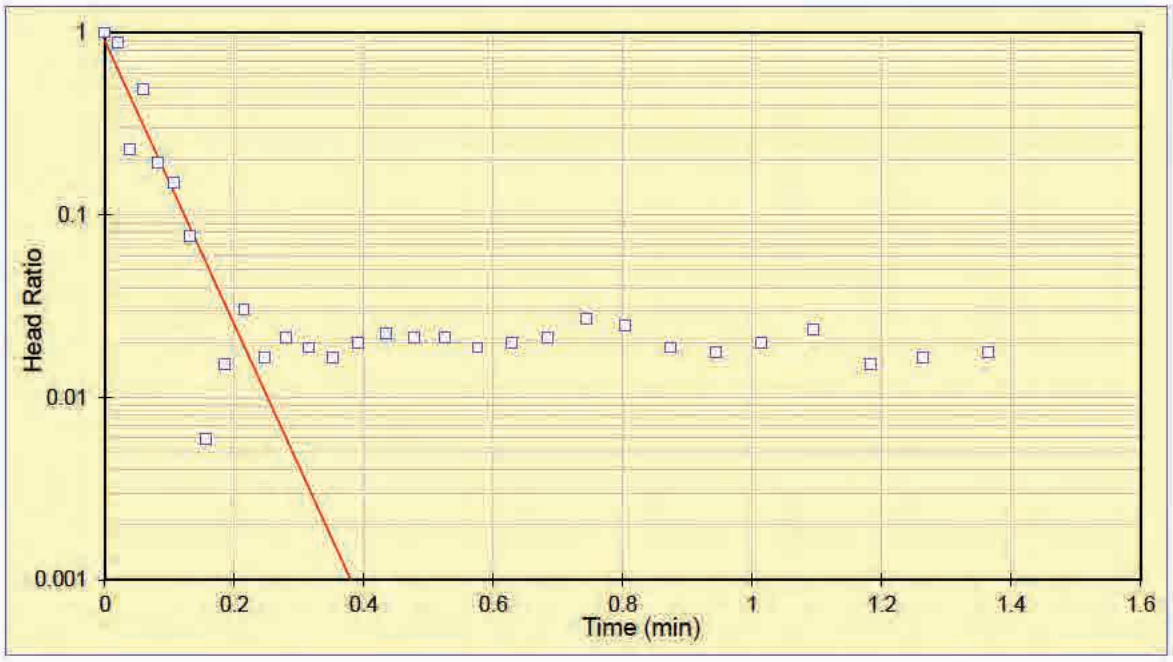
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

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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BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

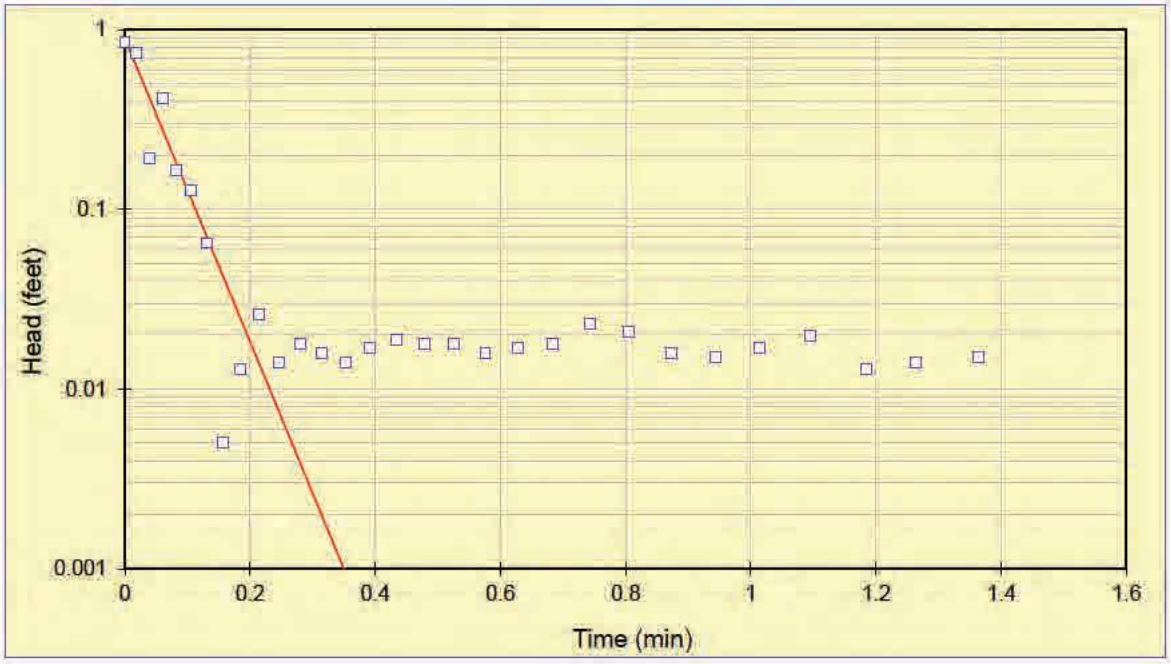
where:

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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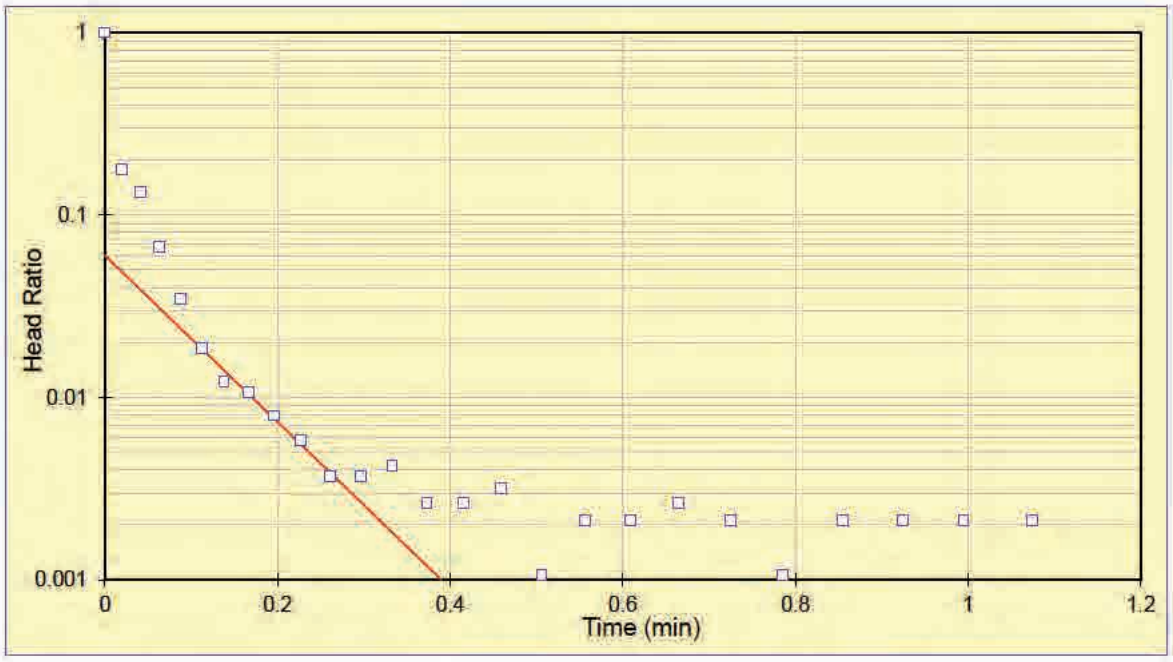
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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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Checked By: JRS
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BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19 (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

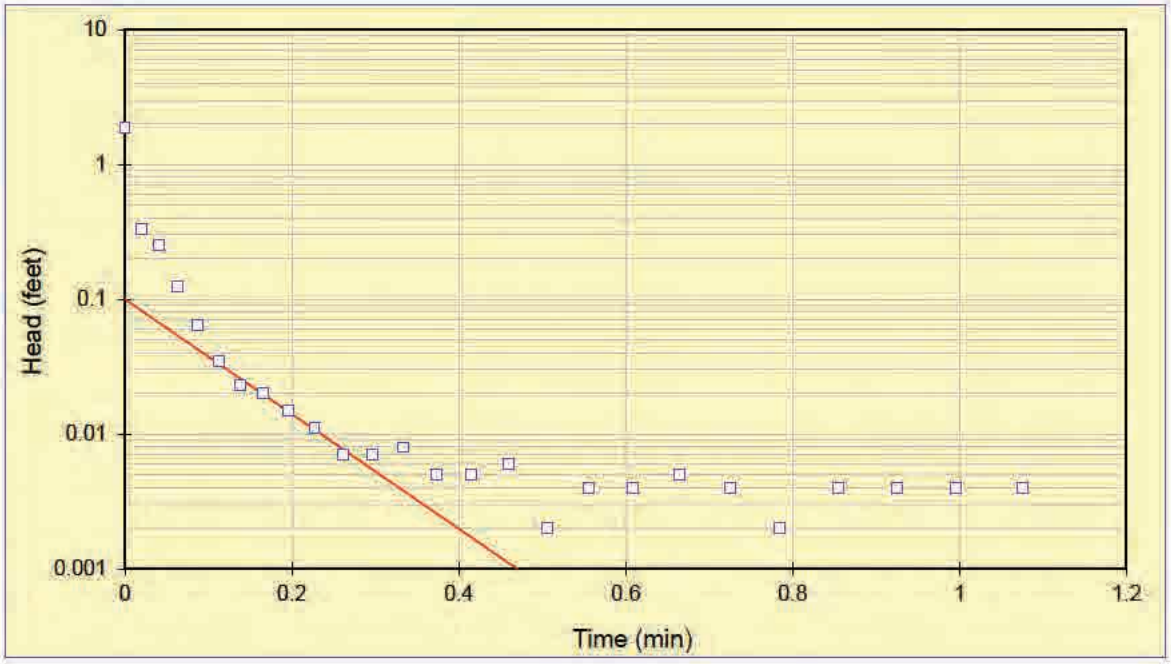
where:

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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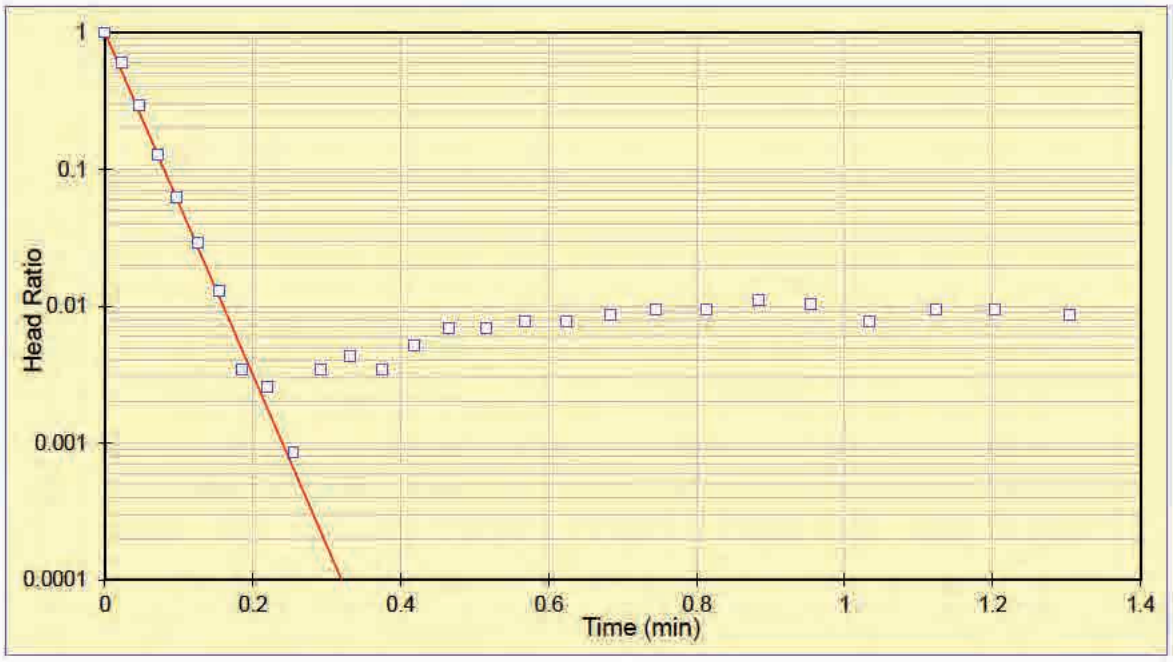
Analysis By: DFS
Checked By: JRS
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HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19 (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

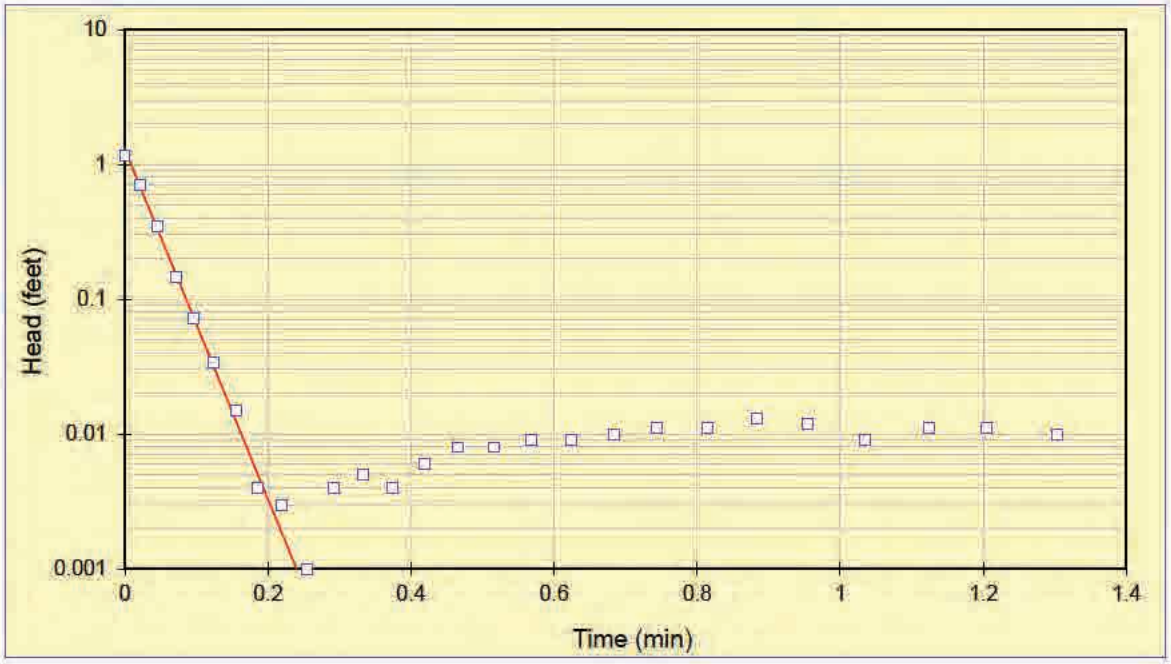
where:

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



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

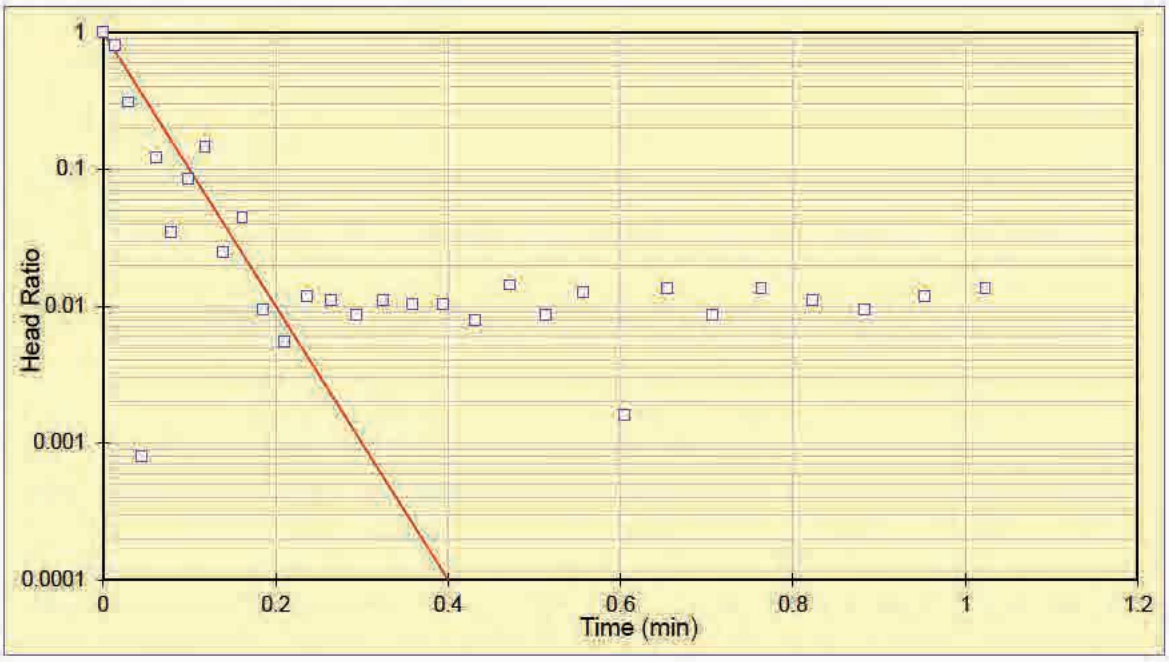
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-19B (TEST 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
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 1)

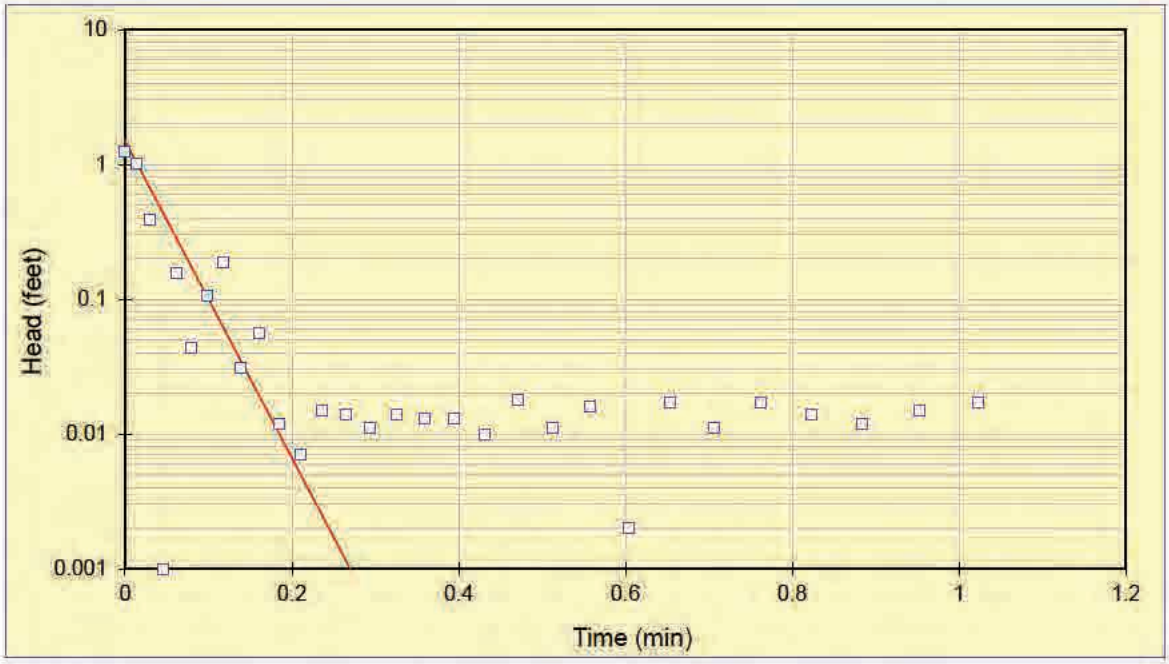
$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

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

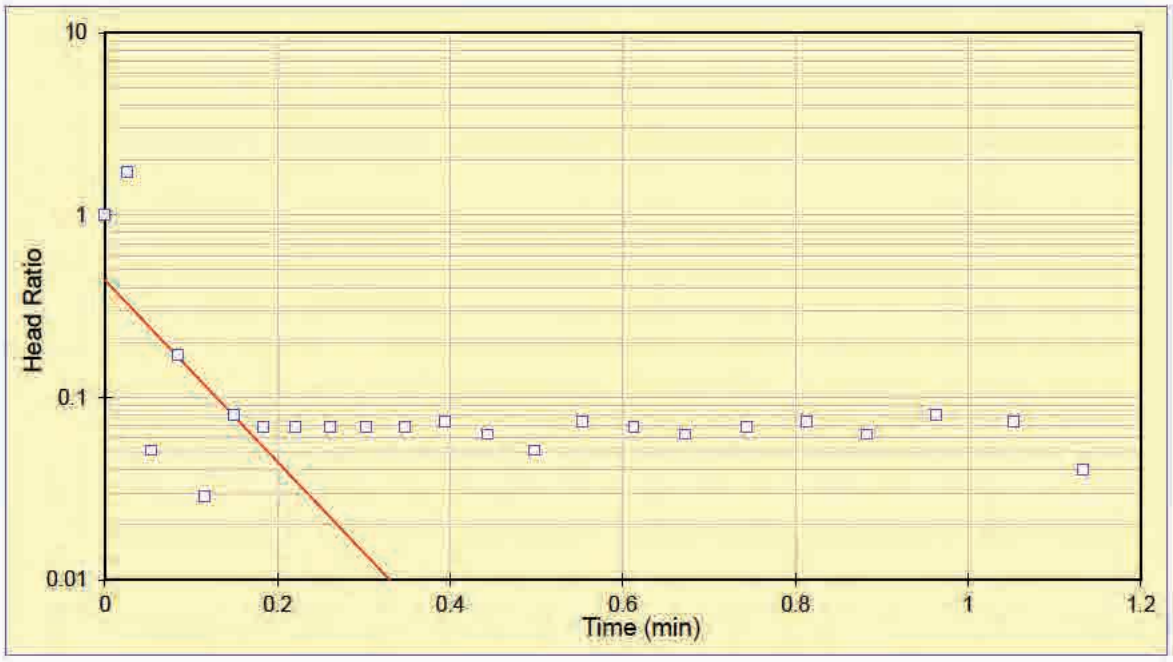
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

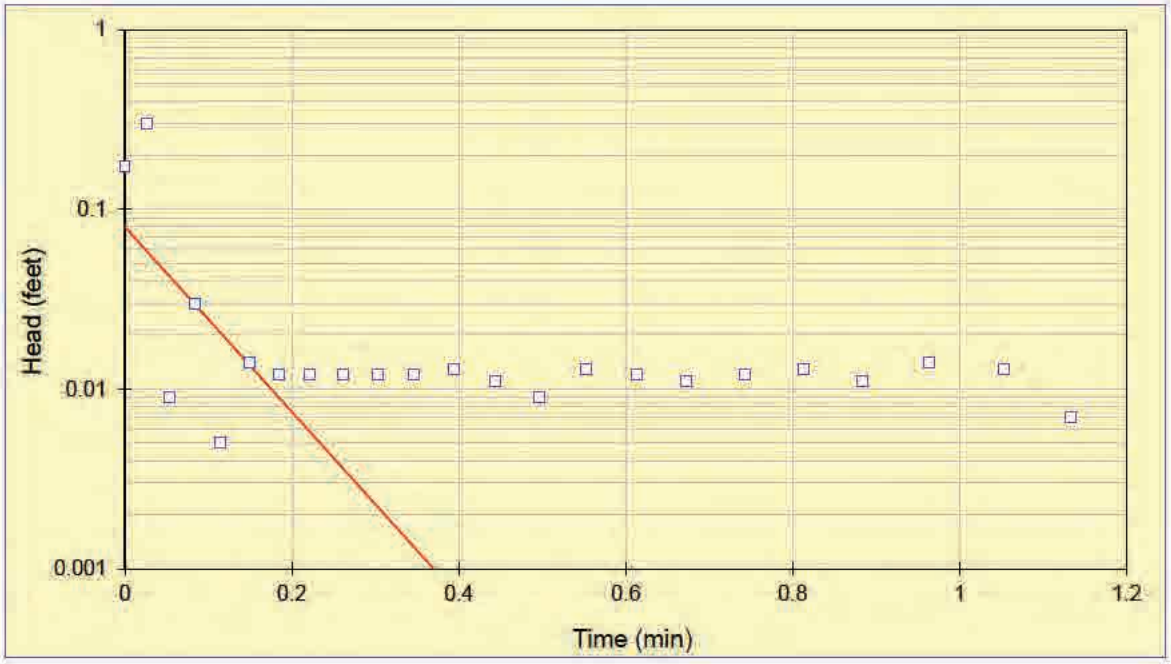
where:

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:

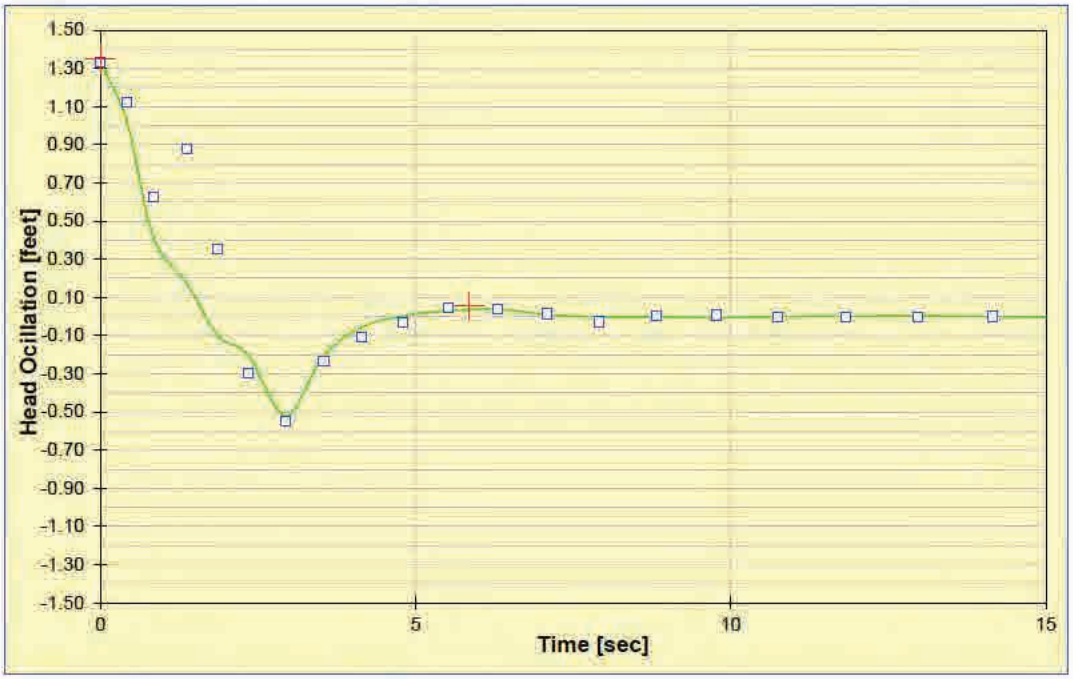
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma/(g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

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

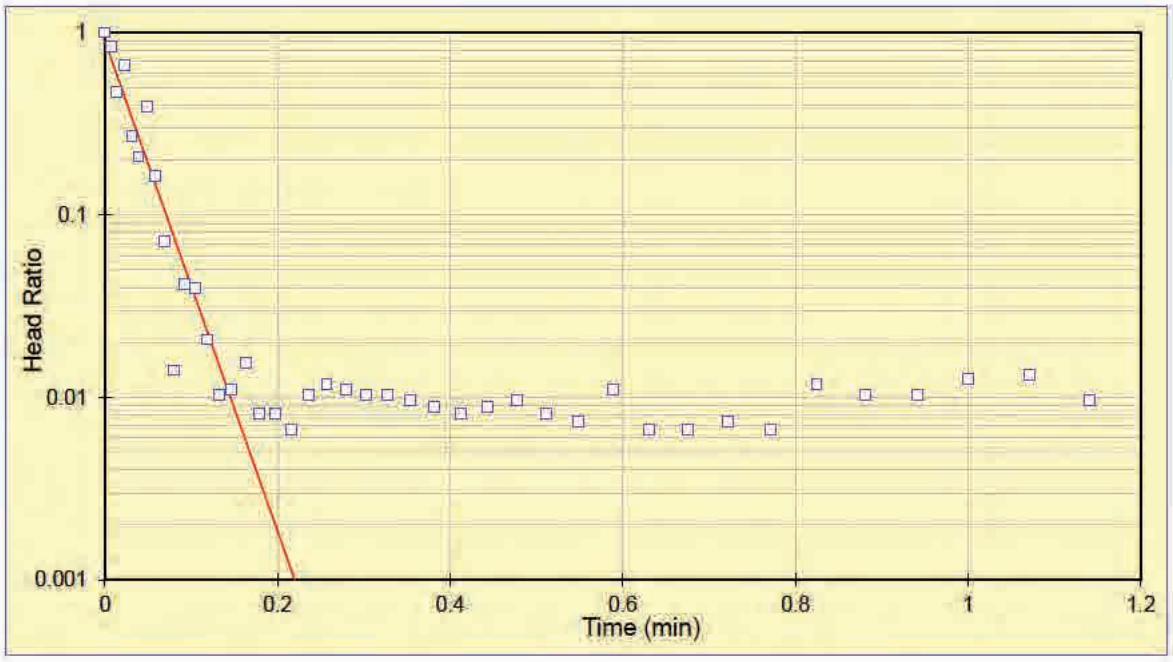
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

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		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.84E-02	cm/sec
t_1 =	0	K=	5.21E+01	ft/day
t_2 =	0.22			
h_1/h_0 =	0.90			
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 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

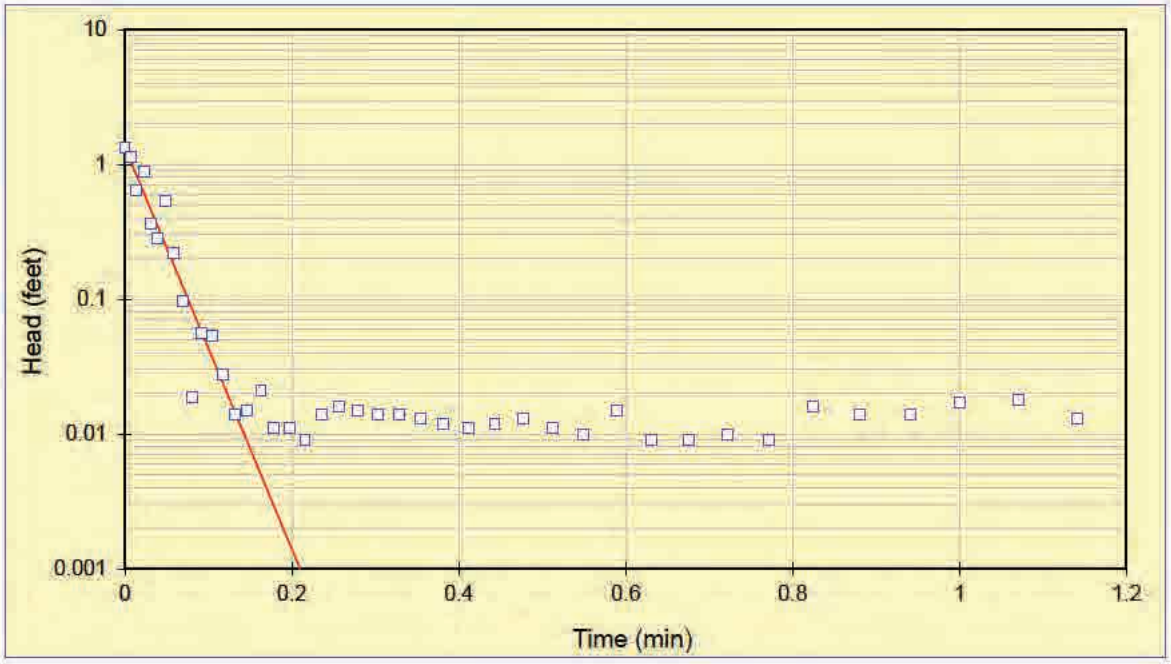
where:

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:

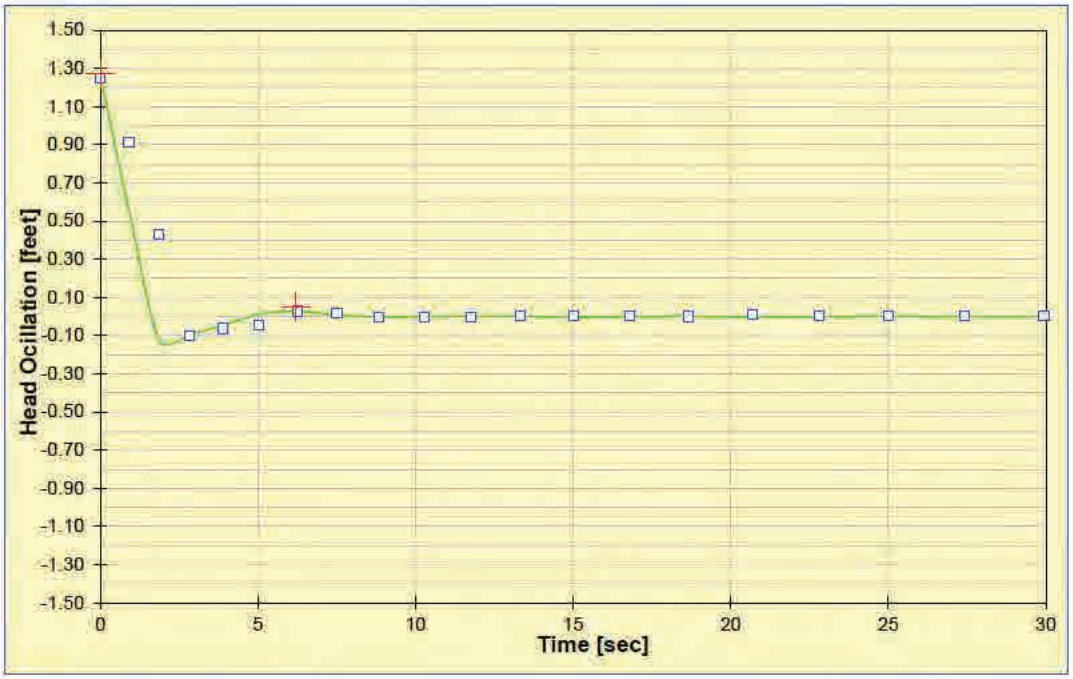
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

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

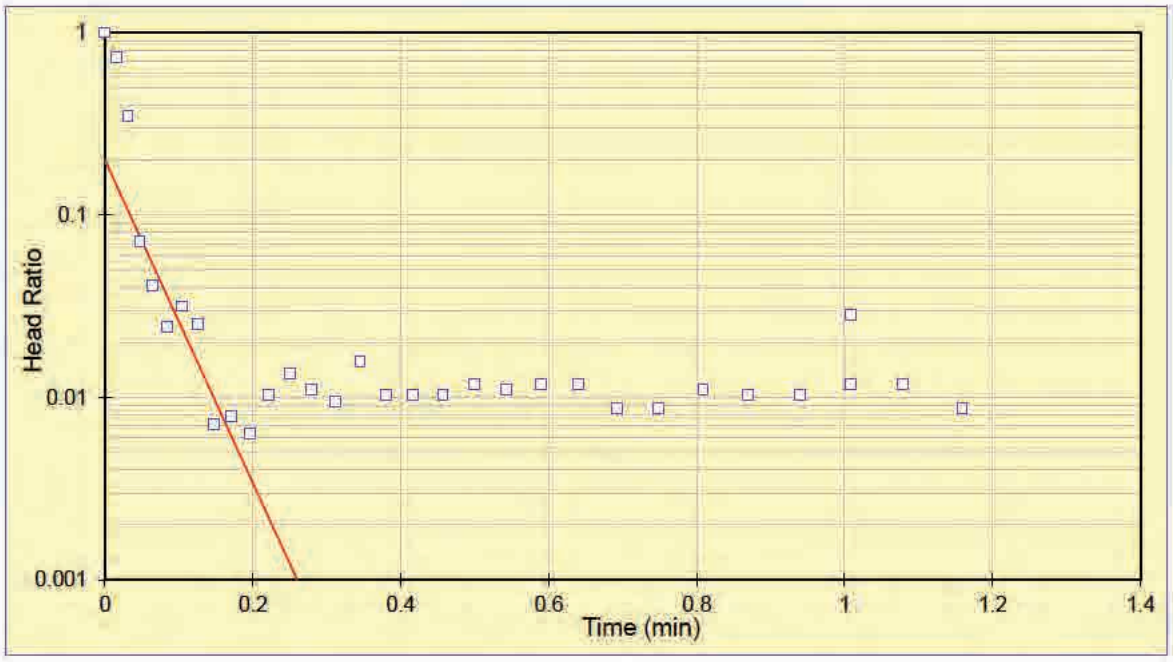
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

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)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

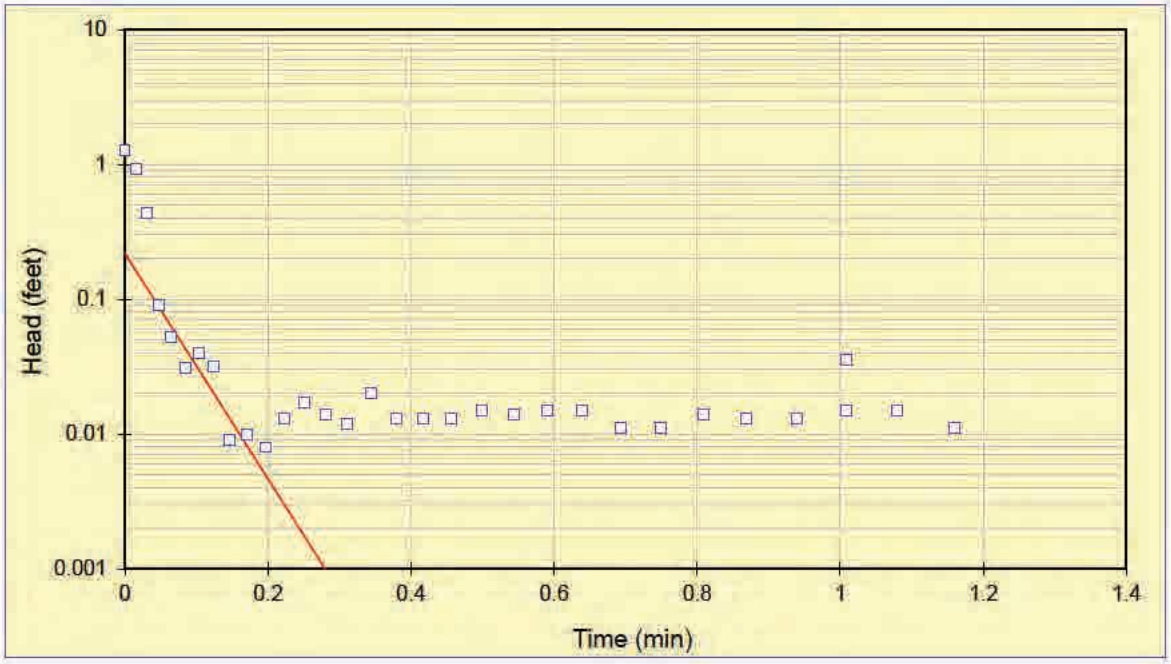
where:

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 D
VERTICAL GRADIENT FLOW CALCULATIONS

Monitoring Well Locations	Ground Surface Elevation (ft-masl)	Top of Casing Elevation (ft-masl)	Screen Interval				June 13, 2016				July 11, 2016				September 9, 2016				November 2, 2016			
			Top (ft-bgs)	Bottom (ft-bgs)	Center (ft-bgs)	Center (ft-masl)	Depth To Water (ft-btoc)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction
GAWW01	993.02	993.94	5	15	10	983.02	10.77	983.17			10.84	983.10			10.85	983.09			11.00	982.94		
GAWW01B	993.01	993.93	20	40	30	963.01													11.04	982.90	-0.0018	Down
GAWW02	992.45	992.76	5	15	10	982.45	9.91	982.85							9.91	982.85			10.14	982.62		
GAWW02B	992.40	992.76	20	35	27	965.40													10.14	982.62	-0.0458	Down
GAWW03	992.16	992.49	5	15	10	982.16	9.62	982.54			10.29	981.89			9.11	983.04			9.52	982.63		
GAWW03B	992.16	992.54	24.5	34.5	29.5	962.66	9.75	982.54	-0.180-02	Down	9.81	982.48	-0.145-02	Down	8.15	983.11	-0.245-02	Down	9.68	982.67	-0.0459	Down
GAWW10	993.21	993.05	5	15	10	983.04	9.52	983.53			9.82	983.23			9.22	983.83			9.36	983.69		
GAWW10B	993.11	993.05	29.3	37.1	33.2	959.91	9.15	983.90	-0.417-03	Down	9.42	983.63	0.00E+00	Flat	9.18	983.87	1.67E-03	up	8.96	984.09	0.0000	up
GAWW11E	992.57	992.97	5	15	10	982.57	9.21	983.76	-0.00E-00	Down	9.61	983.36	1.46E-01	up	9.18	983.79	-0.45E-01	up	8.32	984.65	0.960-02	up
GAWW11B	992.70	992.76	70.76	74.71	72.74	919.96	8.91	983.85			8.80	983.96			7.91	984.85			8.64	983.13		
GAWW11C	993.01	992.80	5	15	10	983.01	9.19	983.61			9.29	983.51			10.05	982.75			9.25	983.55		
GAWW12B	992.83	993.05	28	38	33	957.83	10.79	982.26	-0.22E-03	up	9.77	983.28	0.61E-01	Down	10.05	982.99	4.22E-02	Down	10.23	982.81	0.23E-01	Down
GAWW16	993.74	994.07	5	15	10	983.74	9.75	983.99			9.96	983.77			9.44	984.29			9.80	983.93	0.90E-02	Down
GAWW16B	993.64	993.47	25	35	30	958.64	--	--			--	--			--	--			9.54	983.93		
GAWW18B	991.00	990.83	5	15	10	981.00	--	--	NA	NA	--	--	NA	NA	--	--	NA	NA	9.06	981.94	-0.11E-01	Down
GAWW19B	993.90	993.79	22	32	27	966.90	--	--			--	--			--	--			9.05	984.74		
GAWW20	994.27	993.72	5	15	10	984.27	--	--	NA	NA	--	--	NA	NA	--	--	NA	NA	9.06	984.66	1.66E-03	Up
GAWW20B	992.20	992.93	27	37	32	960.20	--	--			--	--			--	--			9.05	983.89		
GAWW53	991.89	991.54	5	15	10	981.89	--	--	NA	NA	--	--	NA	NA	--	--	NA	NA	8.85	983.04	1.42E-03	Up
GAWW53B	992.17	992.04	28	38	33	959.17	--	--			--	--			--	--			8.87	983.30		
GAWW54	992.97	992.57	5	15	10	982.97	--	--	NA	NA	--	--	NA	NA	--	--	NA	NA	9.05	983.92	1.81E-03	up
GAWW54B	992.99	992.67	32	42	37	955.99	--	--			--	--			--	--			8.87	984.12		
GAWW55	992.95	992.84	5	15	10	982.95	--	--	NA	NA	--	--	NA	NA	--	--	NA	NA	8.54	984.30	0.00E+00	Flat
GAWW55B	992.16	992.93	25	35	30	962.16	--	--			--	--			--	--			8.54	984.39		
GAWW56	992.43	992.61	5	15	10	982.43	--	--	NA	NA	--	--	NA	NA	--	--	NA	NA	7.90	984.71	-0.00E+00	Down
GAWW56B	992.35	992.84	30	40	35	957.35	--	--			--	--			--	--			7.90	984.77		

Notes:
ft-bgs = Feet below ground surface
ft-msl = Feet above mean sea level
ft-btoc = Feet below top of casing
NA = Not applicable

Monitoring Well Location	Ground Surface Elevation (ft-masl)	Top of Casing Elevation (ft-masl)	Screen Interval				January 4, 2017				February 21, 2017				April 24, 2017				June 26, 2017			
			Top (ft-bgs)	Bottom (ft-bgs)	Center (ft bgs)	Center (ft masl)	Depth To Water (ft-bTOC)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-bTOC)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-bTOC)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-bTOC)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction
GAMW07	991.15	993.94	5	15	10	981.15	10.08	983.86	1.10E-03	Down	9.85	984.09	1.07E-03	Down	9.85	984.09	NA	NA	9.80	984.14	NA	NA
GAMW07B	991.61	994.10	39	42	40	951.61	9.69	984.41			9.67	984.43			9.71	984.39			9.70	984.40		
GAMW08	992.45	995.15	5	15	10	982.45	10.60	984.55	1.64E-03	Up	10.63	984.52	2.61E-03	Down	9.71	985.44	NA	NA	10.15	984.99	NA	NA
GAMW08B	979.15	981.97	20	35	27	952.15	9.21	984.76			9.07	984.90			--	--	--	--	--	--	--	--
GAMW09	990.1	992.86	5	15	10	980.1	9.49	983.37	3.20E-03	Down	9.50	983.36	2.70E-03	Down	9.25	984.22	0.03E-03	Down	9.30	984.09	2.1E-03	Down
GAMW09B	993.19	995.94	34.5	44.5	39.5	953.69	9.85	984.81			9.81	984.85			9.26	985.40			9.80	985.21		
GAMW10	993.17	995.95	5	15	10	983.17	9.83	984.82	1.22E-03	Up	9.86	984.80	1.84E-03	Up	7.60	987.38	1.47E-03	Up	9.80	985.05	0.00E+00	NA
GAMW10B	993.18	995.95	37.5	47.5	42.5	950.68	9.13	984.82			9.11	984.84			8.77	985.24			9.80	985.35		
GAMW11	992.7	995.37	5	15	10	982.7	9.33	984.14	1.63E-03	Up	9.46	983.91	1.02E-03	Up	9.27	984.10	0.97E-03	Up	9.72	983.65	1.03E-03	Up
GAMW11B	992.76	995.76	47.76	52.76	50.26	942.50	9.71	984.05			9.70	984.06			9.34	984.42			9.68	984.08		
GAMW12	993.51	996.80	5	15	10	983.51	NA				11.24	984.36			11.35	984.25			11.31	984.43		
GAMW12B	994.13	997.0	35	45	40	959.13	11.60	984.53	0.0E+00	Up	11.54	984.59	0.00E+00	Up	11.60	984.53	0.00E+00	Up	11.58	984.55	1.56E-03	Up
GAMW13	993.74	996.57	5	15	10	983.74	9.68	984.11			9.84	983.95			9.48	984.31			9.85	983.72		
GAMW13B	993.14	995.47	25	35	30	963.64	9.62	984.04	6.2E-02	Down	9.61	984.05	0.0E+00	Down	--	--	--	--	--	--	NA	NA
GAMW14	991.09	993.63	5	15	10	981.09	9.75	983.53			9.84	983.70			--	--	NA	NA	--	--		
GAMW14B	990.80	993.76	22	32	27	963.80	9.75	984.04	-3.0E-04	Down	9.69	984.10	1.93E-04	Up	--	--			--	--	NA	NA
GAMW15	994.27	996.93	5	15	10	984.27	9.77	984.14			9.76	984.15			--	--	--	--	--	--		
GAMW15B	992.20	994.83	37	47	42	950.20	9.78	984.14	9.1E-03	Up	9.80	984.12	2.05E-03	Up	--	--	NA	NA	--	--	NA	NA
GAMW16	990.80	993.24	5	15	10	980.80	9.55	983.79	4.1E-03	Up	9.61	983.73	2.37E-03	Up	--	--	NA	NA	--	--	NA	NA
GAMW16B	990.91	993.53	26	36	31	954.91	9.85	983.78			9.81	983.82			--	--	--	--	--	--		
GAMW17	992.07	995.01	5	15	10	982.07	9.58	985.53	3.92E-03	Up	9.61	985.50	3.80E-03	Up	--	--	NA	NA	--	--	NA	NA
GAMW17B	992.09	994.67	32	42	37	955.09	9.62	985.05			9.61	985.06			--	--	--	--	--	--		
GAMW18	990.05	992.84	5	15	10	980.05	9.62	983.22	1.5E-03	Down	9.81	983.03	1.6E-03	Down	--	--	NA	NA	--	--	NA	NA
GAMW18B	988.16	990.93	25	35	30	958.16	9.81	983.12			9.76	983.17			--	--	--	--	--	--		
GAMW19	990.23	992.91	5	15	10	980.23	9.73	983.18	1.0E-03	Down	9.85	983.06	4.6E-03	Down	--	--	NA	NA	--	--	NA	NA
GAMW19B	988.33	990.91	30	40	35	953.33	9.77	983.14			9.80	983.11			--	--	--	--	--	--		

Notes:
Bold = Well located in groundwater mound
Italic = Well above mound (sump well)
Bold + Italic = Well below mound (sump well)
NA = Not Available
*Min = Minimum detected

Appendix C
VERTICAL GRADIENT FLOW CALCULATIONS

Monitoring Well Locations	Ground Surface Elevation (ft-masl)	Top of Casing Elevation (ft-masl)	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 masl)	Depth To Water (ft-bgs)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-bgs)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-bgs)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-bgs)	Groundwater Elevation (ft-masl)	Vertical Gradient (m/m)	Flow Direction
GAMW09	993.02	993.94	5	15	10	983.02	10.92	983.02	NA	NA	10.75	983.19	NA	NA	–	–	NA	NA	9.8	984.06	NA	NA
GAMW09R	994.67	995.02	290	40	35	959.67	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GAMW08	992.45	992.76	5	15	10	982.45	10.10	982.53	NA	NA	NA	–	NA	NA	–	–	NA	NA	9.38	983.38	NA	NA
GAMW08B	979.52	980.40	20	35	27	952.52	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GAMW04	992.1	992.96	5	15	10	982.01	9.11	983.85	0.0018/0.02	Down	10.25	982.85	0.0015/-0.02	Down	–	–	NM	NM	9.29	983.67	-0.1/-0.02	Down
GAMW08R	993.19	993.56	294.5	345	319.5	674.69	1.65	991.91			9.81	983.38			–	–			9.92	983.27		
GAMW10	993.01	993.95	5	15	10	983.01	9.66	984.29	0.0027/-0.02	Up	9.80	984.21	0.0028/-0.02	Up	–	–	NM	NM	9.36	984.59	0.0022/-0.02	Up
GAMW10B	993.14	993.95	27.5	37.5	32.5	960.64	7.33	986.62			8.47	985.48			–	–			7.96	985.99		
GAMW11	992.0	992.97	5	15	10	982.0	9.15	982.85	0.0024/0.02	Up	10.68	982.32	0.0028/0.02	Up	–	–	NM	NM	9.36	982.64	0.0022/0.02	Up
GAMW10A	992.16	992.76	170.16	181.75	175.96	816.20	7.64	984.96			9.87	982.82			–	–			8.07	984.62		
GAMW11B	993.51	994.83	5	15	10	983.51	10.34	984.49			NA				–	–			10.45	984.38		
GAMW12B	993.63	993.0	35	55	45	948.63	10.95	982.05	0.0006/-0.02	Down	12.23	980.77			–	–			9.12	984.18	0.0005/-0.02	Up
GAMW12	993.74	994.19	5	15	10	983.74	9.23	984.51			11.73	982.00			–	–			9.8	983.93		
GAMW10B	993.14	993.47	25	35	30	963.64	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TW09MW01	991.00	992.69	5	20	13	977.00	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA
GAMW09B	993.80	993.76	22	32	27	966.80	–	–	–	–	–	–	–	–	–	–	NM	NM	–	–	–	–
GAMW09A	994.27	994.10	5	15	10	984.27	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA
GAMW05B	992.20	992.93	37	57	52	940.20	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GAMW05	992.80	992.24	5	15	12	982.80	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA
GAMW05B	992.47	992.19	26	36	31	962.80	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GAMW04	992.97	992.57	5	15	13	982.97	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA
GAMW04B	992.99	992.47	32	42	37	955.99	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GAMW06	992.05	992.34	5	15	10	982.05	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA
GAMW06B	992.18	992.53	25	35	30	962.18	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
GAMW07	992.03	992.51	5	15	10	982.03	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA	–	–	NA	NA
GAMW07B	992.33	992.84	35	45	40	952.33	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Notes:
ft-bgs = Feet below ground surface
ft-masl = Feet above mean sea level
ft-bgsc = Feet below top of casing
NA = Not applicable
NM = Not measured

Monitoring Well Location	Ground Surface Elevation (ft-asl)	Top of Casing Elevation (ft-asl)	Screen Interval				April 13, 2016				June 12, 2016				August 27-30, 2016				October 22-24, 2016			
			Top (ft-bgs)	Bottom (ft-bgs)	Center (ft-bgs)	Center (ft-asl)	Depth To Water (ft-bTOC)	Groundwater Elevation (ft-asl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-bTOC)	Groundwater Elevation (ft-asl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-bTOC)	Groundwater Elevation (ft-asl)	Vertical Gradient (m/m)	Flow Direction	Depth To Water (ft-bTOC)	Groundwater Elevation (ft-asl)	Vertical Gradient (m/m)	Flow Direction
GAMW09	691.62	693.94	5	15	10	681.62	9.99	683.95	7.70E-01	Up	9.70	684.24	1.71E-01	Up	9.95	683.99	3.43E-01	Up	10.07	683.87	1.71E-01	Up
GAMW09B	691.67	693.93	39	49	44	647.67	9.32	684.61			9.30	684.63			9.58	684.35			10.17	683.76		
GAMW08	692.45	694.76	5	15	10	682.45	9.84	684.92	1.03E-01	Up	9.60	685.17	1.03E-01	Up	12.32	682.45	1.20E-03	Up	11.16	683.62	2.56E-01	Up
GAMW08B	692.52	694.82	40	50	45	647.52	9.79	685.03			9.80	685.02			9.84	684.98			9.95	684.87		
GAMW06	690.1	692.56	5	15	10	680.1	7.42	685.14	2.07E-02	Down	7.5	685.06	2.15E-02	Down	9.52	683.04	2.04E-02	Down	8.66	683.90	2.04E-02	Down
GAMW06B	690.19	692.76	49.5	54.5	52	638.19	7.14	685.62			7.25	685.51			9.15	683.61			8.29	684.47		
GAMW15	693.07	695.25	5	15	10	683.07	9.83	685.42			9.8	685.45			9.58	685.67			8.93	686.31		
GAMW15B	693.11	695.08	29.1	37.1	33.1	660.01	7.4	687.68	9.63E-03	Up	8.85	686.26	1.04E-02	Up	8.93	686.18	1.93E-02	Up	8.002	687.11	1.77E-02	Up
GAMW16	692.07	693.97	5	15	10	682.07	8.15	685.82	5.59E-03	Up	8.36	685.61	9.14E-03	Up	9.95	684.02	1.72E-03	Up	8.7	685.27	2.14E-03	Up
GAMW16B	692.13	693.76	47.16	54.71	50.76	641.84	6.45	687.31			7.5	686.26			9.24	684.52			8.65	685.10		
GAMW17	693.51	695.83	5	15	10	683.51	11.35	684.48			11.45	684.38			11.66	684.17			10.7	685.13		
GAMW17B	693.63	695.6	35	45	40	653.63	10.42	685.18	4.98E-03	Up	10.23	685.38	5.00E-03	Up	10	685.6	2.11E-03	Down	9.43	686.18	2.11E-03	Down
GAMW18	693.74	695.57	5	15	10	683.74	9.47	686.1			9.72	685.85			9.98	685.59			8.7	686.87		
GAMW18B	693.64	695.47	25	35	30	663.64	9	686.47	1.39E-03	Up	8.93	686.71	1.93E-03	Up	9.28	686.36	1.11E+00	Up	8.32	687.32	2.89E-03	Up
GAMW07	691.09	692.63	5	15	10	681.09			NA	NA	7.07	685.56	-1.55E-04	Down	9.14	683.52	-1.03E+00	Down	8.29	684.37	-1.03E+00	Down
GAMW08	690.93	692.74	22	32	27	674.08	–	–			7.06	685.87			9.24	683.56			8.39	684.42		
GAMW10	694.27	696.13	5	15	10	684.27	–	–	–	–	–	–	–	–	9.55	686.58	–	–	9.06	687.07	–	–
GAMW10B	694.29	696.13	37	47	42	652.29	–	–	NA	NA	–	–	0.0	NA	9.55	686.58	0.00E+00	No	9.06	687.07	0.00E+00	No
GAMW05	690.39	692.24	5	15	10	680.39	–	–	NA	NA	7.03	685.21	1.72E-02	Up	8.85	683.44	5.67E-03	Up	8.10	684.19	1.15E-02	Up
GAMW05B	690.41	692.24	26	36	31	659.41	–	–			7.05	685.19			8.77	683.47			9.05	685.19		
GAMW04	692.97	695.37	5	15	10	682.97	7.23	–	–	–	7.05	688.32	–	–	7.58	687.79	–	–	7.09	688.27	–	–
GAMW04B	693.02	695.47	32	42	37	656.98	7.32	688.15	1.83E-03	Up	7.07	688.40	9.47E-03	Up	7.72	687.75	3.81E-03	Down	6.92	688.52	3.81E-03	Down
GAMW05	690.05	691.94	5	15	10	680.05	–	–	NA	NA	6.84	685.09	3.02E-02	Up	9.01	682.92	2.93E-03	Down	6.93	685.01	3.04E-03	Down
GAMW06	695.16	697.03	35	45	40	655.16	–	–			6.86	690.17			9.03	688.00			6.95	690.08		
GAMW06B	695.23	697.01	5	15	10	685.23	–	–	NA	NA	6.84	690.17	-9.68E-04	Down	9.06	687.78	1.93E-03	Up	6.93	690.06	1.93E-03	Up
GAMW07	695.33	697.31	37	47	42	653.33	–	–			7.05	690.26			9.03	688.28			6.93	690.38		

Notes:
Bold = Well screen groundwater head
Italics = Well screen mean sea level
Italics = Calculation Result
NM = Not Measured
NA = Not Available

Appendix C
VERTICAL GRADIENT FLOW CALCULATIONS

Monitoring Well Locations	Ground Surface Elevation (masl)	Top of Casing Elevation (masl)	Screen Interval				February 23, 2016				Average Vertical Gradient (m/m)	Flow Direction
			Top (m bgs)	Bottom (m bgs)	Center (m bgs)	Center (masl)	Depth To Water (m BTOC)	Groundwater Elevation (masl)	Vertical Gradient (m/m)	Flow Direction		
DMW07	1000.23	999.95	5	10	7.5	992.45	10.55	989.40				
DMW10S	999.61	999.33	10	13	11.5	988.11	8.33	991.28	0.05E-02	Up	0.0030	Up
DMW11S	999.95	999.66	5	11	8	991.95	8.61	991.05				
DMW11D	999.92	999.61	45	51	48	951.95	8.13	991.48	0.00E+00	Up	0.0031	Up
DMW12S	1001.1	1000.99	7	13	10	991.10	9.05	991.21				
DMW12D	999.83	999.53	84.5	91.5	88.0	911.83	8.48	991.47	-0.04E-02	Down	-0.0214	Down
DMW13	999.07	998.79	5	10	7.5	991.57	7.68	991.39				
DMW15S	998.1	998.06	37.9	47.3	42.6	955.46	7.07	991.04	0.03E-02	Up	0.0061	Up
DMW16	999.2	998.97	5	11	8	991.2	8.20	990.94				
DMW17S	998.16	997.79	27.74	37.16	32.19	965.97	7.22	990.57	0.03E-02	up	0.0057	Up
DMW17D	998.81	998.53	5	10	7.5	991.31	7.94	990.59				
DMW18S	999.36	999.13	24	34	29	965.36	8.54	990.59	-0.23E-02	Down	-0.0111	Down
DMW18D	999.03	998.77	5	10	7.5	991.53	8.24	990.53				
DMW19S	999.04	998.47	25	33	29	969.04	8.55	990.02	0.10E-02	Up	0.0050	Up
DMW19D	999.00	998.69	5	10	7.5	991.50	8.66	990.03				
DMW20S	997.46	996.79	22	32	27	970.79	7.03	989.76	-0.05E-02	Up	-0.0033	Up
DMW21	994.01	993.73	5	10	7.5	986.77	8.10	989.99				
DMW22S	997.00	996.93	25	30	27.5	969.43	8.29	988.64	0.02E-02	Up	0.0020	Up
DMW23	994.66	991.24	5	10	7.5	986.66	8.46	988.78				
DMW23D	994.65	991.39	25	30	27	969.52	8.35	988.94	-0.02E-02	Up	-0.0013	Up
DMW25S	993.89	993.21	5	10	7.5	986.21	8.09	989.40				
DMW25D	993.96	993.47	25	30	27	966.53	8.08	989.27	0.00E-00	Down	0.0001	Up
DMW26	992.99	992.58	5	10	7.5	985.33	8.05	988.81				
DMW26D	993.35	992.93	25	30	27.5	965.75	7.93	988.77	0.04E-02	Down	0.0022	Down
DMW27S	727.62	727.62	5	10	7.5	720.12	7.91	988.70				
DMW27D	993.55	993.42	25	30	27.5	965.92	7.93	988.70	0.00E-00	Down	0.0000	Down

Notes:
Masl = Meters above ground surface
bgs = Meters below ground surface
BTOC = Top of well casing
Bold = Well below lowest casing
NA = Field Well
NM = Not measured

Prepared by: EMW
Checked by: TV
Reviewed by: MAH

APPENDIX D

Monitored Natural Attenuation Evaluation

GOLDER

REPORT

MONITORED NATURAL ATTENUATION EVALUATION

Northern Indiana Public Service Company LLC
Rollin M Schahfer Generating Station
Wheatfield, IN

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Submitted by:

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19121567

November 2020

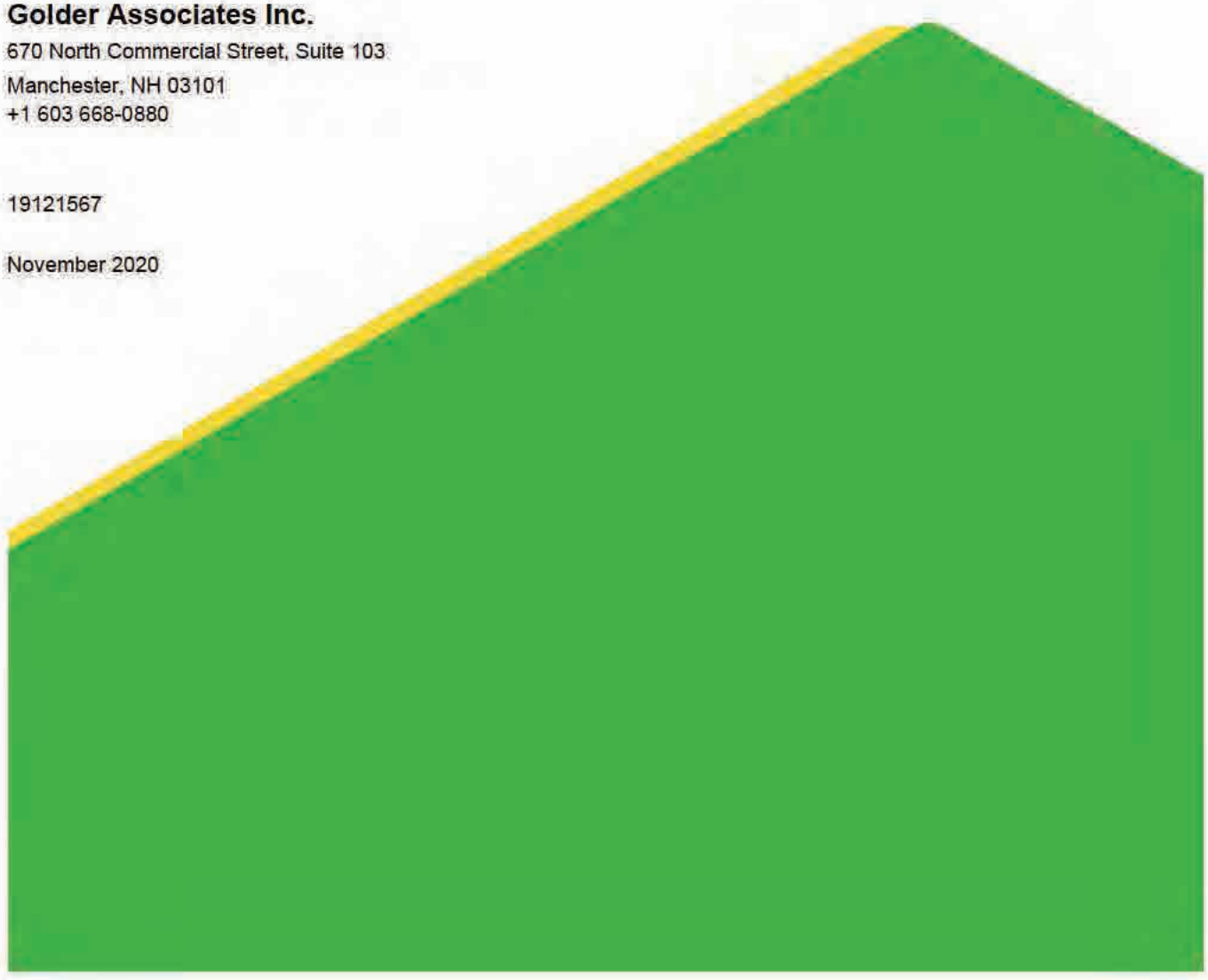


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APPENDICES

APPENDIX A
Groundwater and Porewater Monitoring Data

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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 revers bly 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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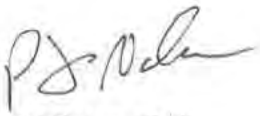
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Tables

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

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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	-4.5	-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	**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 $10^{\wedge value}$ 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	$FeSO\ 7H_2O$	-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	-4.6	-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	$CaSO :2H_2O$	-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	$(H_3O)Fe_3(SO\ )_2(OH)_6$	-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	$KFe_3(SO\ )_2(OH)_6$	**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	$NaFe_3(SO\ )_2(OH)_6$	-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	**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^{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	$FeSO\ 7H_2O$	-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	-4.3	-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	$CaSO :2H_2O$	-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	$(H_3O)Fe_3(SO\ )_2(OH)_6$	-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	$KFe_3(SO\ )_2(OH)_6$	-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	$NaFe_3(SO\ )_2(OH)_6$	-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	**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^{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	$FeSO\ 7H_2O$	-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	-4.5	-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	$CaSO :2H_2O$	-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	$(H_3O)Fe_3(SO\ )_2(OH)_6$	-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	$KFe_3(SO\ )_2(OH)_6$	-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	$NaFe_3(SO\ )_2(OH)_6$	-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	**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^{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	$FeSO\ 7H_2O$	-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	-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	$CaSO :2H_2O$	-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	$(H_3O)Fe_3(SO\ )_2(OH)_6$	-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	$KFe_3(SO\ )_2(OH)_6$	**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	$NaFe_3(SO\ )_2(OH)_6$	-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	**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^{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	$FeSO\ 7H_2O$	-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	-4.9	-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	$CaSO :2H_2O$	-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	$(H_3O)Fe_3(SO\ )_2(OH)_6$	-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	$KFe_3(SO\ )_2(OH)_6$	**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	$NaFe_3(SO\ )_2(OH)_6$	**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	**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^{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	$FeSO\ 7H_2O$	-4.8	-4.8	-6.9	-5.1	-5.1	-5.9	-5.6	-5.0	-5.2	-4.8	-4.9
Anglesite	PbSO	-4.5	-4.6	-4.6	-5.4	-5.5	-5.1	-5.4	-5.0	-5.1	-4.7	-4.7
Gypsum	$CaSO :2H_2O$	-0.6	-0.6	-0.8	-1.7	-1.7	-1.9	-1.7	-1.2	-1.3	-1.0	-0.9
Jarosite-H	$(H_3O)Fe_3(SO)_2(OH)_6$	-3.6	-7.1	-8.6	-8.3	-6.6	-4.3	-8.7	-8.8	-6.6	-1.5	-7.8
Jarosite-K	$KFe_3(SO)_2(OH)_6$	**2.9**	**-0.5**	-1.9	-2.5	**-0.4**	**2.4**	-2.6	-2.6	**-0.4**	**4.6**	-1.2
Jarosite-Na	$NaFe_3(SO)_2(OH)_6$	**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	**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

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: SOURCES: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, AND THE GIS USER COMMUNITY

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

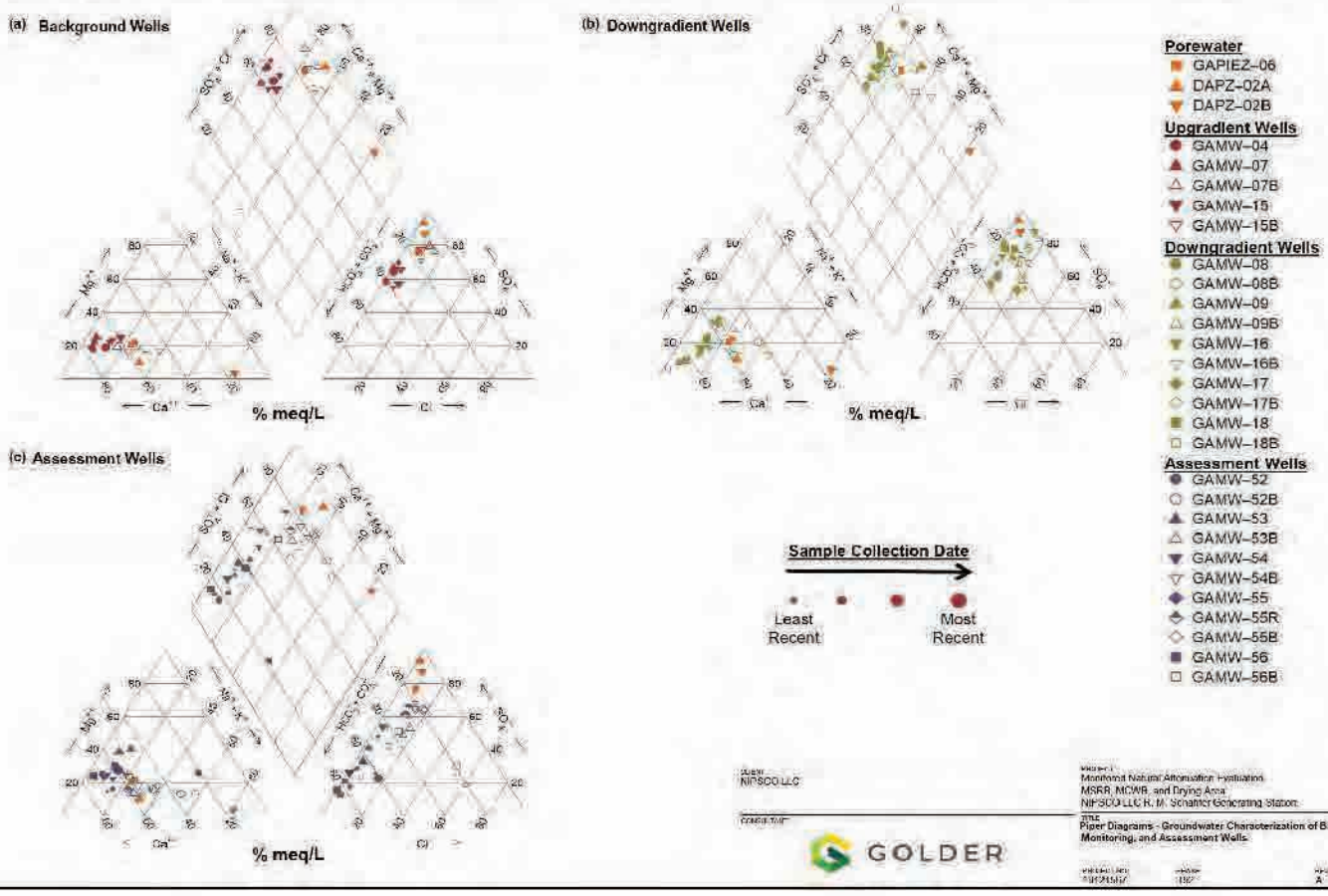
MONITORED NATURAL ATTENUATION EVALUATION
MSRD, MCWD, AND DRYING AREA
MICHIGAN CITY (R. M. SCHAHFER) GENERATING STATION

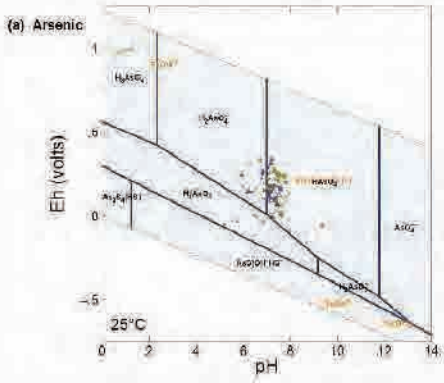
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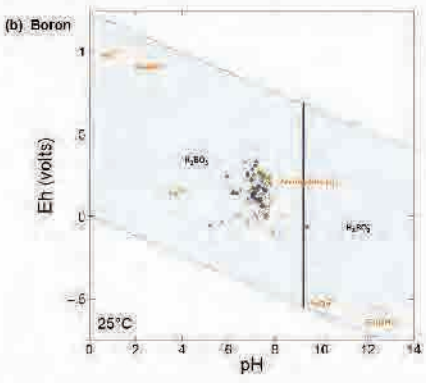
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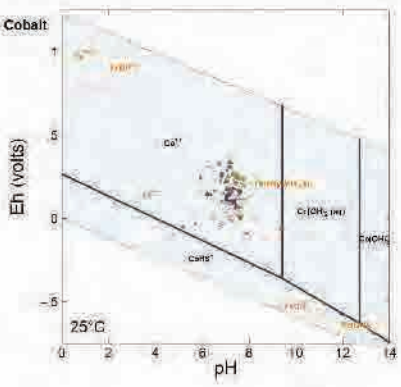
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APPROVED	MWH

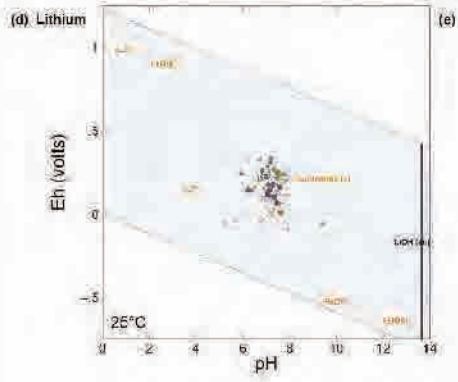
PROJECT NO. 19101587 | CONTROL A | REV. 0 | FIGURE 1

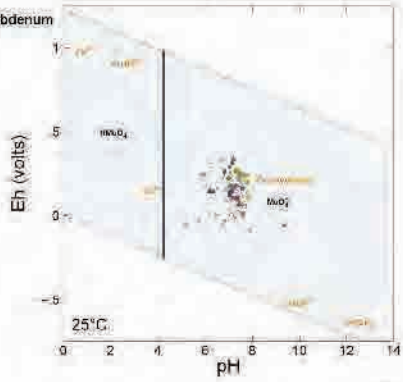

(a) Background Wells
(b) Downgradient Wells
(c) Assessment Wells
% meq/L
Porewater
GAPIEZ-06
DAPZ-02A
DAPZ-02B
Upgradient Wells
GAMW-04
GAMW-07
GAMW-07B
GAMW-15
GAMW-15B
Downgradient Wells
GAMW-08
GAMW-08B
GAMW-09
GAMW-09B
GAMW-16
GAMW-16B
GAMW-17
GAMW-17B
GAMW-18
GAMW-18B
Assessment Wells
GAMW-52
GAMW-52B
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
NIPSCO LLC
GOLDER
Monitored Natural Attenuation Evaluation
MSRR, MCWR, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Piper Diagrams - Groundwater Characterization of Background, Monitoring, and Assessment Wells
A
2a-c











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
NRG/SCO LLC

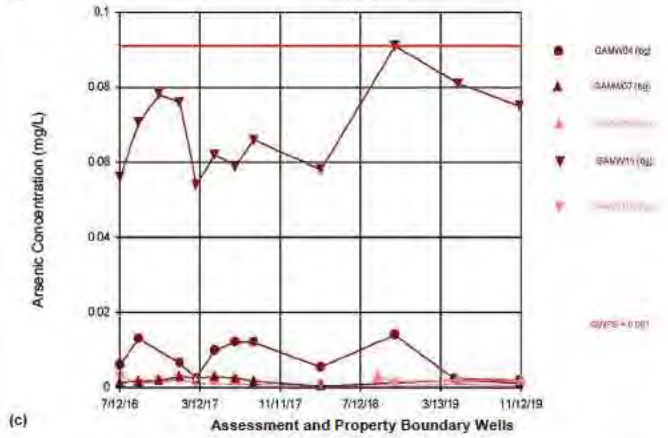
PROJECT
Monitored Natural Attenuation Evaluation
MGWR, MGWR, and Drying Area
NRG/SCO LLC/T.H. Schaefer Generating Station

TITLE
Pourbaix Diagrams For Arsenic, Boron, Cobalt, Lithium, and Molybdenum

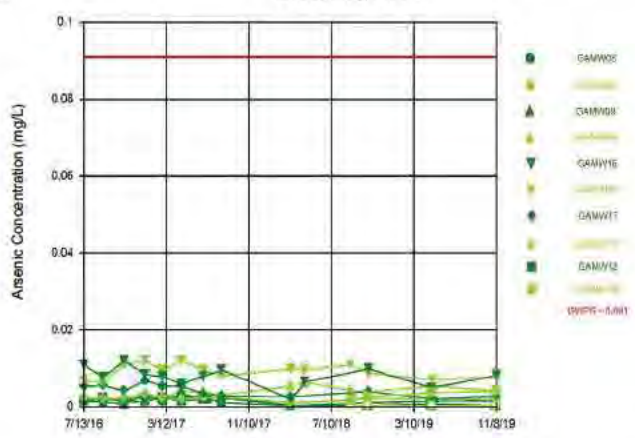
GOLDER

PROJECT NO. 1912165 | REV. 0 | FIG. A | 3a-e

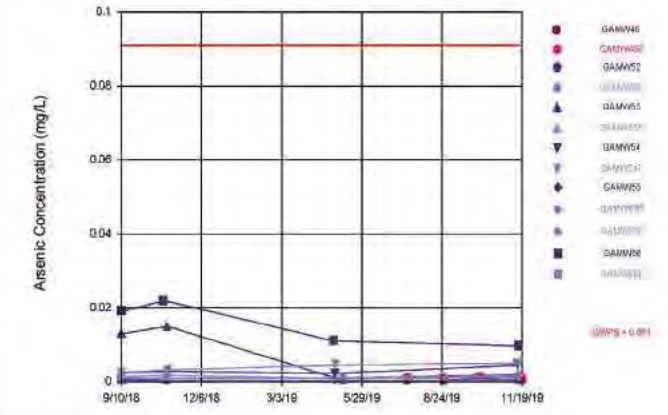
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit.

CLIENT
NIPSCO LLC

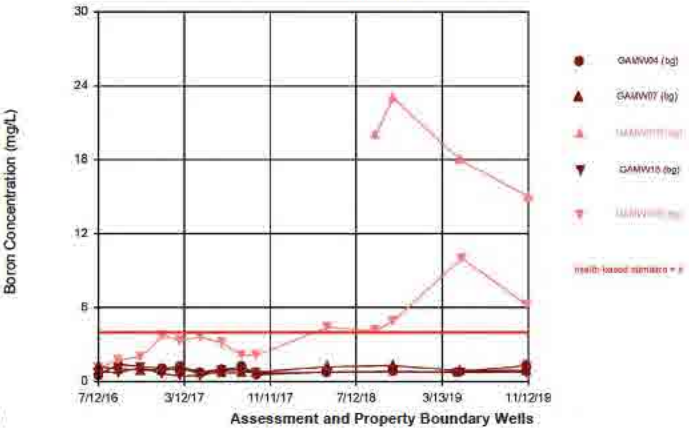
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

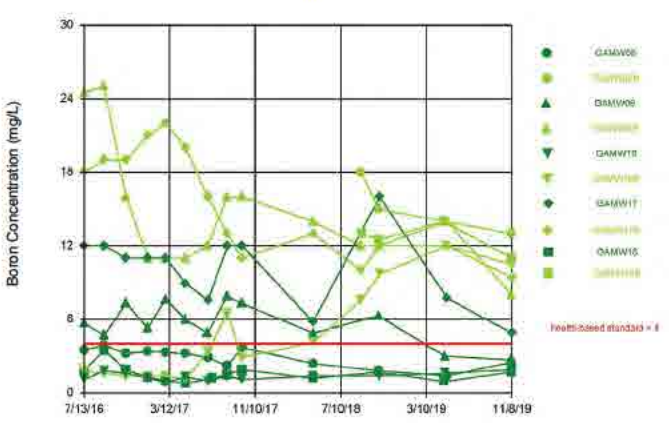
TITLE
Arsenic Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	4a-c

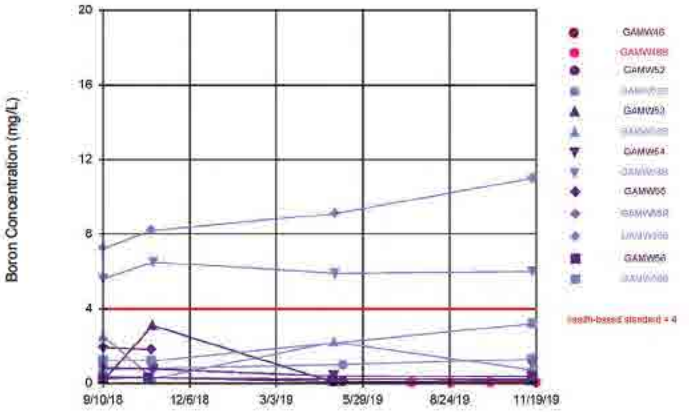
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit

CLIENT
NIPSCO LLC

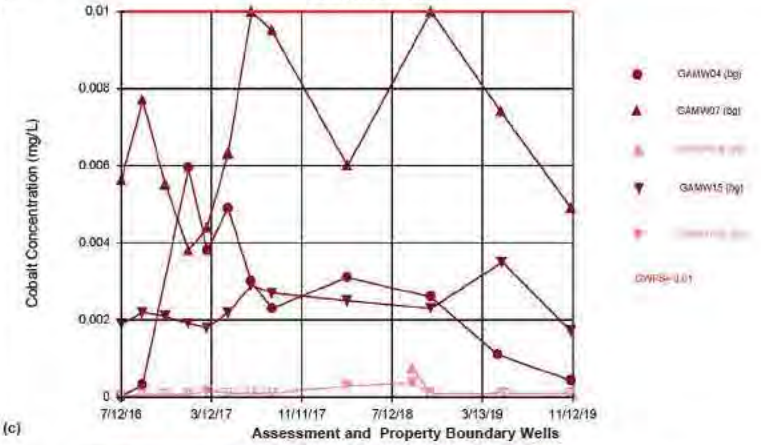
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

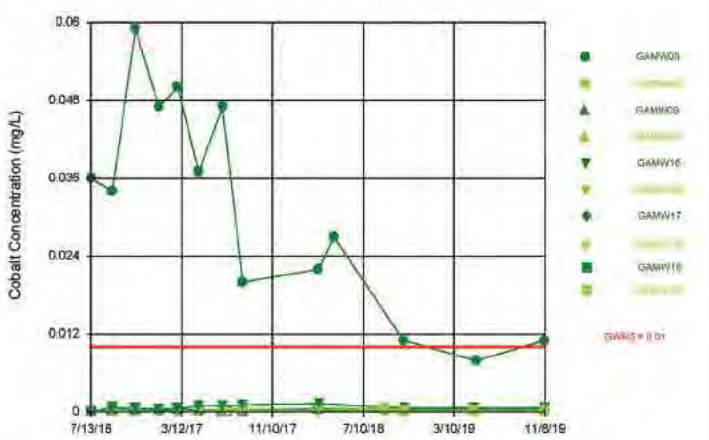
TITLE
Boron Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	5a-c

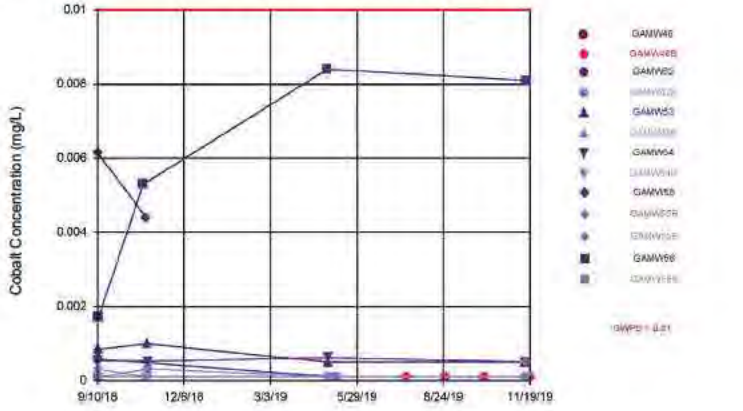
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit

CLIENT
NIPSCO LLC

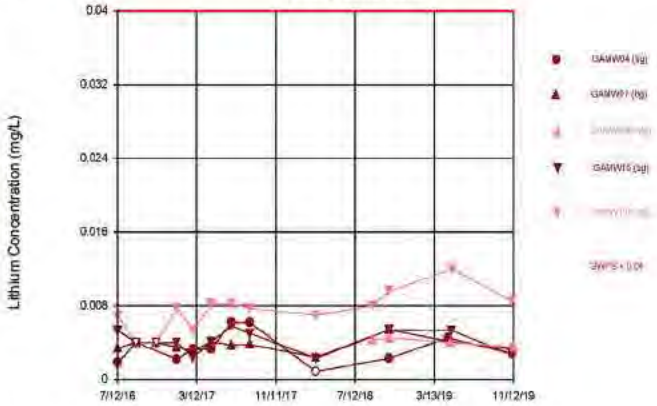
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

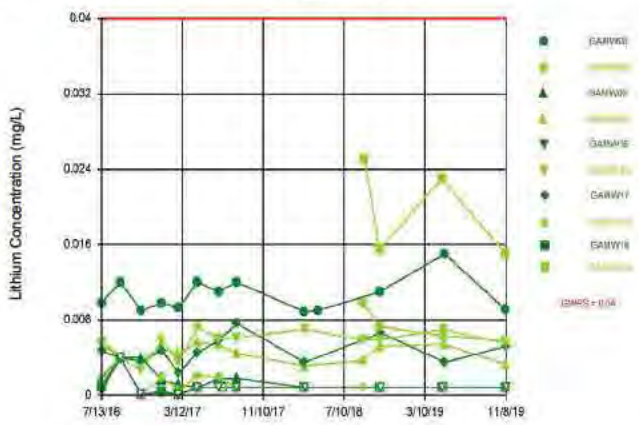
TITLE
Cobalt Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	152	A	6a-c

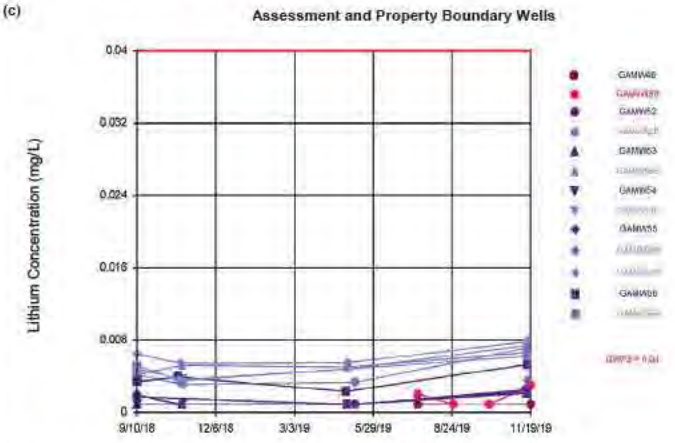
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit

CLIENT
NIPSCO LLC

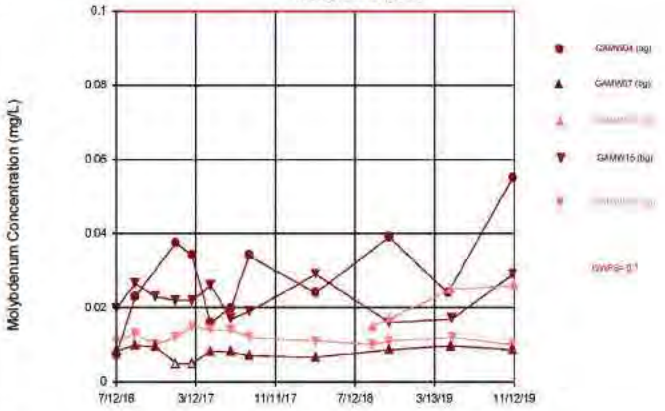
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

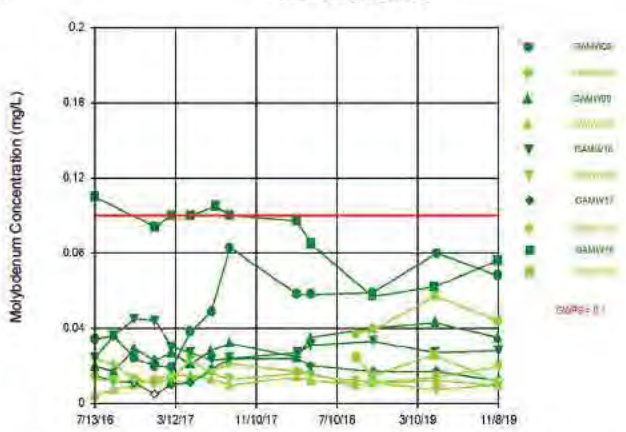
TITLE
Lithium Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	7a-c

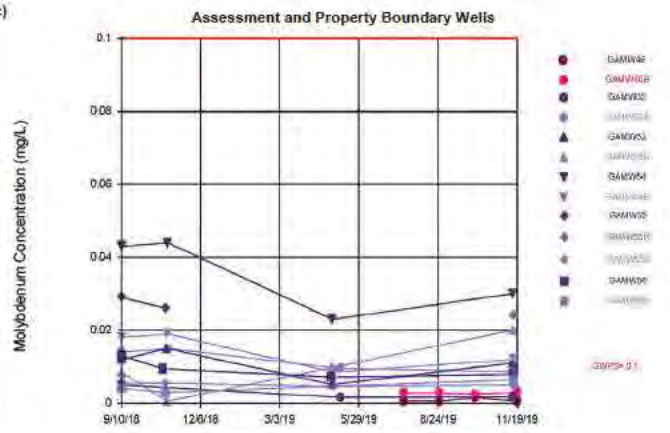
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit

CLIENT
NIPSCO LLC

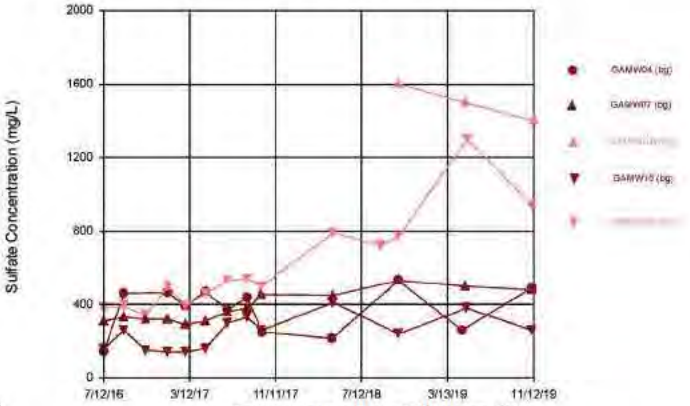
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

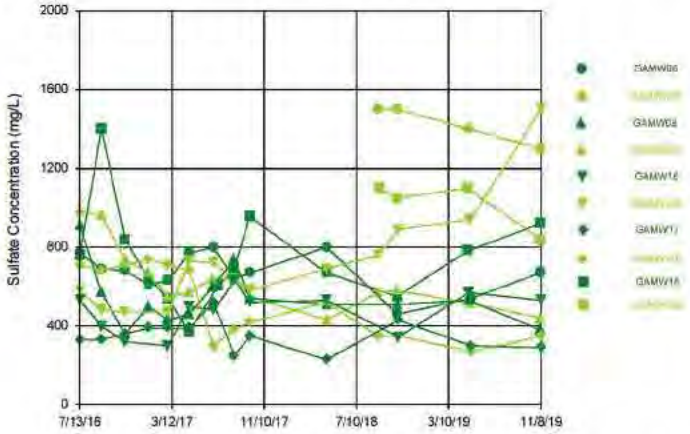
TITLE
Molybdenum Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	8a-c

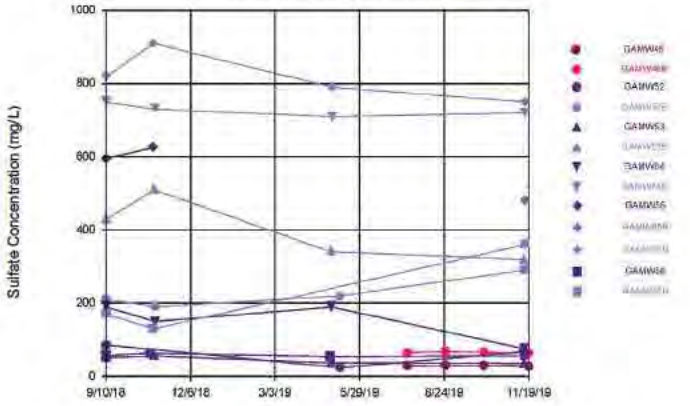
(a)



(b)



(c)



Note: Open symbols reflect sample measurements below the laboratory method detection limit

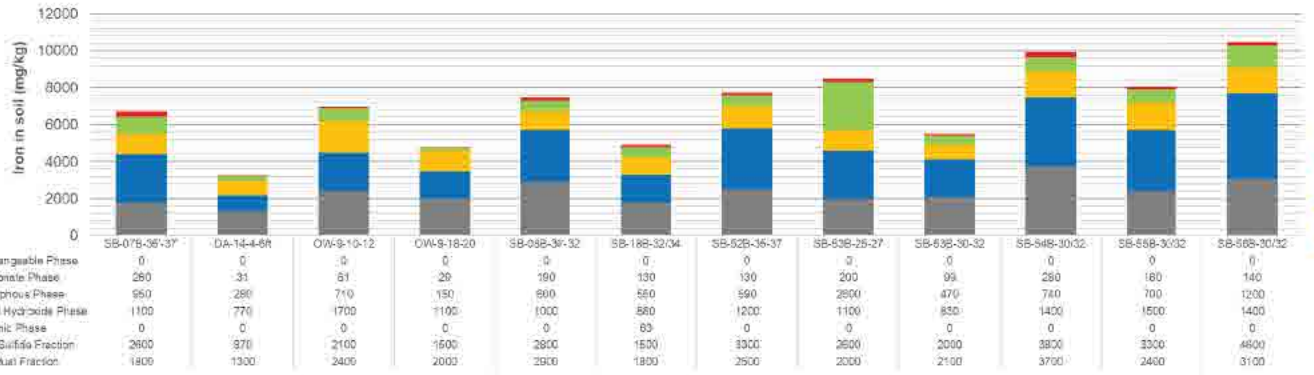
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

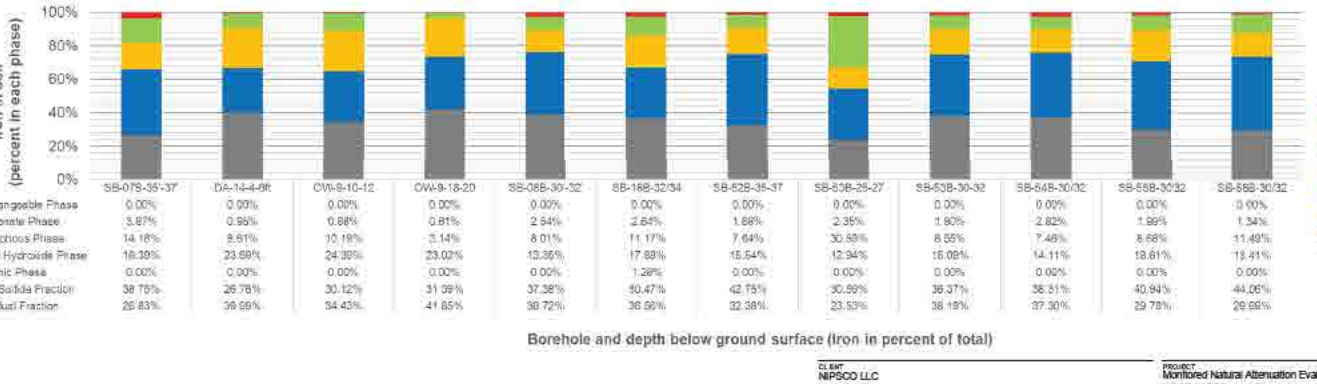
TITLE
Sulfate Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	9a-c



	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	180	140
Amorphous Phase	950	280	710	150	660	550	590	2800	470	740	700	1200
Metal Hydroxide Phase	1100	770	1700	1100	1000	880	1200	1100	850	1400	1500	1400
Organic Phase	0	0	0	0	0	63	0	0	0	0	0	0
Acid/Sulfide Fraction	2600	970	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%	8.81%	11.17%	7.64%	32.89%	8.55%	7.46%	8.68%	11.49%
Metal Hydroxide Phase	16.39%	23.69%	24.39%	23.02%	13.36%	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%	29.78%	30.12%	31.39%	37.38%	30.47%	42.75%	30.59%	36.37%	36.51%	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%	29.79%	29.69%

Borehole and depth below ground surface (Iron in percent of total)

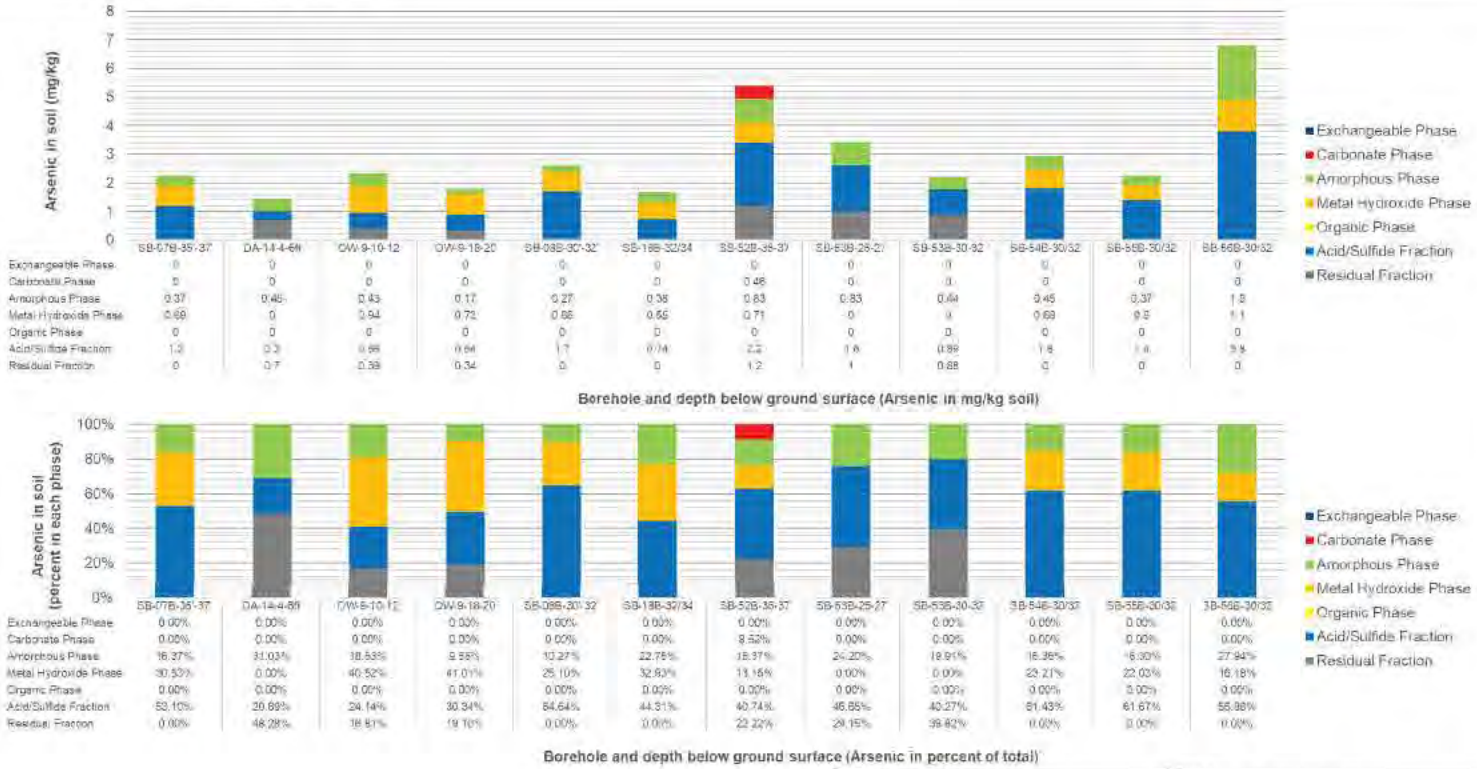
CLIENT
NIPSCO LLC

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



	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	0.46	0.43	0.17	0.27	0.38	0.83	0.83	0.64	0.45	0.37	1.9
Metal Hydroxide Phase	0.69	0	0.94	0.72	0.66	0.55	0.71	0	0	0.69	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	0.88	0.84	1.7	0.74	2.2	1.6	0.89	1.8	1.4	3.5
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%	16.36%	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%	25.21%	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)

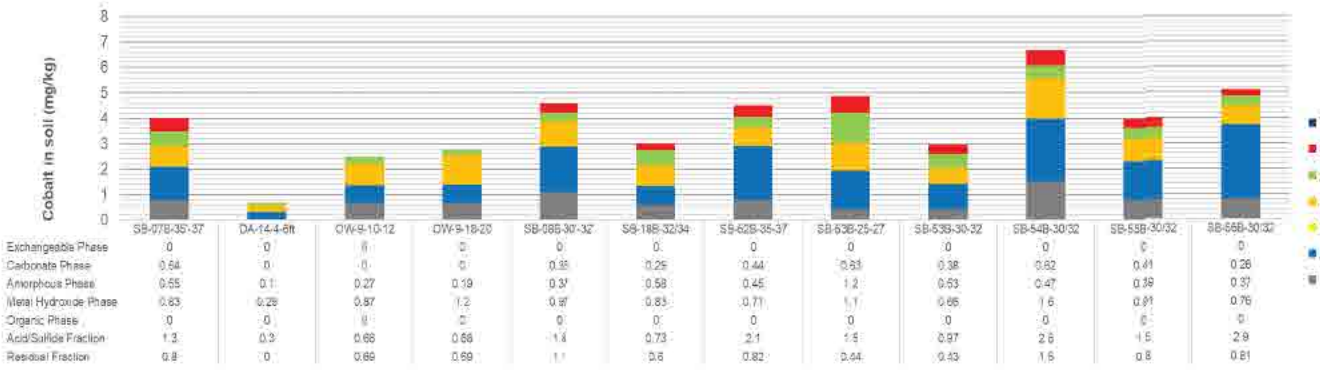
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

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Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

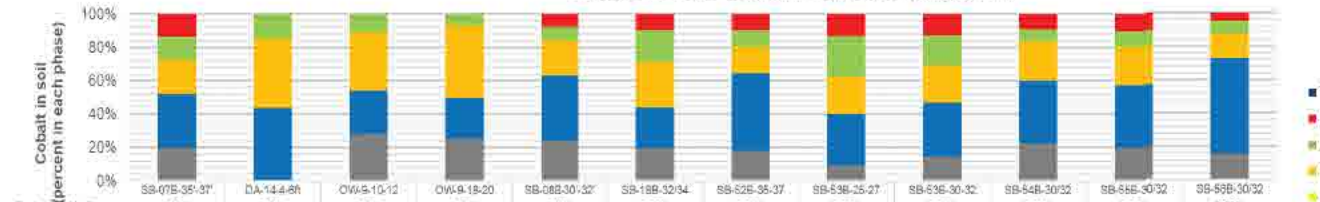
TITLE
Arsenic Sequential Extraction Results

PROJECT NO.	PHASE	REV.	FIGURE
19121567	152	A	11



	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-55B-30/32
Exchangeable Phase	0	0	0	0	0	0	0	0	0	0	0	0
Carbonate Phase	0.64	0	0	0	0.33	0.25	0.44	0.83	0.38	0.62	0.41	0.26
Amorphous Phase	0.55	0.1	0.27	0.19	0.3'	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	0.9'	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	0.68	0.56	1.4	0.73	2.1	1.5	0.97	2.6	1.5	2.9
Residual Fraction	0.8	0	0.69	0.69	1.1	0.6	0.82	0.64	0.43	1.6	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-55B-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%	7.65%	9.57%	9.75%	12.94%	12.79%	9.27%	10.22%	6.10%
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	20.85%	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%	46.48%	30.80%	32.66%	37.37%	37.41%	56.86%
Residual Fraction	19.90%	0.00%	27.71%	25.00%	23.97%	18.80%	18.14%	9.03%	14.48%	22.42%	19.95%	15.88%

Borehole and depth below ground surface (Cobalt in percent of total)

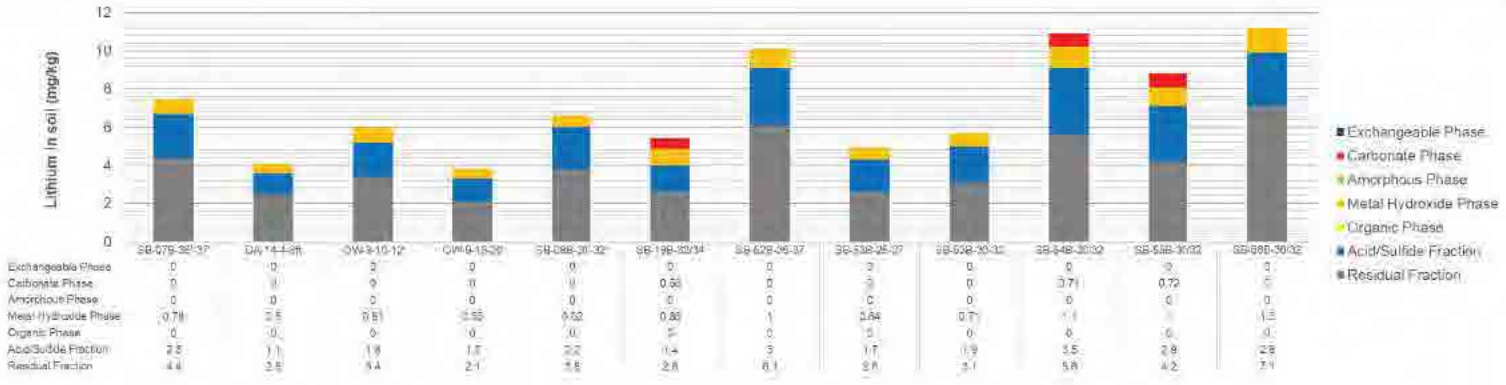
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
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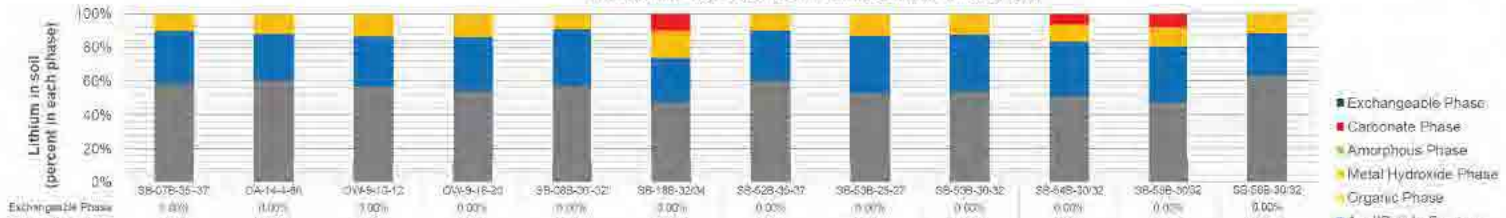
TITLE
Cobalt Sequential Extraction Results

PROJECT NO.	PHASE	REV.	FIGURE
19121567	192	A	12



	SB-07B-35-37	DA-14-4-6ft	OW9-10-12	OW9-18-20	SB-08B-30-32	SB-19B-32/34	SB-62B-35-37	SB-53B-25-27	SB-53B-30-32	SB-64B-30/32	SB-59B-30/32	SB-66B-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	0.51	0.55	0.52	0.89	1	0.84	0.71	1.1	1	1.3
Organic Phase	0	0	0	0	0	0	0	0	0	0	0	0
Acid/Sulfide Fraction	2.8	1.1	1.8	1.5	2.2	1.4	3	1.7	1.9	3.5	2.8	2.8
Residual Fraction	4.4	2.5	3.4	2.1	3.8	2.8	6.1	2.8	3.1	5.8	4.2	7.1

Borehole and depth below ground surface (Lithium in mg/kg soil)



	SB-07B-35-37	DA-14-4-6ft	OW9-10-12	OW9-18-20	SB-08B-30-32	SB-19B-32/34	SB-62B-35-37	SB-53B-25-27	SB-53B-30-32	SB-64B-30/32	SB-59B-30/32	SB-66B-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%	16.67%	9.90%	12.86%	12.43%	10.09%	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	38.75%	26.83%	26.25%	31.17%	32.23%	25.83%	29.70%	34.41%	33.21%	32.08%	32.68%	25.00%
Residual Fraction	58.82%	60.98%	56.67%	54.55%	57.40%	47.07%	60.40%	52.63%	54.29%	51.33%	47.02%	63.39%

Borehole and depth below ground surface (Lithium in percent of total)

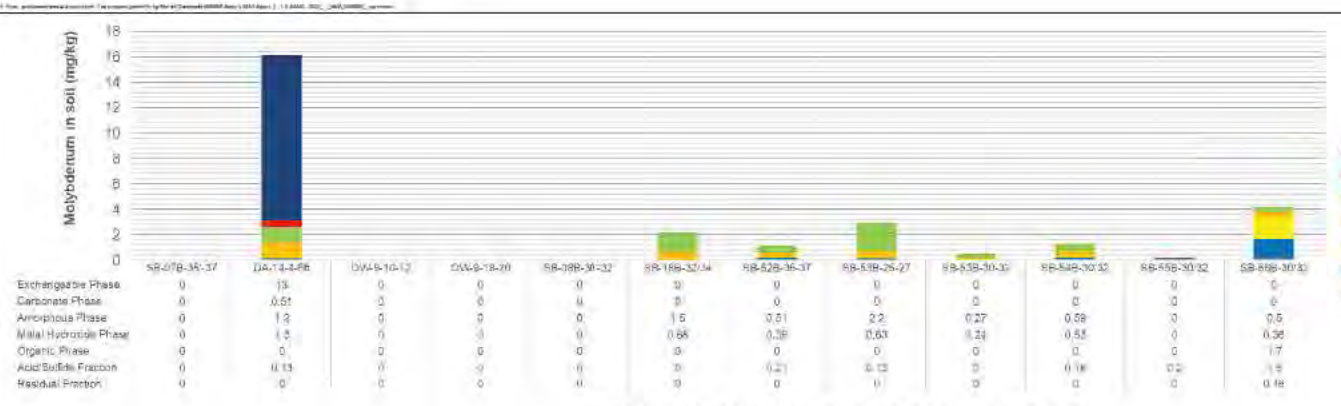
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

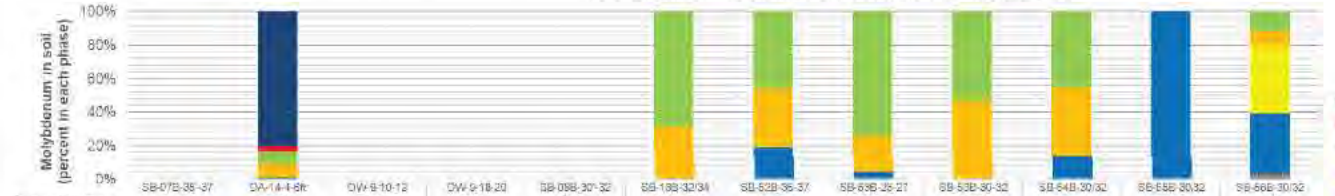
TITLE
Lithium Sequential Extraction Results

PROJECT NO.	PHASE	REV.	FIGURE
19121567	152	A	13



	SB-07B-35-37	DA-14-4-5R	OW-9-10-12	OW-9-18-20	SB-09B-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-66B-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	0.69	0	0.5
Metal Hydroxide Phase	0	1.5	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	0.19	0.2	1.5
Residual Fraction	0	0	0	0	0	0	0	0	0	0	0	0.18

Borehole and depth below ground surface (Molybdenum in mg/kg soil)



	SB-07B-35-37	DA-14-4-5R	OW-9-10-12	OW-9-18-20	SB-09B-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-66B-30/32
Exchangeable Phase	0.00%	80.66%	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%	45.39%	0.00%	11.65%
Metal Hydroxide Phase	0.00%	9.05%	0.00%	0.00%	0.00%	31.19%	35.14%	21.28%	47.06%	46.77%	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)

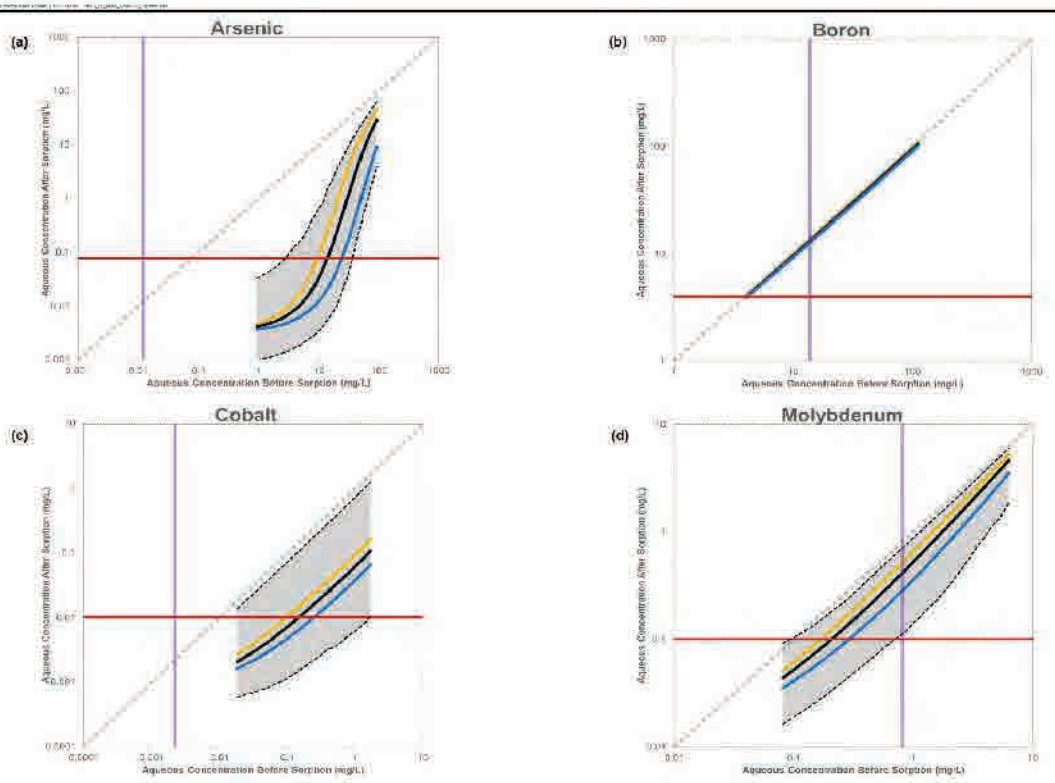
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Molybdenum Sequential Extraction Results

PROJECT NO.	PHASE	REV.	FIGURE
19121567	152	A	14



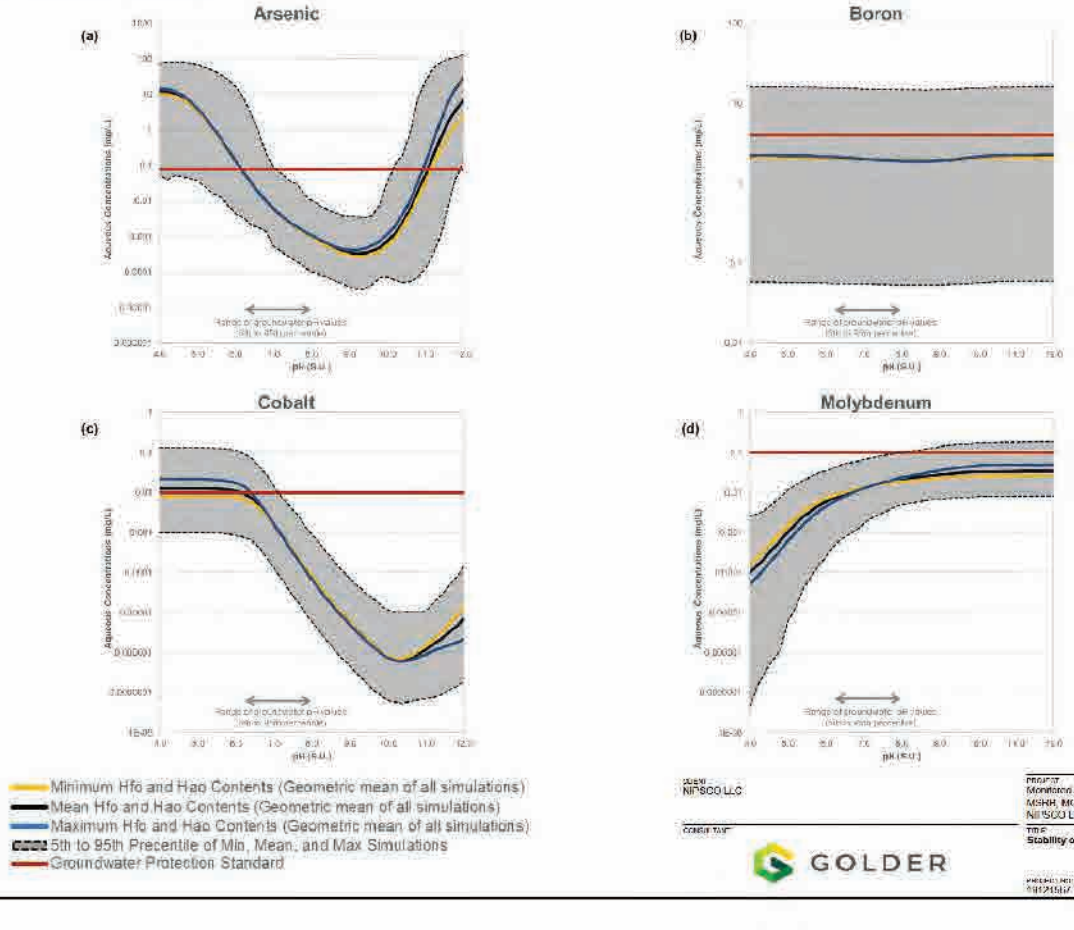
CLIENT
NRGCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSHH, MCWH, and Laying Area
NRGCO 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

PROJECT NO. 19121557 | PHASE 150 | REV. A | FIGURE 15



CLIENT
NRGCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSWF, IMCWF, and Laying Area
NRGCO LLC/ R. M. Schahfer Generating Station

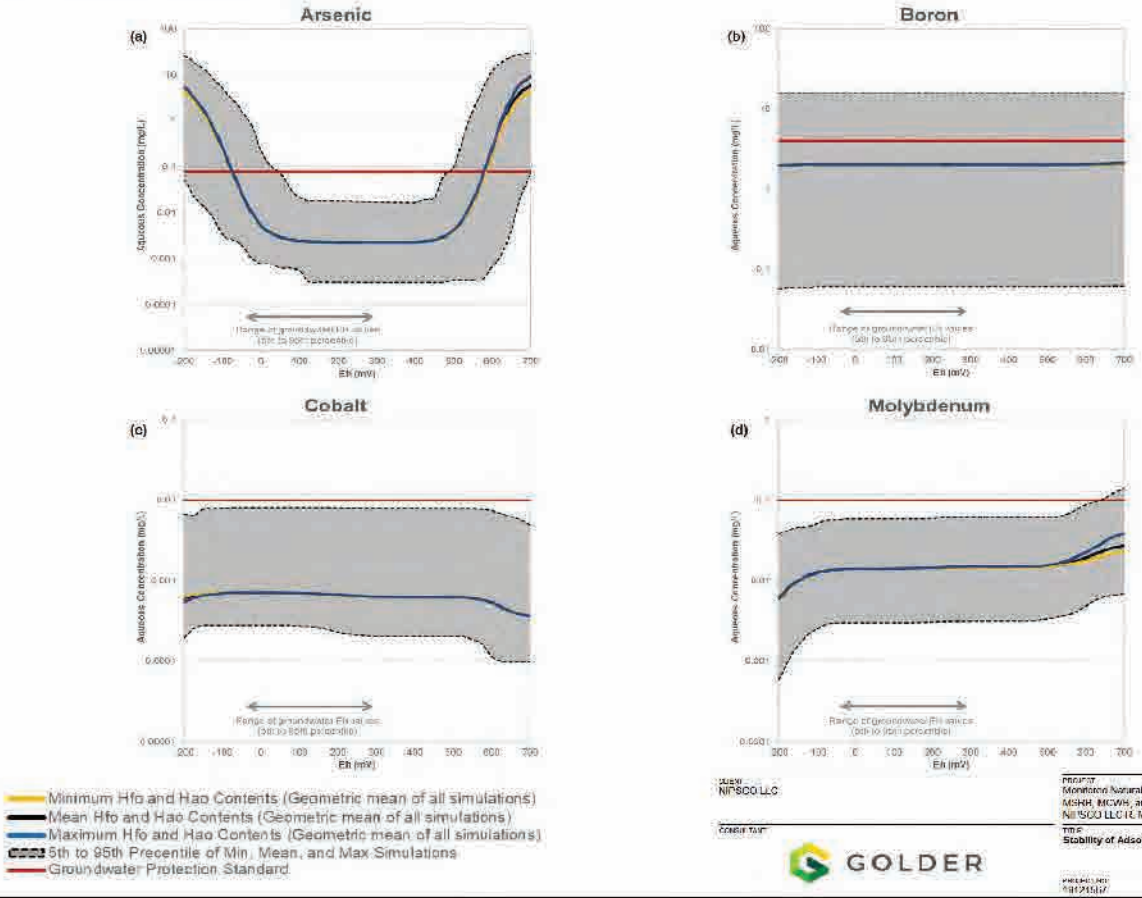
TITLE
Stability of Adsorbed Constituents Versus pH

PROJECT NO.
19121567

PHASE
100

REV.
A

FIGURE
16



CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSWF, IMCWF, and Haying Area
NIPSCO LLC R. M. Schahfer Generating Station

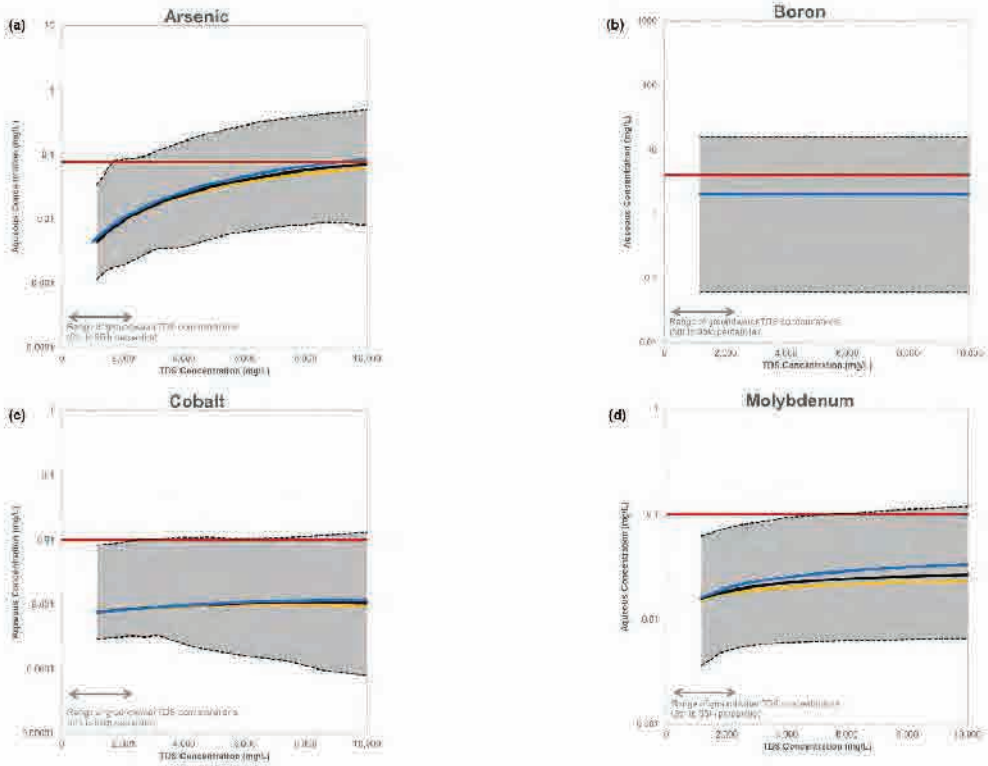
TITLE
Stability of Adsorbed Constituents Versus Eh

PROJECT NO.
19125507

PHASE
150

REV.
A

FIGURE
17



CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSWF, MCWF, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Stability of Adsorbed Constituents Versus TDS

PROJECT NO.
19121560

PHASE
150

REV.
A

FIGURE
18

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 Generat ng Station
Wheatfield ndiana

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
Samp e Type		N	N	N	FD	N	N	N	N	N	N	FD	N	FD	N	N	N	N
Chemical Name	Un t																	
CCR Appendix I I I																		
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
Ca cium	mg/L	110	230	300	270	240	230	220	200	200	140			140	140	210	130	190
Ch oride	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
Su fate	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																		
Ant mony	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
L thium	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																		
Alkal nity Bicarbonate (HCO3)	mg/L																	
Alkal nity Carbonate (CO3)	mg/L																	
Alkal nity Hydrox de (OH)	mg/L																	
Alkal nity Total	mg/L															230	190	270
Ferr c 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 Potent al	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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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
Samp e Type		N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N	N	N	N
Chemical Name	Un t																			
CCR Appendix I I I																				
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
Ca cium	mg/L	170	190	200	170	170	190	220	190	220	220		210	230	220	180	370	430	380	400
Ch oride	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
Su fate	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																				
Ant mony	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
L thium	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																				
Alkal nity Bicarbonate (HCO3)	mg/L																180			
Alkal nity Carbonate (CO3)	mg/L																5 U			
Alkal nity Hydrox de (OH)	mg/L																5 U			
Alkal nity Total	mg/L													260	270	250	180	180	170	170
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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
Samp e Type		N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	FD	N	N	N
Chemical Name	Un t																				
CCR Appendix I I I																					
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
Ca cium	mg/L	310	310	300	260	270	310	340	270	290		360	230	250	280		380		370	350	340
Ch oride	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
Su fate	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																					
Ant mony	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
L thium	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																					
Alkal nity Bicarbonate (HCO3)	mg/L															160	160				
Alkal nity Carbonate (CO3)	mg/L															5 U	5 U				
Alkal nity Hydrox de (OH)	mg/L															5 U	5 U				
Alkal nity Total	mg/L												350	380	380	160	160	160	160	130	160
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nepheloметric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.
UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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
Samp e Type		N	N	N	N	FD	N	FD	N	N	N	N	N	N	N	FD	N	N
Chemical Name	Un t																	
CCR Appendix I I I																		
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
Ca cium	mg/L	320	240	210	210	200	200	220	240	270	280	220		220	220	200	200	150
Ch oride	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
Su fate	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																		
Ant mony	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
L thium	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																		
Alkal nity Bicarbonate (HCO3)	mg/L																	
Alkal nity Carbonate (CO3)	mg/L																	
Alkal nity Hydrox de (OH)	mg/L																	
Alkal nity Total	mg/L														150	110	100	110
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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
Samp e Type		FD	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	FD	N	N
Chemical Name	Un t																		
CCR Appendix I I I																			
Boron	mg/L	24	25	25	16	11	11	11	12	16	16	16		14	12	12		14	8
Ca cium	mg/L	260	280	270	190	200	170	170	180	180	180	160		160	150	180		150	150
Ch oride	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
Su fate	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																			
Ant mony	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
L thium	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																			
Alkal nity Bicarbonate (HCO3)	mg/L														190				
Alkal nity Carbonate (CO3)	mg/L														5 U				
Alkal nity Hydrox de (OH)	mg/L														5 U				
Alkal nity Total	mg/L														190	200	200	200	170
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m illigrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.
UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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
Samp e Type		N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N
Chemical Name	Un t															
CCR Appendix I I I																
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
Ca cium	mg/L	100	130	120	100	82	81	95	160	150	77		170	120	140	100
Ch oride	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
Su fate	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																
Ant mony	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
L thium	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		0.0617		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																
Alkal nity Bicarbonate (HCO3)	mg/L															
Alkal nity Carbonate (CO3)	mg/L															
Alkal nity Hydrox de (OH)	mg/L															
Alkal nity Total	mg/L													180	180	170
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

Location		GAMW158																
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	
Samp e Type		N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	FD	N
Chemical Name	Un t																	
CCR Appendix I I I																		
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
Ca cium	mg/L	160	160	160	180	160	170	190	170	73		230		200	210	280		280
Ch oride	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
Su fate	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																		
Ant mony	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
L thium	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																		
Alkal nity Bicarbonate (HCO3)	mg/L												180	180				
Alkal nity Carbonate (CO3)	mg/L												5 U	5 U				
Alkal nity Hydrox de (OH)	mg/L												5 U	5 U				
Alkal nity Total	mg/L												180	180	200	200	180	180
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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	
Samp e Type		N	N	N	N	N	N	N	N	N	N	N	FD	N	N	FD	N
Chemical Name	Un t																
CCR Appendix I I I																	
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
Ca cium	mg/L	230	180	170	120	160	210	220	240	57		220	160	160	210		210
Ch oride	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
Su fate	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																	
Ant mony	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
L thium	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																	
Alkal nity Bicarbonate (HCO3)	mg/L																
Alkal nity Carbonate (CO3)	mg/L																
Alkal nity Hydrox de (OH)	mg/L																
Alkal nity Total	mg/L													180	200	5 U	210
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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	
Samp e Type		N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	FD	N
Chemical Name	Un t																	
CCR Appendix I I I																		
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
Ca cium	mg/L	230	190	180	180	210	210	270	220	260	100		250	310	350	350	300	280
Ch oride	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
Su fate	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																		
Ant mony	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
L thium	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																		
Alkal nity Bicarbonate (HCO3)	mg/L													200				
Alkal nity Carbonate (CO3)	mg/L													5 U				
Alkal nity Hydrox de (OH)	mg/L													5 U				
Alkal nity Total	mg/L													200	210	190		200
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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	
Samp e Type		N	N	N	N	N	N	N	N	N	FD	N	FD	N	N	N	N	
Chemical Name	Un t																	
CCR Appendix I I I																		
Boron	mg/L	12	12	11	11	11	8.9	7.6	12	12			5.8	5.8	16	7.7	4.9	
Ca cium	mg/L	150	160	170	180	200	180	120	150	64			110	110	200	130	120	
Ch oride	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	
Su fate	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																		
Ant mony	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	
L thium	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																		
Alkal nity Bicarbonate (HCO3)	mg/L																	
Alkal nity Carbonate (CO3)	mg/L																	
Alkal nity Hydrox de (OH)	mg/L																	
Alkal nity Total	mg/L														190	160	160	
Ferr c 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	
Spec f c 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	
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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
Samp e Type		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Chemical Name	Un t															
CCR Appendix I I I																
Boron	mg/L	18	19	19	21	22	20	16	13	11		13	10	12	12	9.4
Ca cium	mg/L	230	250	240	250	270	250	240	160	57		180	150	150	180	150
Ch oride	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
Su fate	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																
Ant mony	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
L thium	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																
Alkal nity Bicarbonate (HCO3)	mg/L												210			
Alkal nity Carbonate (CO3)	mg/L												5 U			
Alkal nity Hydrox de (OH)	mg/L												5 U			
Alkal nity Total	mg/L												210	230	300	190
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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
Samp e 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	Un t																						
CCR Appendix I I I																							
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
Ca cium	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
Ch oride	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
Su fate	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																							
Ant mony	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
L thium	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																							
Alkal nity Bicarbonate (HCO3)	mg/L																		230				
Alkal nity Carbonate (CO3)	mg/L																		5 U				
Alkal nity Hydrox de (OH)	mg/L																		5 U				
Alkal nity Total	mg/L															240	190	250	230		230	210	200
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m ligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
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UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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	
Samp e 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	Un t																						
CCR Appendix I I I																							
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
Ca cium	mg/L	56	14	28	25 J-	25	25	23	27	25	58	58	56	52	58	49	56	75		59	52		72
Ch oride	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
Su fate	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																							
Ant mony	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
L thium	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																							
Alkal nity Bicarbonate (HCO3)	mg/L																	210					
Alkal nity Carbonate (CO3)	mg/L																	5 U					
Alkal nity Hydrox de (OH)	mg/L																	5 U					
Alkal nity Total	mg/L			82					73			140					130	210	180	190	170	190	190
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.
UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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
Samp e 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	Un t																						
CCR Appendix I I I																							
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
Ca cium	mg/L	160	160	110	130	45	53	17	25	180		190	150	140	93	88	93	81	210		220	200	240
Ch oride	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
Su fate	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																							
Ant mony	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
L thium	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																							
Alkal nity Bicarbonate (HCO3)	mg/L	220				120				250					150				240				
Alkal nity Carbonate (CO3)	mg/L	5 U				5 U				5 U					5 U				5 U				
Alkal nity Hydrox de (OH)	mg/L	5 U				5 U				5 U					5 U				5 U				
Alkal nity 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
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Appendix A 1 Groundwater Analytical Data
CCR Unit Schahfer MSRB MCWB and Drying Area
NIPSCO LLC R M Schahfer Generat ng Station
Wheatfield ndiana

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
Samp e Type		FD	N	FD	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N
Chemical Name	Un t																		
CCR Appendix I I I																			
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
Ca cium	mg/L	260	250	270	260	180	250	250	260	210	210	130	110	91	120	140	140	150	150
Ch oride	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
Su fate	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																			
Ant mony	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
L thium	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																			
Alkal nity Bicarbonate (HCO3)	mg/L		240					230				370				370			
Alkal nity Carbonate (CO3)	mg/L		5 U					5 U				5 U				5 U			
Alkal nity Hydrox de (OH)	mg/L		5 U					5 U				5 U				5 U			
Alkal nity Total	mg/L		240		240	230		230	220	230	230	370	370	300	330	370	410	330	270
Ferr c 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
Spec f c 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
Turb dity	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 res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nepheloметric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.
UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Prepared by: DFSC
Checked by: KMC
Rev ewed 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 he result was not detected above the method detection limit (MDL) for the sample; he 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

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List of Attachments:

Attachment A Model Grid

Attachment B Cross Section of Model Grid

Attachment C Boundary Conditions

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Attachment E Active Pumping Wells

Attachment F Model Calibration – September 2019

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Table B-2 Site Pumping Test Results

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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



NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRD, MCWD, AND DRYING AREA
MICHIGAN CITY GENERATING STATION

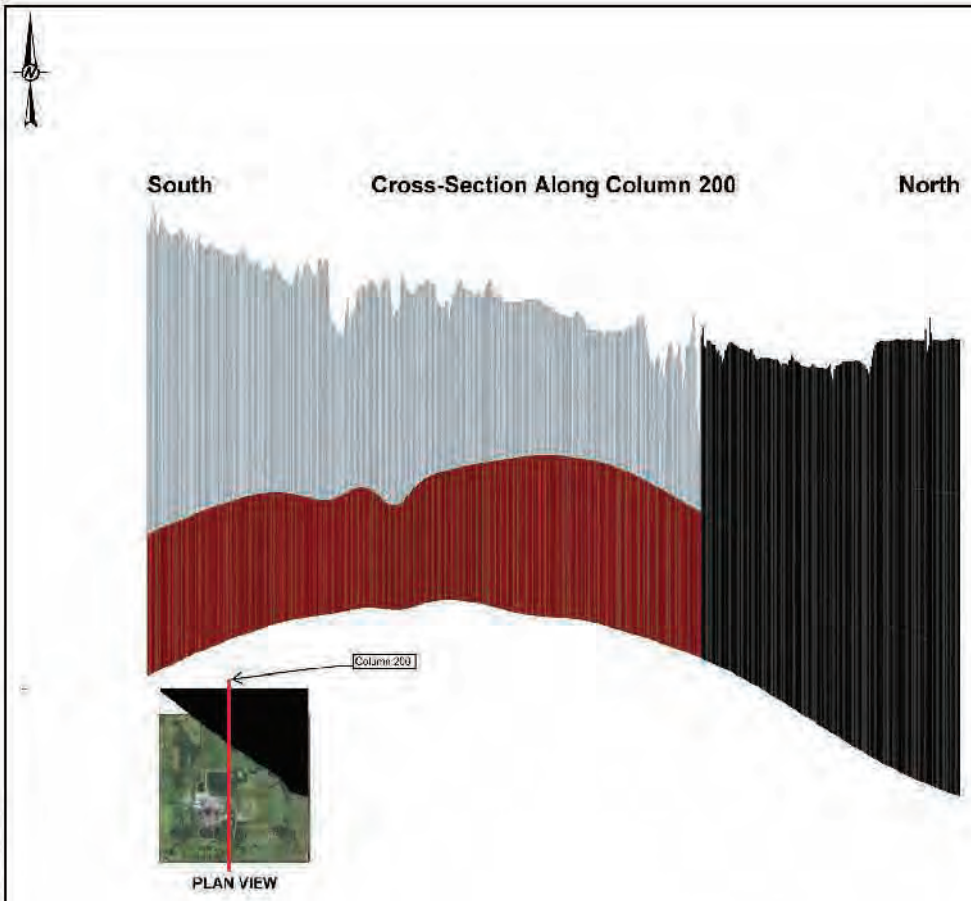
MODEL GRID

GOLDER

DESIGNED RWB

APPROVED RWB

19121587 A



CLIENT
NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

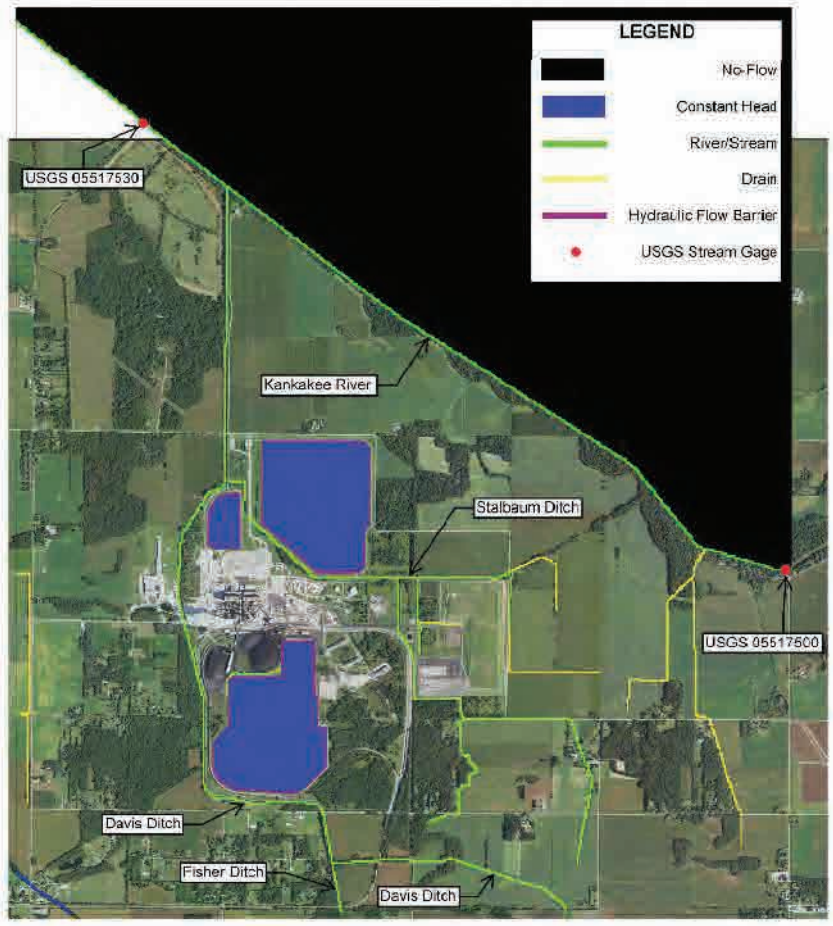
PROJECT
GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRD, MCWD, AND DRYING AREA
NIPSCO R.M. SCHAHFER GENERATING STATION

TITLE
CROSS SECTION OF MODEL GRID

CONSULTANT
GOLDER

DESIGNED	RWB
PREPARED	SR
REVIEWED	BP
APPROVED	RWB

PROJECT NO. 19121587 | B



NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

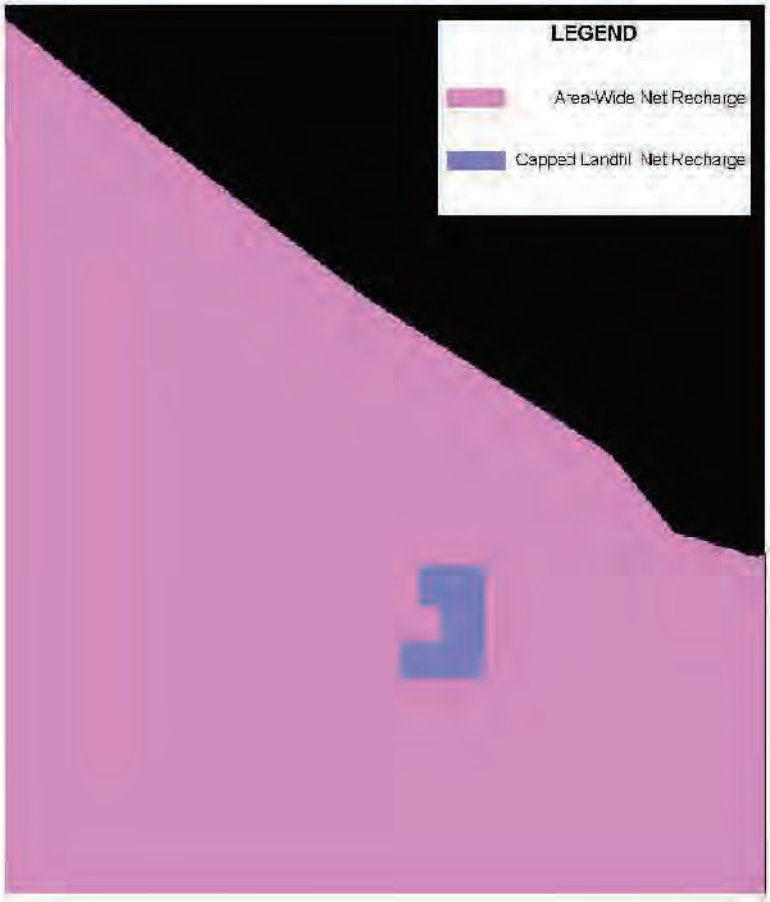
GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRB, MCWD, AND DRYING AREA
MICHIGAN CITY GENERATING STATION

BOUNDARY CONDITIONS

GOLDER

DESIGNED: RWB

PROJECT NO.: 19431587 | CONTROL: - | REV: - | C



NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRD, MCWD, AND DRYING AREA
MICHIGAN CITY GENERATING STATION

PRECIPITATION RECHARGE ZONES

GOLDER

DESIGNED RWS

APPROVED MKG

19121587 D



LEGEND

Well Location

0 700 1,400

Feet

1:1 - 1,667 (at)

NOTE(S)

1. DASTON MODEL VER. 2018.

REFERENCE(S)

1. COORDINATE SYSTEM: NAD 1983 STATE PLANE INDIANA WEST FIPS 1302 FEET
2. 2019 NAIP IMAGERY RETRIEVED FROM ESRI ARCGIS ONLINE IMAGERY SERVICE LAYER

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRD, MCWD, AND DRYING AREA
NIPSCO R.M. SCHAHFER GENERATING STATION

TITLE

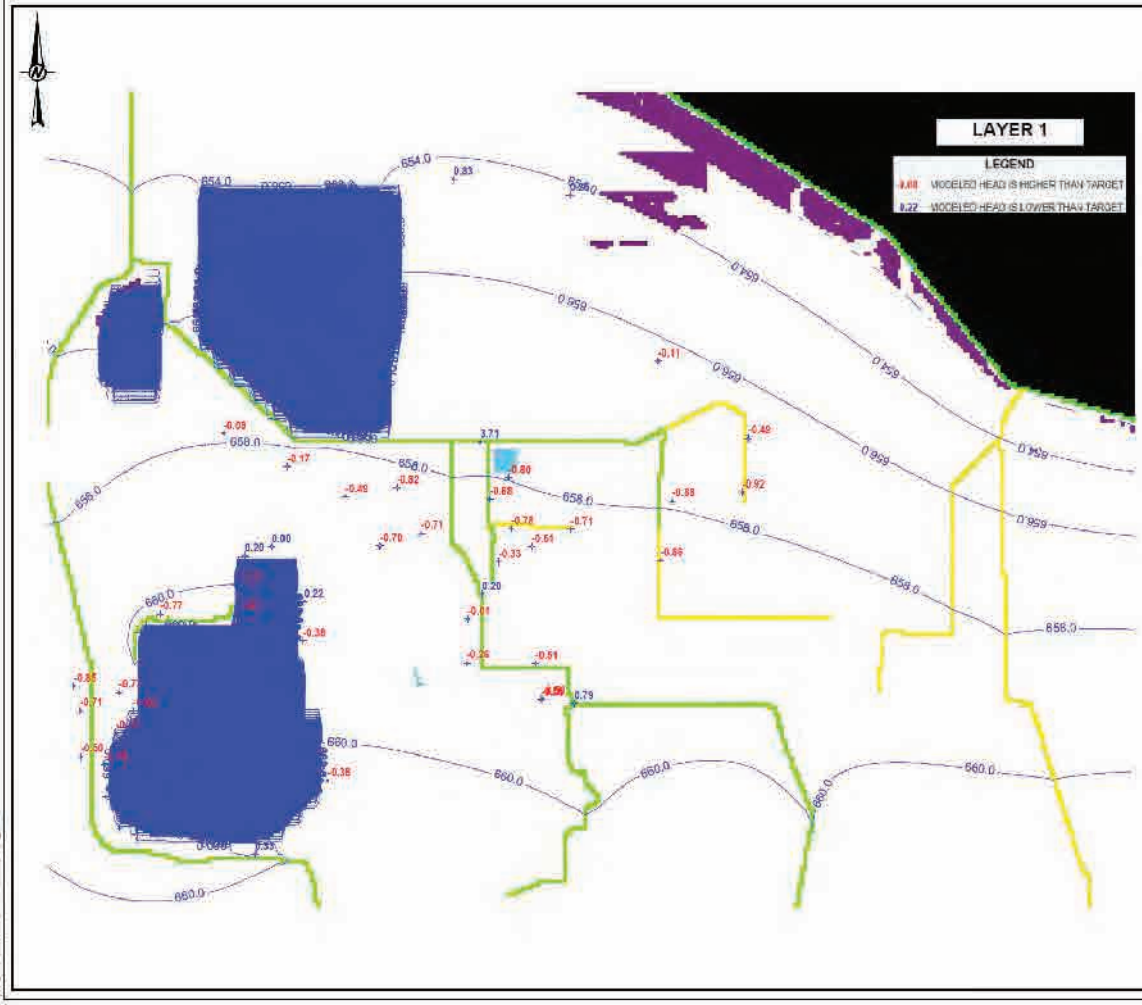
ACTIVE PUMPING WELLS

CONSULTANT

GOLDER

YYYY-MM-DD	2020-12-09
DESIGNED	RWS
PREPARED	SR
REVIEWED	RP
APPROVED	DAH

PROJECT NO. 19121567 | CONTROL - | REV. - | FIGURE NO. E



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, MCWD, AND DRYING AREA
NIPSCO R.M. SCHAHFER GENERATING STATION

TITLE:
MODEL CALIBRATION - SEPTEMBER 2019

CONSULTANT:
GOLDER

YYYY-MM-DD	2020-12-22
DESIGNED	RWB
PREPARED	SR
REVIEWED	RP
APPROVED	RWB

PROJECT NO.: 19121567 | CONTROL: - | REV.: - | FIG. NO.: F



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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 mhane @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 mhane @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

GOLDER
MEMBER OF WSP

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

+1 517 482-2262

21496761

December 31, 2021

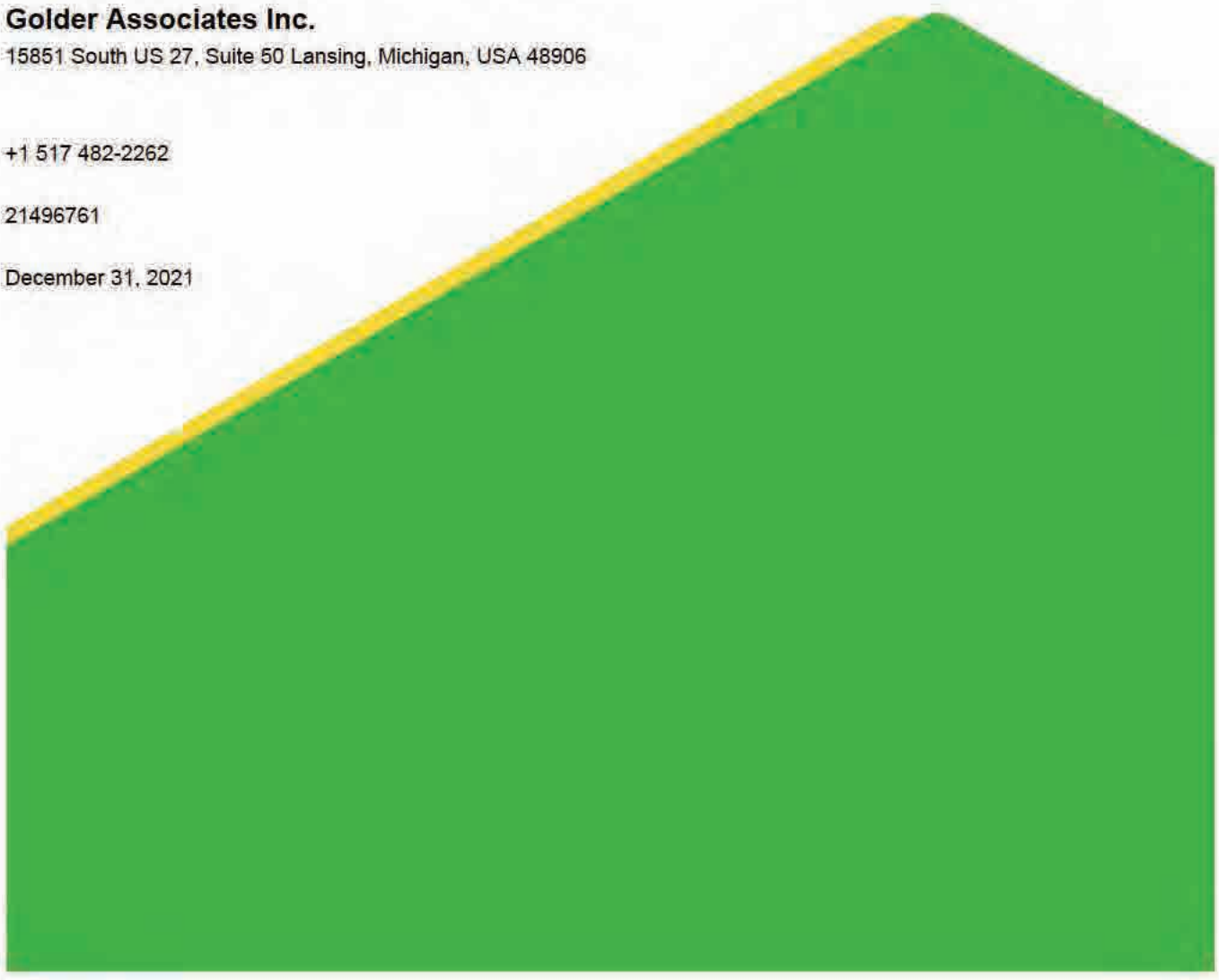


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1.0 INTRODUCTION

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. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

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.

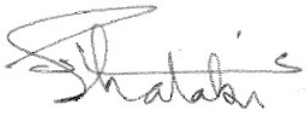
For additional information about air permits and how the public and interested parties can participate, refer to the IDEM Air Permits page on the Internet at: https://www.in.gov/idem/airpermit/public-participation/; and the Citizens' Guide to IDEM on the Internet at:

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

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

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

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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):

Page 2 of 2

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.

*****

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".

*****

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

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B.10 Preventive Maintenance Plan [326 IAC 2-7-5(12)][326 IAC 1-6-3]

*****

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100 North Senate Avenue, **Room 13W**
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B.11 Emergency Provisions [326 IAC 2-7-16]

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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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*****

B.17 Permit Amendment or Modification [326 IAC 2-7-11][326 IAC 2-7-12][40 CFR 72]

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B.19 Operational Flexibility [326 IAC 2-7-20][326 IAC 2-7-10.5]

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*****

B.22 Transfer of Ownership or Operational Control [326 IAC 2-7-11]

*****

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*****

C.8 Asbestos Abatement Projects [326 IAC 14-10][326 IAC 18][40 CFR 61, Subpart M]

*****

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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]

*****

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*****

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]

*****

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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**
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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**
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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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*****

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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*****

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 Em t (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 Em t (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 b/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 Em t in tons/yr	246	31	0.27	0.51	5.01E-05

Uncontrolled/Unlimited HAPs Metals								
	Selenium	Cadmium	Chromium	Manganese	Nickel	Bery lium	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 Em t 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 b/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 b/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	Beryl ium	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 neglig ble.

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 ***	Beryl ium ***	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/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 b/MMBtu. (e.g. (5 lb/Tbtu) * (1 Tbtu/1,000,000,000,000 Btu) * (1,000,000 Btu/ 1 MMBtu) 5.0E-06 b/MMBtu)

Note 1 Limited HCl EF Pursuant to NESHAP UUUUU, Table 2 E.F 0.002 lb/MMBtu; (e.g. (0.002 b/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 (m les/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

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
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

IDEM Staff	JLSCOTT 7/7/2025 SIGECO - FB Culley Generating Station 173-48980-00001 Final		AFFIX STAMP HERE IF USED AS CERTIFICATE OF MAILING
Name and address of Sender	▶	Indiana Department of Environmental Management Office of Air Quality – Permits Branch 100 N. Senate Indianapolis, IN 46204	Type of Mail: **CERTIFICATE OF MAILING ONLY**

Line	Article Number	Name, Address, Street and Post Office Address	Postage	Handing Charges	Act. Value (If Registered)	Insured Value	Due Send if COD	R.R. Fee	S.D. Fee	S.H. Fee	Rest. Del. Fee Remarks
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)*									
11											
12											
13											
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FACSIMILIE OF PS Form 3877

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. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

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