SEPARATIONS PROCESS RESEARCH UNIT
DISPOSITION PROJECT

SPRU EEC-20-001

RCRA INTERIM CORRECTIVE MEASURES REPORT FOR UPPER LEVEL SWMUs and AOC

NYSDEC Hazardous Waste Facility Permit No. 4-4224-00024/00055

May, 2020

5/5/2020

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Appendix 2 Final Site Layout and Grading ***(****provided as inserts and electronically****)***

ACRONYMS

AOC	Area of Concern
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
ICM	Interim Corrective Measures
CoC	Constituent of Concern
DCA	Dichloroethane
DCE	Dichloroethylene
DOE	U.S. Department of Energy
DOECAP	Department of Energy Consolidated Audit Program
DOE-EM	Department of Energy – Environmental Management
DP	Disposition Project
DQO	Data quality objective
EDD	Electronic Data Deliverable
ELAP	Environmental Laboratory Approval Program
EPA	U.S. Environmental Protection Agency
GEL	General Engineering Laboratories
ICM	Interim Corrective Measures
KAPL	Knolls Atomic Power Laboratory
LLRW	Low Level Radioactive Waste
MDC	Minimum Detectable Concentration
MDL	Minimum Detection Limit
MLLW	Mixed Low Level Waste
NFA	No Further Action
NYSDEC	New York State Department of Environmental Conservation
PCB	Polychlorinated Biphenyl
PDR	Preliminary Data Report
PPE	Personal Protective Equipment
QA/QC	Quality assurance and quality control
QAPjP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
SCO	Soil Cleanup Objective
SVOC	Semi-volatile organic compound
SPRU	Separations Process Research Unit
SWPPP	Stormwater Pollution Prevention Plan
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TCE	Trichloroethylene
TCL	Target Compound List
TOGS	Technical and Operational Guidance Series
VOC	Volatile organic compound

1.0 EXECUTIVE SUMMARY

This Interim Corrective Measures (ICM) Implementation report addresses environmental cleanup of chemically impacted soil at the Separations Process Research Unit (SPRU) Disposition Project (DP), Knolls Atomic Power Laboratory (KAPL), in Niskayuna, New York. This ICM report has been prepared to satisfy the corrective measure requirements of the New York State Department of Environmental Conservation (NYSDEC) Hazardous Waste Facility Permit No. 4-4224-00024/00055 under the Resource Conservation and Recovery Act (RCRA) corrective action requirements [1]. This report verifies the cleanup of chemical contamination associated with the demolition, removal, and remediation of Solid Waste Management Units (SWMUs) and an Area of Concern (AOC) located on the SPRU Upper Level, as required, to meet NYSDEC soil cleanup objectives (SCOs) per New York Codes, Rules, and Regulations Part 375-6.8(b). The SCOs selected for each constituent were the lower (more restrictive) value for residential use or groundwater protection with several exceptions (see Section 3.3). In addition, this ICM report includes the information required to obtain a No Further Action (NFA) determination.

This ICM report describes the completion of corrective measures associated with the SPRU Upper Level SWMUs and an AOC, including demolition, excavation, and removal of chemical contamination, as well as chemical confirmation sampling results confirming the SCOs were met. Corrective measures were conducted in accordance with NYSDEC-approved work plans developed for Upper Level SWMUs (Upper Level Work Plan) [2] and the G2 Area of Concern (AOC-008) (G2 Work Plan) [3]. This report provides the required confirmatory evidence that the objectives and requirements detailed in the work plans have been met, including the demolition, excavation, and removal of buildings, associated contaminated materials, and contaminated soil excavation at the SPRU Upper Level site. The SPRU Upper Level site included the H2 Processing Facility (SWMU-030), the H2 Tank Farm (SWMU-031), the Pipe Tunnel (SWMU-057), the SPRU Fractionation Tanks 2 (SWMU-082), and the G2 AOC (AOC-008). The SPRU Fractionation Tanks 1 (SWMU-081), the SPRU Mixed Waste Storage Area (SWMU-085), and the CONEX Box Storage Area (SWMU-086) were located in the Lower Level and supported SPRU remediation activities.

The Upper Level Work Plan also addressed the potential contamination associated with a surface release from the SPRU fractionation tanks (SWMU-082). A sample collected from the spill location following cleanup of impacted surface soil indicated no contamination remained. Therefore, no further excavation or remediation was required for SWMU-082.

Confirmation sampling was conducted in accordance with the Upper Level and G2 Work Plans using applicable guidance documents, including NYSDEC DER-10, *Technical Guidance for Site Investigation and Remediation* [4] and U.S. Environmental Protection Agency SW-846 for sampling and analysis [5]. Confirmation sampling and analysis activities conducted under the work plans indicate that the corrective measures and associated remediation conducted for each of the four Upper Level SWMUs and one AOC addressed in this report have been completed as required and, therefore, these areas warrant an NFA determination.

2.0 INTRODUCTION

2.1 SPRU Background

The SPRU facilities were constructed and operated from the late 1940s to the early 1950s in two Upper Level buildings, G2 and H2, to conduct research on the chemical separation of plutonium and uranium. After discontinuing operations in October 1953, SPRU was maintained in a caretaking status until decommissioning began in 2000. The SPRU Upper Level site included buildings G2 and H2, surrounding asphalt and gravel roadways, and the hillside to the west. The SPRU site map in Figure 1 shows the SWMUs and AOC addressed in this report. The SPRU Upper Level facilities map is shown in Figure 2. Figure 3 and Figure 4 include the H2 Building SWMU and G2 AOC maps, respectively. The fractionation tank SWMUs in the Upper and Lower Level, which were created during the SPRU decommissioning operations, are detailed in Figure 5 and Figure 6. These SWMUs and AOC are identified in the U.S. Department of Energy (DOE) SPRU RCRA Hazardous Waste Part 373 facility permit (RCRA Permit) issued by NYSDEC [1]. The SPRU site EPA ID number issued by NYSDEC is NYR 000 096 859.

The DOE is using its authority under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to address radiological contamination at the SPRU site and is following the non-time critical removal process (42 USC 9601 et seq. 1980). A CERCLA Engineering Evaluation/Cost Analysis was prepared and issued for public comment, and a preferred alternative selected [6]. An Action Memorandum documenting the planned actions under CERCLA was issued in September 2007 and revised in August 2009. The SPRU Upper Level remedial actions included decontaminating, demolishing, and removing buildings G2, H2, and the G2/H2 tunnel; removal of contaminated soil associated with these structures; and off-site disposal of generated waste.

Demolition of SPRU facilities began in 2010 with the removal of the H2 Building above-grade structure and the start of removal of the G2 Building exterior. After an unexpected radiological release during removal of equipment from H2, the technical approach for the project was changed. Enclosures were built around both the G2 and H2 structures to allow decontamination to proceed under controlled ventilation. During construction of the enclosures, rain water accumulated in the basements of both buildings. After the enclosures were constructed, equipment and piping were removed from the G2 and H2 facilities and the interior of the buildings underwent substantial radiological decontamination. Demolition resumed for the G2 and H2 Building structures in 2016 and was completed in 2018. Soil confirmation sampling and SPRU site restoration activities were completed in July 2019.

2.2 Purpose and Objective

The objective of this report is to document the remedial (corrective) actions associated with the SWMUs and completion of the Interim Corrective Measures (ICM) requirements, including removal and excavation of contaminated soil and chemical confirmation sampling results for soil in the SPRU Upper Level SWMUs. The remediation and sampling documented in this report were completed in accordance with SPRU-ENV-020, *RCRA Interim Corrective Measure Work Plan for the Upper Level SWMUs* [2] and SPRU-ENV-017, *RCRA Interim Corrective Measure Work Plan G2 Area of Concern (AOC-008)* [3]. The buildings and contaminated soil removed included chemical contamination associated with the Upper Level SWMUs and AOC found above the cleanup levels. Confirmation sample data obtained during implementation of the ICM Work Plans indicate that there is no chemical contamination above the cleanup levels, and the data are sufficient to obtain an NFA determination for chemical contamination from the NYSDEC.

This report addresses the SPRU Upper Level corrective actions, including the demolition, excavation, and removal of buildings G2, H2, and G2/H2 tunnel; removal of contaminated soil associated with these structures; and off-site disposal of generated waste. The SPRU Upper Level areas of interest are identified in the facility RCRA permit [1]. One additional SWMU, the SPRU Fractionation Tanks 2 (SWMU-082), was identified during SPRU Upper Level remediation activities and evaluated for potential remediation in this report. SWMU-082 was added to the facility RCRA permit in 2012 [7] (see Attachment 1).

This ICM report documents how the corrective measures and associated completion criteria have been satisfied and that an NFA designation should be applied for the subject SWMUs and AOC. This report addresses the following:

- Purpose and objective;
- Discussion of corrective measures and work performed, including the nature and extent of excavated soil and other materials;
- Summary of significant activities or actions completed during the implementation of the corrective measures associated with the ICM Work Plans;
- Discussion of soil confirmation sampling activities;
- Corrective measure completion criteria (or SCOs); and
- Summary and evaluation of laboratory data, including data validation results, that demonstrate that the completion criteria have been met and documentation of any further actions.

An electronic file (D-size plot) of the final site layout and grading is provided in Appendix 2. This documents the final site conditions as required per DER-10 Section 5.8(b)(8).

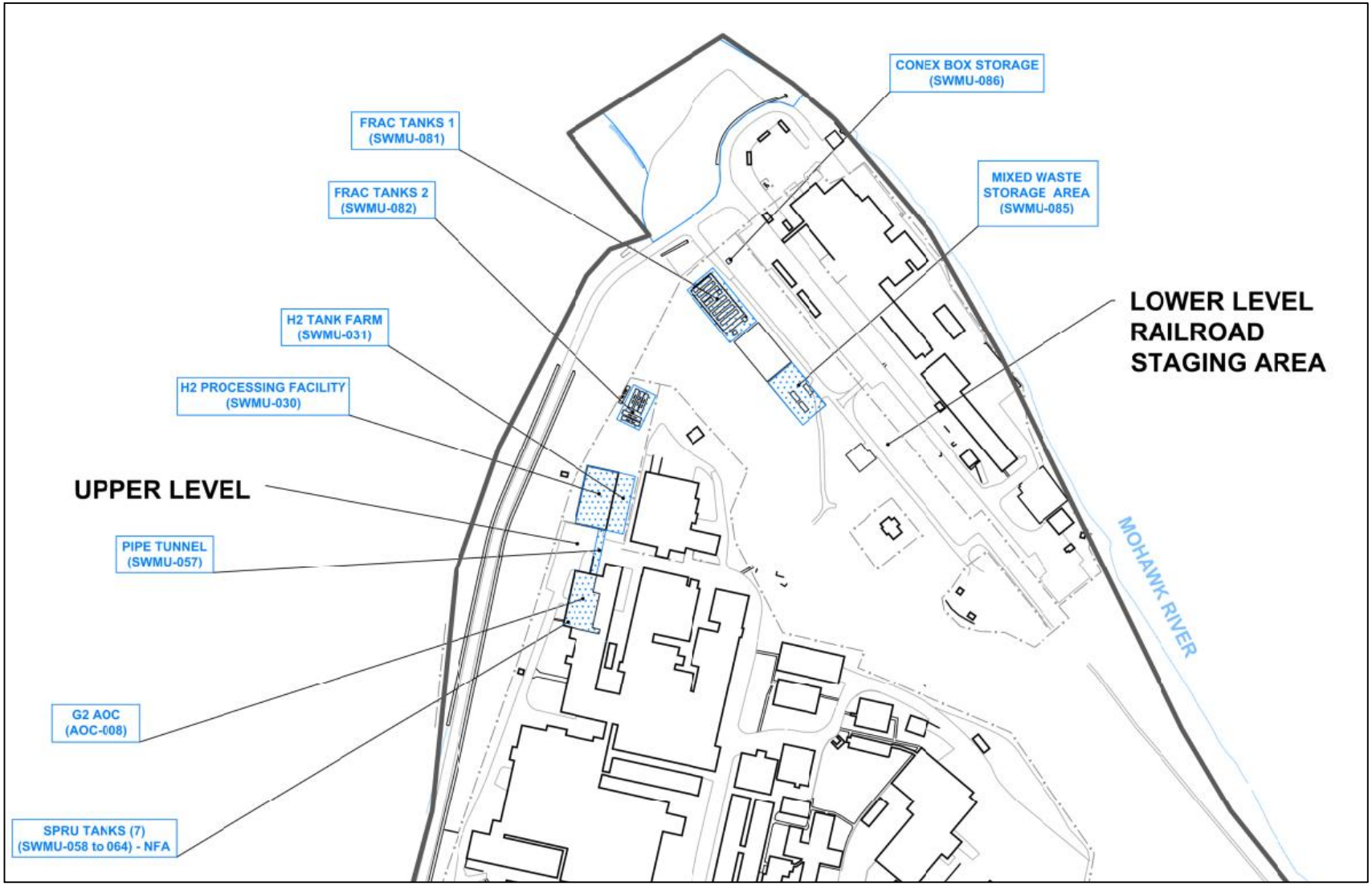

Figure 1. KAPL Site Map Showing SPRU Area and Upper Level SWMUs

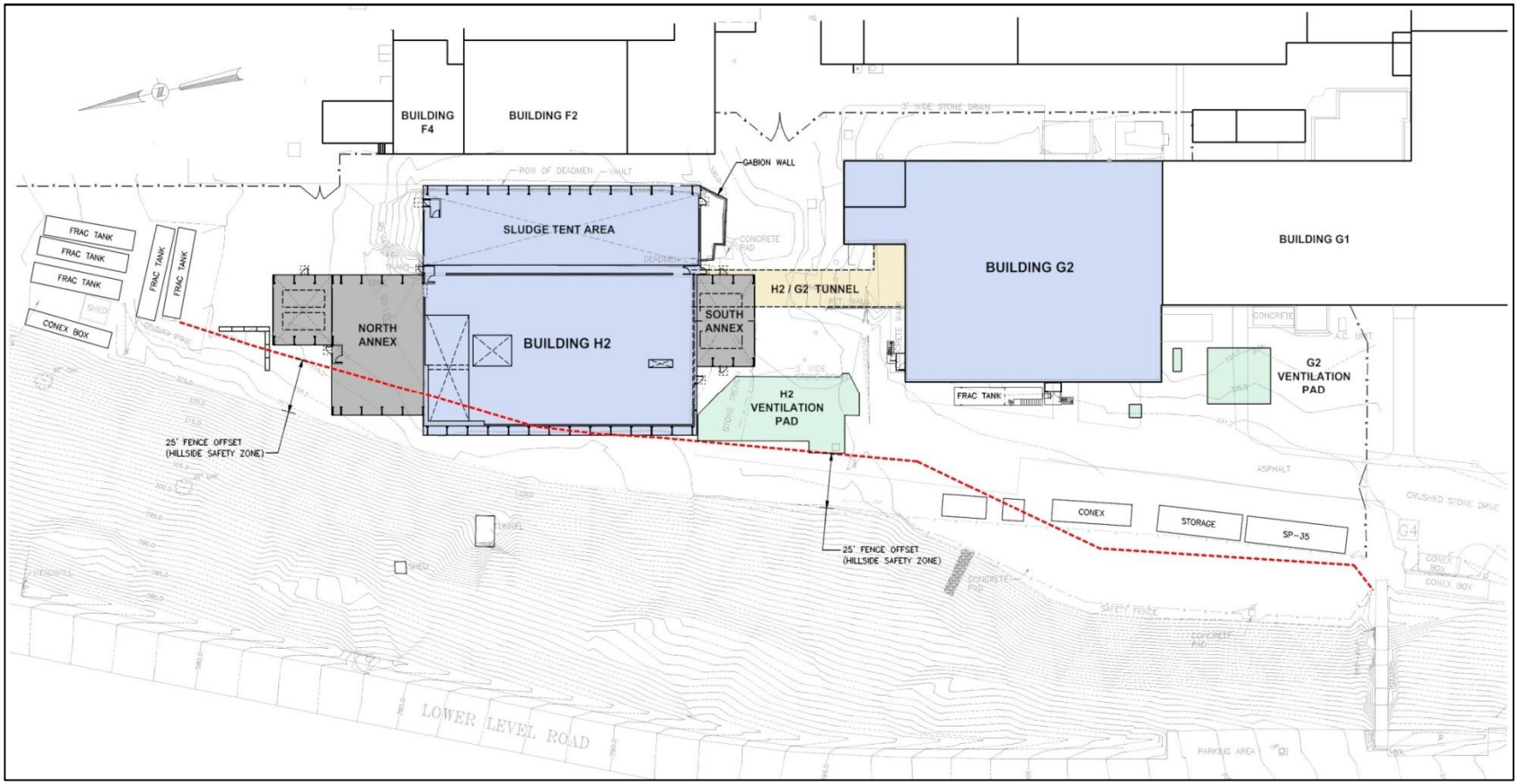

Figure 2. SPRU Upper Level Prior to Demolition

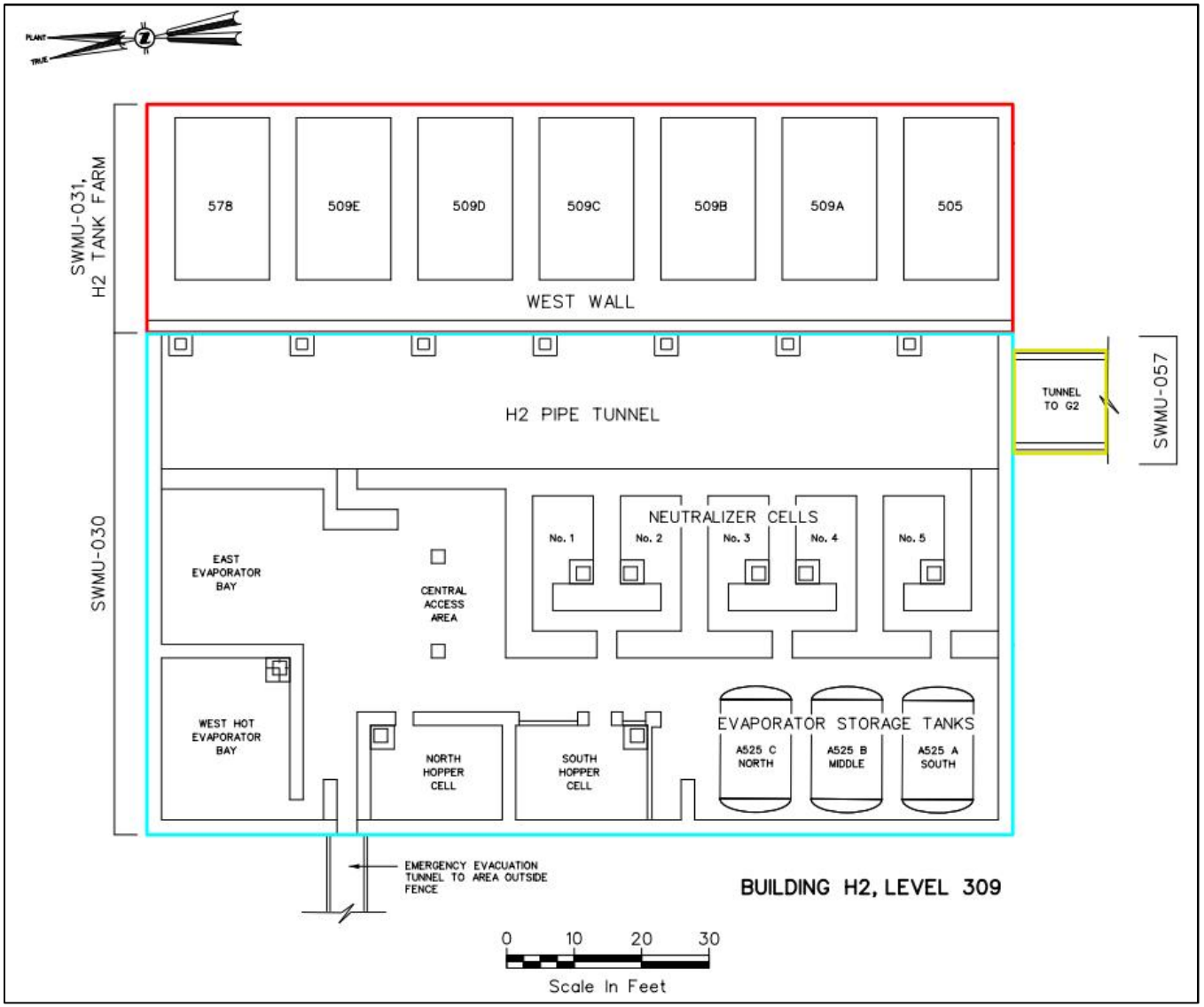

Figure 3. Building H2 SWMUs (SWMU-030, SWMU-031, and SWMU-057)

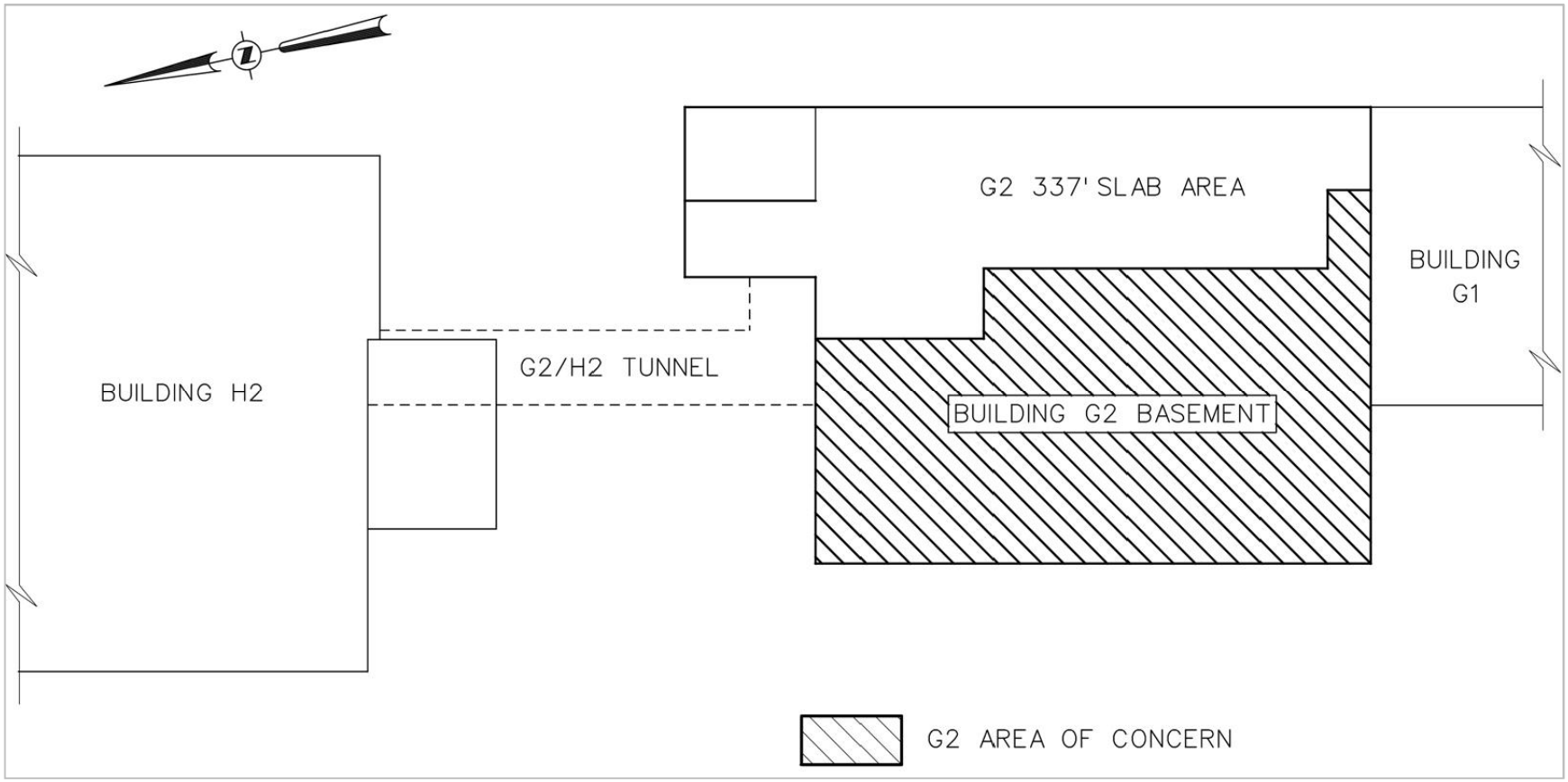

Figure 4. G2 Area of Concern (AOC-008)

3.0 SPRU CORRECTIVE MEASURES

3.1 SWMUs and AOCs Addressed in this Report

Seven SWMUs and one AOC identified in the SPRU permit along with the current completion/status are included in Table 1. This report addresses the demolition and remediation of the SPRU Upper Level buildings and contaminated soils, including the associated SWMUs and AOC. URS Federal Services, LLC (URS), formerly Washington Group International, is listed in the permit as the organization responsible for the demolition and remediation of the SPRU Upper Level SWMUs and AOCs. Four SWMUs (SWMUs-081, -082, -085, and -086) and an AOC (AOC-008) were added during the project to the permit by NYSDEC.

Table 1. SPRU SWMUs and AOC

Class	SWMU/AOC	Remediation Completion/Status
Miscellaneous	H2 Processing Facility (SWMU-030)	Corrective action completed
	Pipe Tunnels (SWMU-057)	Corrective action completed
Area of Concern	G2 AOC (AOC-008)	Corrective action completed
Container Storage Areas	H2 Tank Farm (SWMU-031)	Corrective action completed
	SPRU Fractionation Tanks 1 (SWMU-081)	2012 NFA from NYSDEC
	SPRU Fractionation Tanks 2 (SWMU-082)	Corrective action completed
	SPRU Mixed Waste Storage Area (SWMU-085)	2017 NFA from NYSDEC
	CONEX Box Storage (SWMU-086)	2017 NFA from NYSDEC

3.1.1 SPRU SWMUs Previously Identified as Requiring No Further Action

Former process tanks SPRU Tanks 316, 527, 531, 532, 534, 536, and 551 that were present in the G2 Building are identified in the permit as SWMUs-058 through -064. However, the release of hazardous constituents to the environment had not been identified or suspected from these tanks. Therefore, SWMUs-058 through -064 were designated in 1998 as "inactive" by NYSDEC and require no action per Module II, Section E.1 in the SPRU permit. When these tanks were removed in 2006 prior to the current decommissioning effort, it was confirmed that no releases had occurred.

Two carbon steel fractionation tanks in the Upper Level, THDS-2 and THDS-3, were included with the tanks in the Lower Level as SWMU-081, *SPRU Lower Level Fractionation Tanks 1*, based on the potential for contamination associated with a spill/release. This SWMU was designated by the NYSDEC in 2012 as requiring "no further action at this time." The tanks continued to be used throughout the remainder of site activities and were monitored during use to ensure that no further releases occurred. Areas around the tanks were inspected during operations and removal of the tanks from the SPRU site; no evidence of spills/releases was observed. Therefore, SWMU-081 should receive "final" NFA status and this SWMU is not addressed further in this report. The letter from NYSDEC documenting the "no further action at this time" status for SWMU-081 is included as Attachment 1 (NYSDEC, 2012) [7].

In 2017, the NYSDEC designated two new SWMUs as "SPRU Mixed Waste Storage Area" (SWMU-085) and "SPRU Conex Box Storage" (SWMU-086). Both SWMUs were designated as requiring "no further action at this time" based on information provided in an April 2017 Assessment Report. The storage areas continued to be used throughout the remainder of site activities and were monitored during use to ensure that no spill/release of contaminants occurred. Areas around the storage areas were inspected during operations and removal of the storage areas from service; no evidence of any spills or releases was observed. Therefore, SWMUs-085 and -086 should receive "final" NFA status and these SWMUs are not addressed

further in this report. The letter from NYSDEC documenting the "no further action at this time" status for SWMU-085 and SWMU-086 is included as Attachment 2 (NYSDEC, 2017) [8].

3.2 Corrective Action Objectives

The H2 Processing Facility (SWMU-030), H2 Tank Farm (SWMU-031) including the H2 building footer drains, G2 building (including AOC-008), and G2/H2 tunnel (SWMU-057) were demolished and removed from the SPRU site along with the SWMU-associated radiological and chemical contamination. Corrective action activities resulted in the removal of about 1,300 cubic yards of soil and stone during cleanup and removal of the SWMUs and AOC. Post-excavation sampling was conducted in accordance with NYSDEC DER-10 requirements and the approved G2 Work Plan [3] and Upper Level Work Plan [2] to verify successful remediation to below the SCOs. Cleanup of radiological contamination is not covered under the SPRU Part 373 Permit and is addressed in a separate report.

3.3 Constituents of Concern

The primary and secondary Constituents of Concern (CoC) for soil were identified based on the results of previous SPRU site investigations described in the Upper Level and G2 Work Plans [2] [3]. In 2010, a series of seven borings were advanced into the footer drain system adjacent to the eastern edge of the tank farm (Figure 11 in the Upper Level Work Plan [2]). Toluene was the only organic primary CoC with levels exceeding its SCO (Toluene SCO at SPRU = 700 ppb). No other organic contaminants were detected above their SCOs. All sample analyses in the vicinity of the H2 Building were below the SCO limits for metals with one exception. Arsenic was detected in one surface soil sample collected near the southwest corner of the H2 Building at 25.2 mg/kg (SCO 16 mg/kg). Soil in that location was removed as part of the excavation completed around the H2 Building. It is possible that this contamination may have migrated from the drains running along the north, south, and east perimeters of the H2 Tank Farm. Several additional samples collected in 2011 at two locations 8 feet east of the tank farm wall (closer to the F2 Building) did not show any contamination above the SCO cleanup criteria for CoCs.

For the G2 Building, toluene was detected in 10 samples collected from beneath the G2 Building slab. Four of those results exceeded the SCO of 700 ppb. No other primary CoCs were detected above their respective SCOs in any of the G2 Building samples. Additional information with respect to the H2 and G2 Buildings soil investigations are included in Sections 3.4.1 and 3.4.3, respectively.

Other chemical contaminants detected below their respective SCOs were identified as primary or secondary CoCs. These include metals found in concentrations above background that could be attributed to SPRU operations (antimony, arsenic, mercury, and zinc) and volatile organic compounds (VOCs) found at trace levels that could be attributed to a chemical release (1,1-dichloroethane (1,1-DCA), 1,1-dichlorothylene (1,1-DCE), cis-1,2-DCE, trans-1,2-DCE, toluene, trichloroethylene (TCE), and vinyl chloride). Methyl isobutyl ketone is a CoC because it was detected at a low concentration below its SCO following a leak from the SWMU-082 fractionation tanks.

Methylene chloride, styrene, isopropyl benzene, and acetone were added as CoCs based on the use of fixatives containing those chemicals and the potential for the fixatives to transfer VOCs to the soil or groundwater.

The sludge in each of the seven H2 Tank Farm tanks was sampled. Based on the tank sludge sample analytical results, the following chemical constituents were also added to the list as secondary CoCs: barium, cadmium, chromium, lead, manganese, nickel, selenium, silver, 1-methylnaphthalene, 2-methylnaphthalene, 2-chloronaphthalene, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(ghi)perylene, benzo(k)fluoranthene, carbazole, chrysene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, methyl methacrylate, naphthalene, phenanthrene, pyrene,

bis(2-ethylhexyl)phthalate, tributylphosphate, 2-butanone, benzene, ethylbenzene, tetrachloroethylene, styrene, and xylenes(total). Table 2 lists the CoCs and their associated SCOs.

Table 2. Constituents of Concern and Associated SCOs

Primary Constituents of Concern	SCO (ppm)
Antimony	12[b]
Arsenic	16
Mercury	0.73
Zinc	2200
Acetone	0.05
1,1-DCA	0.27
1,1-DCE	0.33
cis-1,2-DCE	0.25
Methylene chloride	0.05
Methyl isobutyl ketone	1[a]
trans-1,2-DCE	0.19
Toluene	0.7
Trichloroethylene	0.47
Vinyl chloride	0.02

Secondary Constituents of Concern	SCO (ppm)
Barium	350
Cadmium	2.5
Chromium (trivalent)	36
Cobalt	30[a]
Iron	2000[b]
Lead	400
Manganese	2000
Nickel	130
Selenium	4
Silver	8.3
Thallium	5[b]
1-methylnaphthalene	NC
2-methylnaphthalene	0.41[a]
2-chloronaphthalene	0.010*
acenaphthene	98
anthracene	100
benzo(a)anthracene	1
benzo(a)pyrene	1
benzo(b)fluoranthene	1
benzo(ghi)perylene	100
benzo(k)fluoranthene	1
carbazole	NC
chrysene	1
fluoranthene	100
fluorene	100
indeno(1,2,3-cd)pyrene	0.5
methyl methacrylate	0.050*
naphthalene	12
phenanthrene	100
pyrene	100
bis(2-ethylhexyl) phthalate	50[a]
tributylphosphate	NC
2-butanone	0.12
benzene	0.06
ethylbenzene	1
tetrachloroethylene	1.3
xylenes(total)	1.6
Isopropyl benzene	2.3
Styrene	300[b]

[a] CP-51 / Soil Cleanup Guidance (residential or protection of groundwater)

[b] CP-51 / Soil Cleanup Guidance (protection of ecological resources is only used if it is the only SCO listed in CP-51 for that contaminant)

NC - No criteria

* NYSDEC TOGS 1.1.1 criteria exist for 2-chloronapthalene (guidance value of 10 ppb for class GA waters) & methyl methacrylate (standard of 50 ppb for Class GA). Therefore, any elevated levels of these constituents in soil should be evaluated for their potential to impact groundwater in the area. DEC Division of Water TOGS guidance values are relevant and may be used to evaluate any effect of contamination upon groundwater.

3.4 Corrective Measures for SWMUs and AOC

3.4.1 H2 Building SWMUs (SWMU-030, SWMU-031, SWMU-057)

3.4.1.1 Background

The H2 Processing Facility (SWMU-030), H2 Tank Farm (SWMU-031), and G2/H2 tunnel (SWMU-057) are identified as SWMUs in the permit [1]. The H2 Tank Farm adjoins the H2 Building (SWMU-030) on the east and housed tanks for the storage of liquid waste. Seven separate, subterranean concrete vaults on the east side of the H2 Building formerly housed a single tank each; the tanks were removed and shipped for disposal prior to implementation of the Upper Level Work Plan. The H2 building slab measured approximately three feet thick with a bottom elevation of 302 feet above mean sea level. An 8-foot thick concrete wall separated the tank farm from the H2 Building on the west side. A footer drain system was constructed adjacent to the north and south edges of the tank farm slab and extended along the eastern edge of the tank farm slab.

The G2/H2 tunnel (SWMU-057) housed the waste transfer and utility piping between the G2 and H2 Buildings. Additional historical information for SPRU can be found in *Nuclear Facility Historical Site Assessment for the Separations Process Research Unit (SPRU) Disposition Project* [9].

A series of seven borings previously advanced into the H2 Building footer drain system adjacent to the eastern edge of the H2 Tank Farm, as described in detail in the Upper Level Work Plan, indicated toluene contamination at levels exceeding the SCO (700 ppb). No other organic contaminants or metals were detected above their SCOs in those samples. Several additional samples collected at two locations approximately 8 feet east of the H2 Tank Farm wall (closer to the F2 Building) did not show contamination above the SCO cleanup criteria. This suggested that the material requiring excavation and contamination removal was limited to the soil/stone adjacent to the H2 Tank Farm wall along with the backfilled footer drains. (The footer drains were backfilled after construction of the tank farm vaults.) As described in the Upper Level Work Plan [2], a sheet pile wall installed between the H2 and F Buildings allowed for removal of the H2 Tank Farm vaults and the contaminated soil associated with the footer drains.

The earth around the Tank Farm vaults was composed primarily of till. As indicated in the Upper Level Work Plan, the H2 Tank Farm and H2 Building slabs were expected to rest directly on the till with no distinct fill layer. Several borings made in the vault and building slabs showed that the concrete was in direct contact with the till and water was not present in the borings. Nine feet of soil and gravel fill covering the H2 Tank Farm vaults was removed in 2009-2010. An enclosure structure was erected over the H2 Tank Farm vaults in 2011, and the pre-cast concrete slab panels were removed to allow for tank removal. A larger enclosure was constructed in 2012-2013 over the entire H2 Building, including the tank vault enclosure, to contain emissions from the demolition effort. Tank sludge was removed and shipped off-site for disposal in 2013 and 2014. The tanks, tank vault enclosure, and associated piping were removed in 2015. The surfaces of the concrete vaults were decontaminated prior to demolition and removal. The internal walls of the H2 Building were demolished prior to removal of the building's enclosure in 2017. Following removal of the building enclosure, demolition of the remainder of the H2 structure and foundation and excavation of contaminated soil resumed and was completed in June 2018. Soil confirmation sampling was completed for the H2 Building SWMUs in July 2018, and site restoration activities were completed for the H2 Building SWMUs in July 2019.

3.4.1.2 Historical H2 Building Site Investigation and Characterization Activities

Soil outside the Tank Farm was contaminated with both chemical and radiological constituents, but the source of contamination was not definitively established. The source of organic chemical contamination does not appear to be related to the H2 Processing Facility or H2 Tank Farm activities based on the type of

chemicals previously used in these facilities and the type and location of contaminants. Inspections conducted in 1989, 1998, and during removal in 2015 found the tanks and piping to be structurally sound.

An RCRA Facility Assessment Sampling Visit Investigation conducted in 2000-2001 identified trace concentrations of VOCs in subsurface soil along the western and southern perimeter of Building H2, subsurface soil along the western foundation of the pipe tunnel, groundwater from within the foundation drains along the southern perimeter of Building H2, and groundwater at the western base of the pipe tunnel [10]. Three Upper Level SWMUs were investigated: H2 Processing Facility (SWMU-030), H2 Tank Farm (SWMU-031), and G2/H2 tunnel (SWMU-057). The investigation included collection and analysis of soil and groundwater samples for metals, semi-volatile organic compounds (SVOCs), and VOCs. The RCRA Facility Assessment had the following conclusions:

- Metals: All samples in the vicinity of SWMU-031, SWMU-030, and SWMU-057 were below the SCO limits for metals, except for one surface soil sample collected near the southwest corner of the H2 Building (boring B3002 at 0-2 feet). Arsenic was detected in this sample at 25.2 mg/kg (SCO 16 mg/kg). The soil in this location was removed as part of previous excavation activities around the H2 Building.
- SVOCs: Multiple SVOCs were detected at trace to low concentrations in all Upper Level borings. The detected SVOCs are believed to be associated with surface asphalt and asphaltic waterproofing on building exterior foundations and are not likely associated with a release.
- VOCs: Trace VOC concentrations were detected below the SCOs in multiple soil samples. Methylene chloride was detected in all soil samples analyzed for VOCs ranging from 0.0018 to 0.046 mg/kg (SCO 0.050 mg/kg). Methylene chloride is a common laboratory artifact and its presence is believed to be associated with laboratory cross-contamination.

3.4.2 SPRU Fractionation Tanks 2 (SWMU-082) and SPRU Fractionation Tanks 1 (SWMU-081)

SWMU-082 consists of three carbon steel fractionation tanks (THDS-1, T4, and A1274) and connecting lines. These tanks were adjacent to the Upper Level tanks in SWMU-081, SPRU Lower Level Fractionation Tanks 1 (THDS-2 and THDS-3).

The SWMU-081 tanks (also not identified in the original permit) were designated by NYSDEC in 2012 as requiring “no further action at this time.” The SWMU-081 tanks continued to be used throughout the remainder of site activities and were monitored and inspected during operations. No evidence of spills or releases was observed following removal of the tanks from the SPRU site. Therefore, SWMU-081 should receive “final” NFA status and this SWMU is not addressed further in this report.

The fractionation tanks were part of an overall water handling system used to manage SPRU Upper Level ground/storm water associated with the H2 Processing Facility and H2 Tank Farm. The SWMU-082 tanks were located on the Upper Level, north of Building H2, as shown in Figure 5. The SWMU-081 fractionation tanks and associated equipment were located in the Upper and Lower Levels, as shown in Figure 6. Tank configurations are shown in the two figures as they existed at the time of the original SWMU designations in 2012. Fractionation tank capacities ranged from 20,000 to 21,000 gallons.

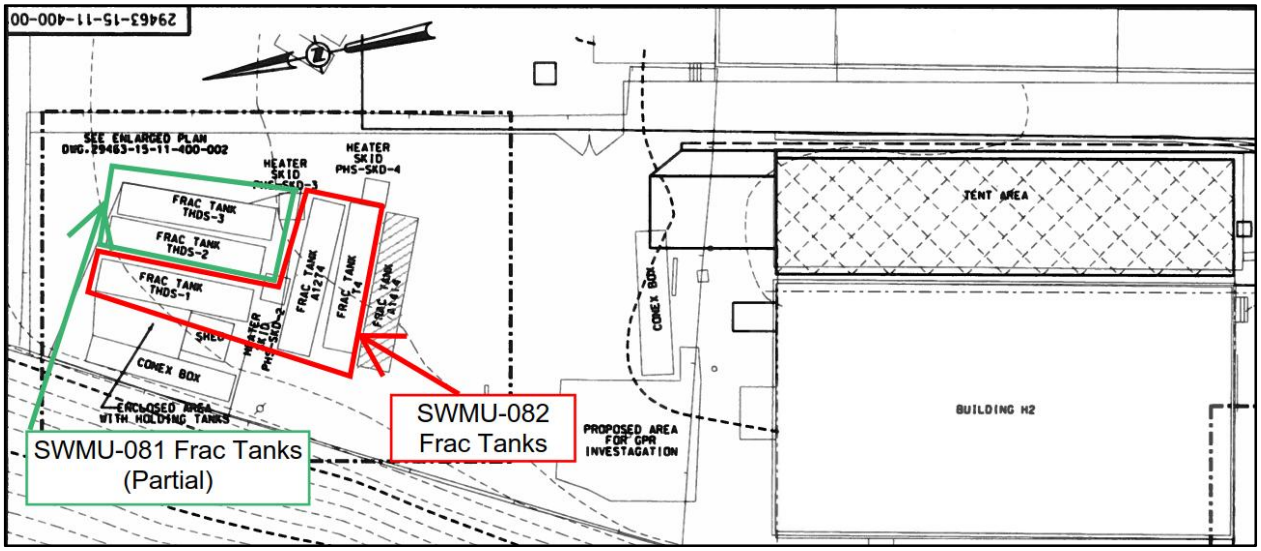

Figure 5. Location of SWMU-081 and SWMU-082 Fractionation Tanks in Upper Level

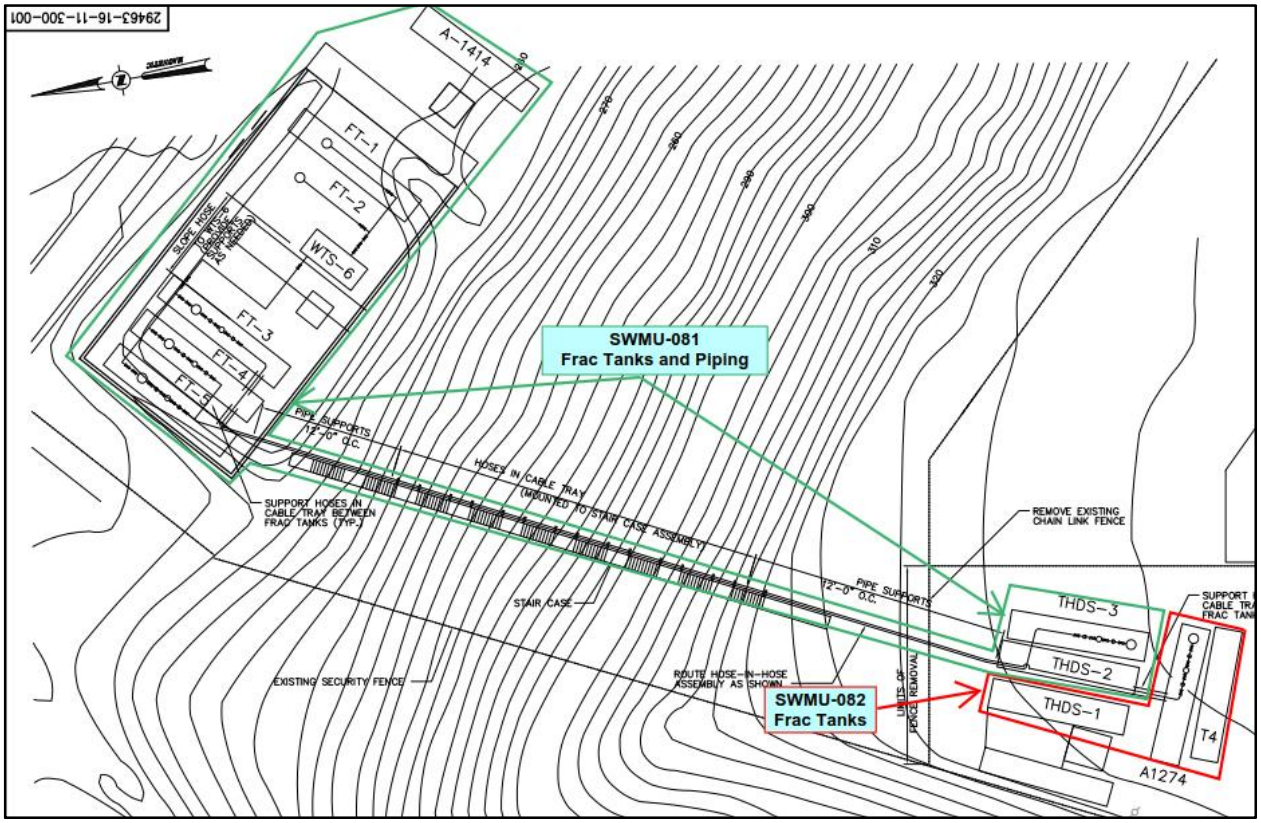

Figure 6. Locations of Fractionation Tank SWMUs in Upper and Lower Levels

A VOC release associated with THDS-1 was the subject of a DOE-EM November 16, 2010 release notification and assessment letter report to the NYSDEC. Also, spills on March 2 and March 20, 2011 from T4 and A1274, respectively, were subject to a December 2, 2011 newly identified SWMU notification and an associated January 13, 2012 assessment letter report to the NYSDEC. The spills from the connecting lines for T4 and A1274 were about 0.5 gallons and less than 1 gallon, respectively. The impacted soil in the area of the spills was removed at that time. NYSDEC did not require DOE to take any further action in these areas at the time and required that one confirmation soil sample be collected after the SWMU was decommissioned to confirm that no contamination remained above the SCOs.

The SPRU Fractionation Tanks 2 equipment (SWMU-082) was removed in 2018 as part of the SPRU remediation. In accordance with the Upper Level Work Plan, a soil confirmation sample (SFT-01) was collected downgradient from the former location of the THDS-1 tank to evaluate potential contamination from the November 2010 spill. No contamination was found in the sample, and no remediation/excavation was required beyond removal of the crusher run and gravel placed for tank support. SFT-01 sampling results are discussed in Section 4.5.

Following the receipt of satisfactory results from chemical testing to meet DER-10 requirements, the gravel and crusher run were used for road construction in the Red Pines Area on the east side of the KAPL site. The data analysis results for the soil/gravel/crusher run reused material are included as Attachment 13.

3.4.3 G2 Building AOC (AOC-008)

3.4.3.1 G2 Background

Building G2 was used heavily between 1950 and 1953 to test chemical processes for separating plutonium and uranium from radioactive material encased in aluminum. Other related operations were conducted in the G2 Building through the 1960s. The G2 facility served as the head-end of the process where slugs of irradiated fuel were dissolved in an acid solution for subsequent separation of recoverable uranium and plutonium. REDOX chemical test runs were performed until the end of 1950 and PUREX test runs until mid-1953. Separation processes were accomplished in equipment located in concrete-shielded G2 cells.

Process tanks 316, 527, 531, 532, 534, 536, and 551 within the G2 Building were identified as SWMUs-058 through -064, and designated as "no further action" when the permit was issued in 1998. When the tanks were removed and shipped for disposal as radioactive waste in 2006, there was no evidence observed of spills from the process tanks or contamination penetrating through the building slab to the underlying soil.

On July 1, 2016, SPRU notified the NYSDEC of the discovery of soil contaminated with a hazardous constituent (toluene) beneath the G2 Building. Notification was made pursuant to Module II, Condition C of the permit. This information is detailed in the *G2 Building Sub-Slab Soil VOC Assessment Report* submitted to NYSDEC in August 2016. NYSDEC subsequently designated the G2 Building as AOC-008 as shown in Figure 4. Following the designation of the AOC, the NYSDEC required the development of an ICM Work Plan, including a soil confirmation plan to be completed following the removal of the G2 Building.

Based on the VOC exceedances, the AOC included the basement footprint in the G2 process area, the G2 hot and process pipe tunnels, the pipe room/library, and the crossover tunnel. The area to the east of the basement, under the former 337-foot slab, was separated from the basement area by a deep concrete foundation under the G2 hot and process pipe tunnels. The sampling areas were expanded east relative to the area detailed in the Assessment Report to bound the extent of contamination.

The G2 Work Plan was developed in accordance with permit and NYSDEC requirements to verify that remaining soil meets chemical clean-up requirements after removal of the G2 Building and soil.

3.4.3.2 Historical Soil Investigations in the Vicinity of the G2 Building

Historical sampling data show the presence of VOC contamination in soil and groundwater in the vicinity of the G2 Building. Results reported in the *KAPL RCRA Facility Investigation* (RFI) *for the Knolls Site Hillside Area* [11] showed the presence of VOCs in the Upper Level, both north and south of the G2 Building, and on the south side of the G1 Building.

The *KAPL Hillside Area RFI* [11] previously identified VOC contamination at low levels immediately adjacent to the G2 Building, as shown in Figure **7**. Specifically, toluene was identified at SB-31 at a 5-foot depth as 0.46 parts per million (ppm) and at a 10-foot depth as 0.47 ppm. However, toluene was not found at SB-7 or SB-29. Other VOCs detected at these three areas included chloroform, cis-1,2- DCE, TCE, vinyl chloride, and tetrachloroethylene. All VOCs were reported at levels below their corresponding SCOs.

Sampling was conducted under SPRU-SAP-WM-020, *Sampling and Analysis Plan for the Sub-Slab Soil of Building G2* [12], as part of the investigation for potential radiological contamination under the G2 Building slab (AECOM, 2015). During the radiological sampling campaign of the subsurface soil (till) under the G2 Building slab, industrial hygiene monitoring detected low levels of organic vapors in several locations, indicating the presence of VOCs. Sub-slab soil (till) samples were collected for VOC analysis. Laboratory analyses of the samples indicated that toluene was detected or estimated above the Minimum Detectable Concentration (MDC) in each of the 10 samples collected. Four out of the 10 samples analyzed for VOCs had levels of toluene that exceeded the SCO of 700 ppb. No other VOCs were detected above their corresponding SCO. The four soil samples that had a result greater than the SCO for toluene were subsequently analyzed for metals and PCBs. All results for metals were less than their corresponding SCOs, except for iron. None of the PCB analyses had detections above the MDC.

3.4.4 Additional Site Information

3.4.4.1 Organic Spill During Micropile Installation

In order to support the external frame for the H2 Building enclosure, a series of micropiles were drilled on the north and west sides of the building. During the initial stages of the installation on the north side, a sheen was observed on some drilling water ponding around the micropile location. This sheen was originally attributed to the use of a petroleum-based lubricant (trade name KOPR-KOTE®), and samples were collected and sent to an off-site laboratory for analysis for VOCs and SVOCs. The samples showed the presence of an SVOC, 2-methylnaphthalene, at a concentration of 57.5 ppb, well below the corresponding SCO of 410 ppb. Further investigation determined that the same SVOC had been identified in samples from the same general area collected during the RFI and had been considered to possibly have come from either the septic system or a historical coal-fired boiler. In response to the sheen and sample results, the impacted water and associated drilling spoils were containerized and shipped for off-site disposal. The drillers used a non-petroleum-based lubricant to install the remainder of the micropiles. The area where the micropiles were drilled using the KOPR-KOTE® petroleum-based lubricant was eventually excavated during the removal of the H2 Building and the septic system.

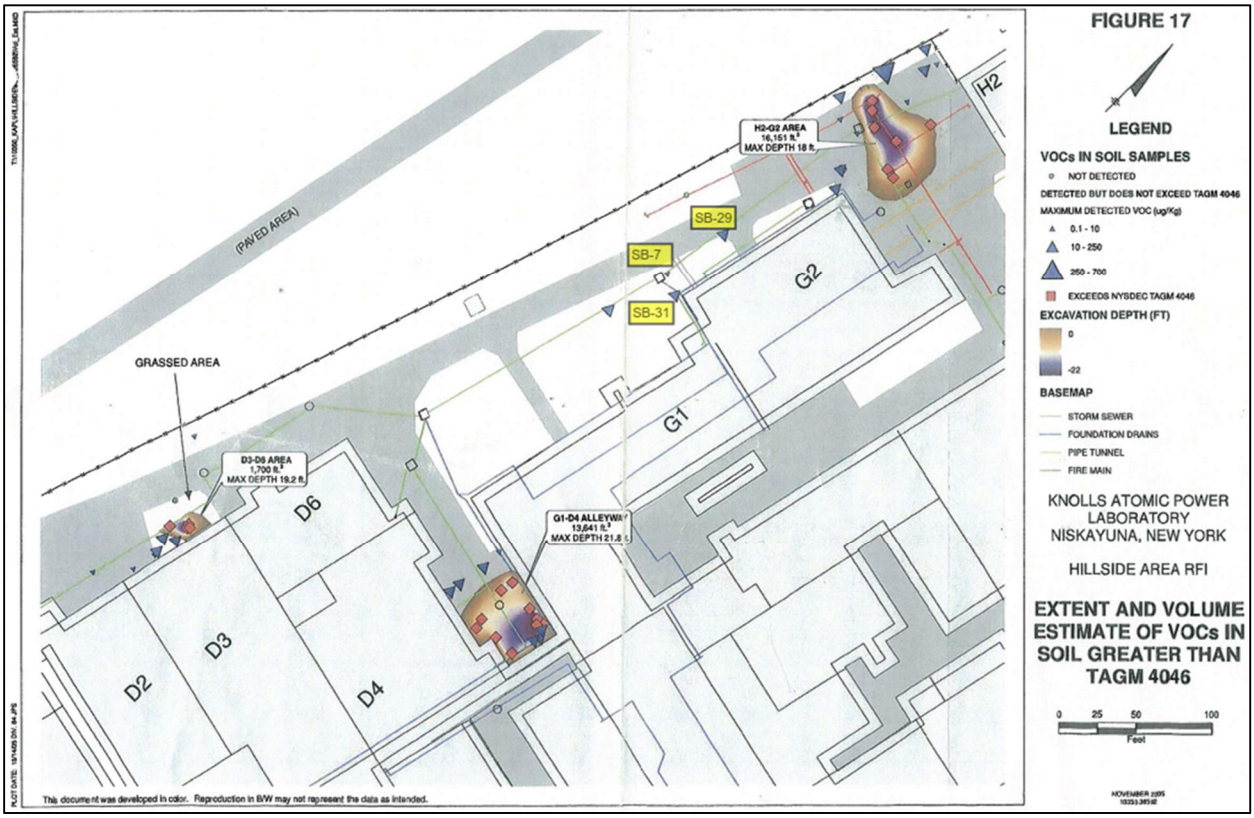

Figure 7. VOC Sample Locations Near G2 (*KAPL Hillside Area RFI*)

3.4.4.2 Monitoring Well Decommissioning

A number of monitor wells located in the Upper Level in the vicinity of the H2 and G2 work areas were decommissioned in accordance with NYSDEC requirements. The wells were decommissioned to support SPRU site decommissioning activities and site restoration. This information is included in Attachment 9 to this report.

3.5 Corrective Measures Implementation

As stated previously, the corrective measures undertaken for the SWMUs and AOC in this report address the cleanup of chemical contamination as required under the SPRU permit. The radiological contamination associated with the SWMUs is addressed in a separate report.

3.5.1 Upper Level SWMUs – Demolition and Excavation Activities

The demolition and excavation activities and associated corrective measures were followed as detailed in the Upper Level Work Plan. Excavation emissions were monitored in accordance with the Air Monitoring Plan.

Demolition and removal of the H2 Building and Tank Farm concrete slabs allowed excavation of any VOC contamination in the soil below the slab, and removal of the footer drains removed any VOC contamination in the backfilled drains. Given the limited space on the site, structural and building wastes and soil/stone were loaded from the work area into containers for shipment and off-site disposal. Several waste loadout areas were located outside of the H2 structure perimeter. Containers were placed over impervious material

to prevent cross-contamination of the ground during waste loading. Waste loadout areas are shown in the Upper Level Work Plan.

The material placed as backfill during historical construction activities was excavated from the ground surface to below the footer drains down to an approximate elevation of 301 feet (approximately 30 feet below ground surface). Due to the slope of the ground surface from north to south in this area, the excavation depth varied by several feet, depending on location. The east road material up to the sheet pile wall at the 320-foot level and the backfill material down to the undisturbed till were removed to allow confirmation samples to be collected from the sidewall and bottom of the H2 Tank Farm excavation as required. The excavation of the H2 footprint during confirmation sampling and post-restoration, including the tank vaults, is shown in Figure 8 and Figure 9, respectively.

Radiological contamination above the cleanup criteria was detected in areas of the footer drain. The majority of the radiological contamination was found at the bottom of the borings advanced in the H2 Building footer drains. It was considered likely that the radiological contamination in the soil associated with the H2 Tank Farm, H2 Building, and associated footer drains would be removed when the footer drains and associated soil/stone were removed. Therefore, because previous sampling indicated that the chemical (toluene) contamination is located within the same general footprint as the radiological contamination, the excavation and removal of the H2 facilities, H2 Tank Farm, and associated footer drains, as expected, also removed the chemical contamination.

Backfill of the excavation was conducted following NYSDEC concurrence with the Preliminary Data Report documenting the post-excavation confirmation sampling and satisfactory sample results for excavation and removal activities. The Preliminary Data Report is described in Section 4.4.1.

3.5.2 SPRU Fractionation Tanks 2

As discussed previously, the SPRU Fractionation Tanks 2 (SWMU-082) located in the north end of the SPRU Upper Level have been removed. Surface soil was previously removed from two small areas where ≤1 gallon of liquid had leaked from tank connecting lines. In accordance with the Upper Level Work Plan, a surface soil sample was collected downgradient from the THDS-1 tank (Sample #SFT-01) to evaluate potential contamination from a November 2010 spill. No contamination was noted, and no remediation or excavation was required for SWMU-082. The results of this sampling are described in Section 4.5. The crusher run and gravel placed for support of the tanks were removed as part of site restoration activities. After results from chemical testing met DER-10 requirements, the gravel and crusher run were used for road construction in the Red Pines Area on the east side of the KAPL site.

Figure 8. H2 Excavation During Confirmation Sampling (July 21, 2018)

Figure 9. H2 Footprint After Site Restoration (July 26, 2019)

3.5.3 G2 Building AOC - Demolition and Excavation Activities

Demolition and excavation activities and associated corrective measures were followed as detailed in the G2 Work Plan. Excavation emissions were monitored in accordance with the Air Monitoring Plan.

The G2 Building structure and concrete walls and floors were demolished, allowing for excavation of the VOC contamination in the soil below the slab. There is limited open space on the site available for laydown. As a result, wastes such as concrete and soil were loaded from piles in the work area into containers for shipment and off-site disposal. Loadout areas varied and were located outside the perimeter of the G2 structure. Containers were placed over impervious material to prevent cross-contamination of the ground during waste loading. Waste loadout areas are shown in the G2 Work Plan.

The G2 basement level concrete slab and contaminated soil were removed as part of corrective measure activities for the AOC. The entire G2 slab was removed except for a portion of the crossover corridor adjoining the G1 Building as shown in the G2 Work Plan. That portion of the G2 slab was left to avoid damage to the G1 Building and to support the new concrete walls installed to seal the previous entrances to the G1 basement. VOC samples collected from beneath this portion of the G2 slab did not exceed the SCO of 700 ppb (maximum toluene concentration was 55.8 ppb). Removal of the G2 basement slab and external walls on the north and west sides was conducted in two phases to maintain access on the roadway passing north of G2. Phase 1 of the excavation involved removing the southern part of the basement area and western wall to within approximately 10 to 15 feet south of the northwest corner (Figure 10). Phase 2 of the excavation involved removing the remaining slab and walls at the same time as the H2/G2 tunnel (SWMU-057) excavation and removal. Engineering controls were conducted during excavation, including benching of the slope embankment, to minimize intrusion into the adjoining KAPL VOC AOC. Figure 11 shows the G2 Area after final restoration.

Backfill of the excavation was conducted following post-excavation confirmation sampling, receipt of satisfactory sample results for each phase, and NYSDEC concurrence with the Preliminary Data Reports (PDRs). The PDRs are described in Section 4.4.1. Prior to Phase 2 excavation and to prevent contamination of the backfill placed in the G2 basement area, the wall and soil remaining after Phase 1 were lined with impermeable material prior to placement of the backfill soil. This allowed the reuse of the clean fill following Phase 2 excavation and removal. The impermeable liner material was removed and disposed of as waste prior to backfill operations.

3.6 Waste Management and Disposal

3.6.1 Waste Generated During Corrective Measures Implementation

All project waste was containerized, characterized, and disposed of in accordance with all applicable regulations. The majority of the waste generated during the corrective measures implemented and described in this report included a variety of both contaminated and uncontaminated structural building components (e.g., concrete, metals, wood), building materials (e.g., transite board, plastics, metals and composite materials), miscellaneous equipment (e.g., steel tanks, metal and plastic piping systems), and soil and fill materials.

Figure 10. G2 Excavation, Phase 1 (August 29, 2017)

Figure 11. G2 Area After Final Restoration (July 24, 2019)

Other waste materials generated during implementation of corrective measures included contaminated soil and various types of debris waste generated during site characterization, remediation, and sampling and analysis activities. Personal protective equipment waste (e.g., gloves, booties, and Tyvek suits) was also collected and managed in the same manner as the majority of the soil or debris waste. Waste profiles were developed for each waste stream and disposal site and in accordance with federal and NYSDEC regulations as appropriate.

The majority of the waste was contaminated with radioactive constituents only and, therefore, managed as low level radioactive waste (LLRW) in accordance with federal regulations and DOE requirements. Waste generated during building demolition and process waste cleanout included small amounts of RCRA hazardous and mixed low level waste (MLLW, both radioactive and RCRA-hazardous components) when compared to the overall waste volume. Surface and subsurface soil materials excavated during remediation activities were not hazardous materials and were managed appropriately based on the radiological constituents. All wastes were managed in accordance with NYSDEC, RCRA, and federal Department of Transportation regulations as applicable for each waste type. The main waste sources and waste types generated along with their primary disposal locations are listed in Table 3.

Table 3. Waste Source and Disposal Location

Waste Source	Waste Type	Disposal Location
Untreated water from Hillside Drain System (HSDS)	LLRW – water untreated	PermaFix NW, Hanford, WA UCOR, Oak Ridge, TN SMS, Oak Ridge, TN
H2 basement water	LLRW – water untreated	PermaFix NW, Hanford, WA UCOR, Oak Ridge, TN SMS, Oak Ridge, TN
G2/H2 Excavation Water	LLRW – water untreated	PermaFix NW, Hanford, WA UCOR, Oak Ridge, TN SMS, Oak Ridge, TN
G2 Cell water	LLRW – water untreated	PermaFix NW, Hanford, WA
H2 Tank Farm	LLRW – solidified sludge	WCS, Andrews, TX
H2 Tank Farm (Secondary Waste)	LLRW – sludge transfer system components, hoses, fittings, and associated debris	WCS, Andrews, TX
Building G2 and H2 enclosures, tunnel, equipment, debris, rubble	LLRW	WCS, Andrews, TX
Oversize debris	LLRW (oversize tanks)	Alaron, Wampum, PA WCS, Andrews, TX
Land area cleanup, soil and debris	LLRW	WCS, Andrews, TX Energy Solutions, UT
Multiple areas, hazardous waste	Hazardous waste	Veolia miscellaneous facilities
Multiple areas, industrial waste	Non-hazardous waste	Veolia miscellaneous facilities
Multiple areas, mixed waste	MLLW (miscellaneous debris)	WCS, Andrews, TX Energy Solutions, PermaFix
Ion exchange media	LLRW	WCS, Andrews, TX

Staging of contaminated debris waste and soil was conducted in the disturbed area footprint prior to loadout where possible in an effort to support efficient operations and reduce the potential for the spread of contamination associated with the waste materials. Alternatively, contaminated soil/debris was staged in piles and loaded into containers. The majority of the contaminated waste soil and debris was loaded into standard intermodals for transport off site to DOE-approved and permitted disposal facilities. Construction and debris wastes that were not contaminated and did not require management as hazardous or radioactive waste, such as uncontaminated asphalt, were segregated appropriately and managed for off-site disposal as construction or non-contaminated debris waste and disposed in an appropriate NYSDEC-permitted facility.

In some cases, soil or stone/gravel materials located on site were managed as fill material for reuse on site in accordance with NYSDEC DER-10 and DOE requirements. Data collected for the use/reuse of soil as fill material onsite are included in Attachment 13. The majority of the material cleared for reuse on the KAPL site was placed in the Red Pines Area.

3.6.2 Waste Container Loading and Staging Areas

The majority of waste container loading during the corrective measures implementation program was conducted in the area just outside the south edge of both the H2 and G2 Buildings' footprint as shown in the Upper Level and G2 Work Plans. Containers were placed on impervious material to prevent cross-contamination to the ground during waste loading. The waste containers were closed and sealed prior to being loaded onto a truck for movement to the transport staging area at the SPRU Lower Level. Waste staging areas were also located at the SPRU Lower Level to manage other waste and container types prior to off-site shipment and disposal.

3.6.3 Stormwater Management

During site remediation and excavation activities, water that collected in the excavation areas resulting from dust control and precipitation events was pumped and transferred into fractionation tanks and managed in accordance with the SPRU Stormwater Pollution Prevention Plan (SWPPP) [13] and SPRU operating and waste management procedures. The excavation water was then shipped for off-site disposal after sampling in accordance with the requirements of the disposal facility's Waste Acceptance Criteria. Surface water run-on into the excavation areas was controlled and limited to the extent possible by measures incorporated into the SWPPP. Following post-remediation soil confirmation sampling and concurrence by NYSDEC that SCOs were met, stormwater from post-remediation excavations was collected, sampled, and analyzed and discharged in accordance with NYSDEC requirements and in a manner consistent with the SWPPP. The analytical data and email indicating the NYSDEC approval of the discharge in accordance with the required criteria are included in Attachment 7 to this report [14].

4.0 SAMPLING PROGRAM

The corrective measures sampling program used a combination of judgmental and systematic sampling based on NYSDEC DER-10 guidance for sampling to collect information for determining whether chemical contamination is present above SCOs. The sampling program included both pre- and post-excavation sampling. The sampling program was conducted using the Data Quality Objective (DQO) process as specified in EPA/240/B-06/001, *Guidance on Systematic Planning Using the Data Quality Objectives Process – EPA QA/G-4* [15] and in accordance with the Upper Level and G2 Work Plans [2] [3]. The Upper Level and G2 Work Plans define the sampling locations and analytes to ensure that comprehensive and defensible data were collected and to confirm that the corrective measures had been implemented for the SPRU Upper Levels SWMUs and G2 Building AOC as required for an NFA determination.

4.1 Selection of Sampling Locations

Soil samples were collected within the excavation footprint of the Upper Level SWMUs and the G2 Building AOC in an adequate manner to confirm 1) the successful completion of corrective measures and associated contamination removal via demolition and removal of building materials, equipment, piping, soil and stone, and other construction materials, and 2) that the SCOs for each of the chemical CoCs had been met. One judgmental surface sample was also collected at SWMU-082 downgradient from the THDS-1 tank (sample #SFT-01) to verify that no additional cleanup or excavation was required and to confirm that SCOs had been met for this SWMU.

Samples were collected for chemical testing at selected judgmental and systematic locations for soil remaining after excavation. In accordance with DER-10, Section 3.2.1 guidance, many of the soil sample locations were biased towards areas of known prior or potential contamination (e.g., VOC contamination noted in geoprobe borings). For example, samples were collected in the area of the H2 process cells near potential leak paths associated with cell sumps. Sampling was also prioritized at several locations based on field observations, screening surveys, and accessibility. Per DER-10 guidance, soil sample locations were also collected on the bottom of each sidewall after the H2 Building footer drains were excavated to confirm SCOs (subsurface cleanup levels) had been achieved.

The Upper Level and G2 Work Plans and RCRA Quality Assurance Project Plan (QAPjP) were developed and implemented to meet post-excavation confirmation sampling consistent with DER-10 requirements, which provides sampling protocols for soil characterization and excavation depending on the perimeters and the nature of the impacts. Specifically, for perimeters greater than 300 feet, one sample was collected for every 900 square feet of bottom area and one sample for every 30 linear feet of sidewall from the bottom areas associated with potential subsurface releases. The DER-10 criteria from Chapter 5.4(b) for excavation perimeters greater than 300 linear feet were used as they apply to each excavation associated with H2 and G2 Buildings and associated soil/stone removal activities per the Upper Level and G2 Work Plans. Per DER-10 guidance for VOC analyses in an excavation: 1) samples collected within 24 hours of excavation were collected from the 0-to-6 inch interval at the excavation floor or 2) samples collected after 24 hours were collected from the 6-to-12 inch interval.

Figure 12 and Figure 13 include the confirmatory soil sampling locations for the SPRU Upper Level SWMUs and G2 AOC, respectively. The Upper Level SWMU sampling locations were agreed to in an email between NYSDEC and DOE dated July 17, 2018 included in Attachment 6 to this report [16].

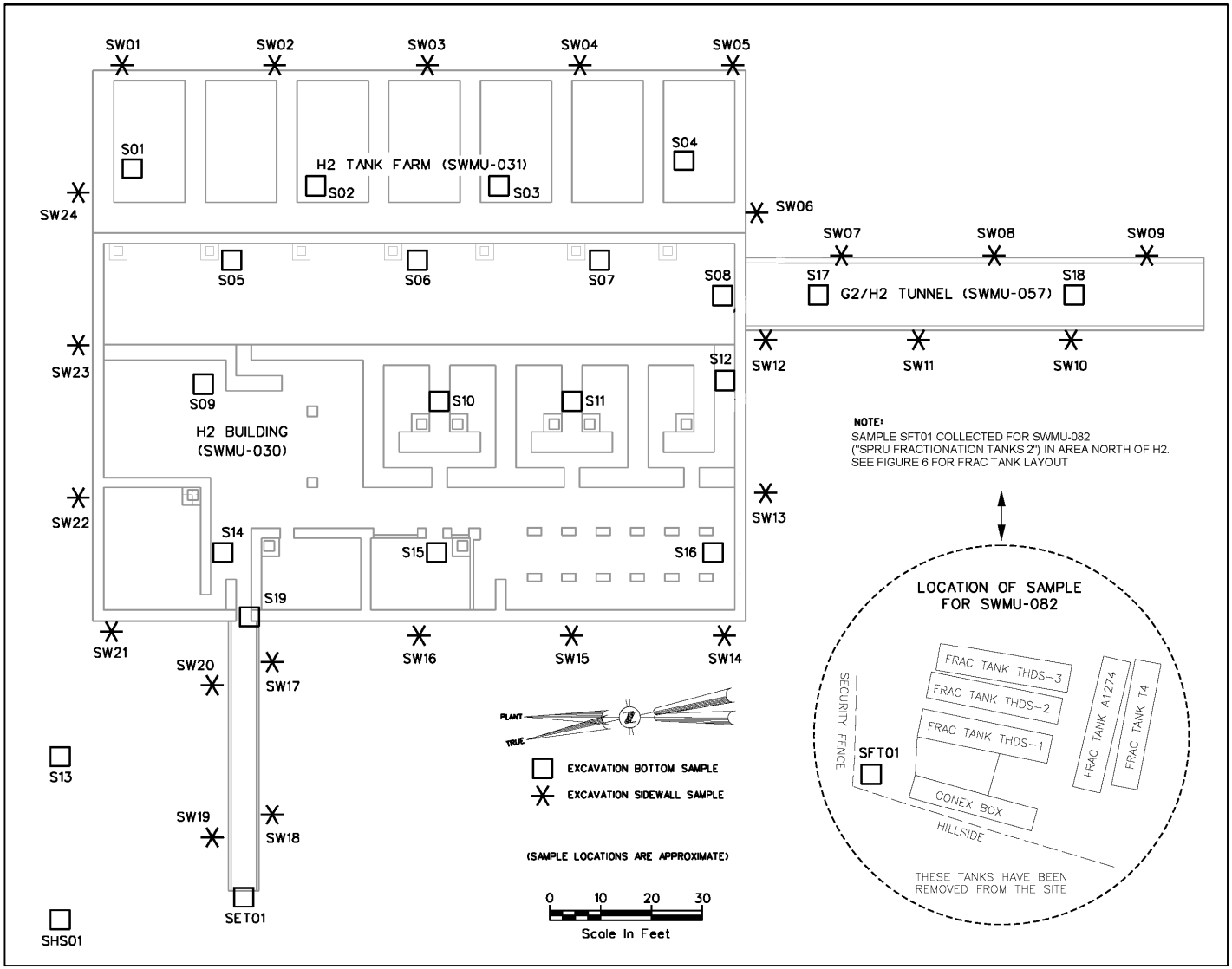

Figure 12. H2 Building SWMU Confirmation Sample Locations

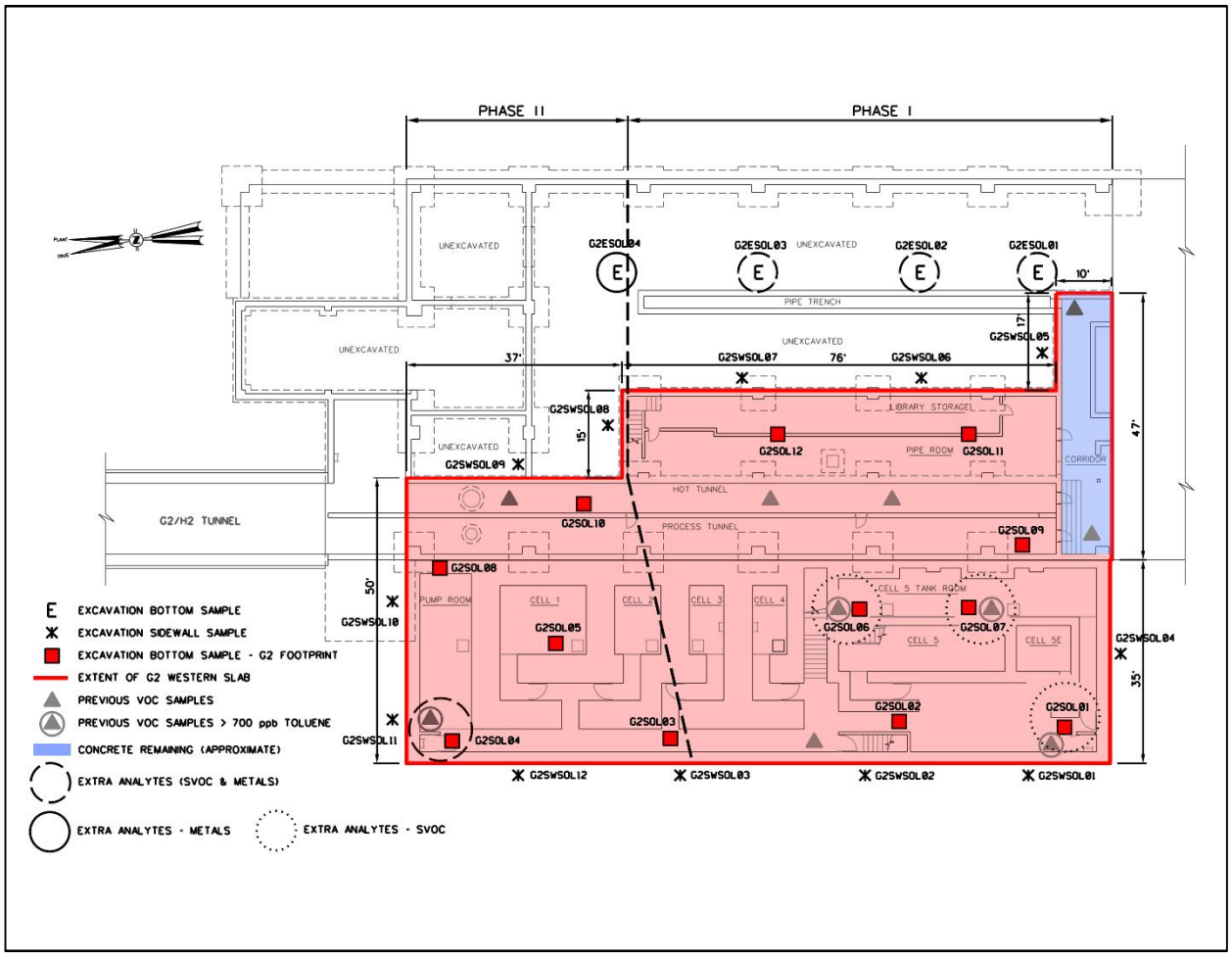

Figure 13. G2 Building AOC Confirmation Soil Sample Locations

The G2 AOC sample locations were as specified in the NYSDEC-Approved Work Plan. The confirmatory sample locations and methods were conducted in accordance with the NYSDEC-approved Upper Level and G2 Work Plans. Sampling and analysis activities were completed as described in Sections 5 and 6 of the Upper Level and G2 Work Plans. Based on DER-10 criteria, a total of 9 excavation bottom and 12 sidewall samples were required for the G2 basement level sub-slab. However, an additional 3 bottom samples were collected at the bottom of the G2 excavation to provide adequate coverage of the areas with SCO (toluene) exceedances during G2 characterization sampling (Figure 13). Due to the configuration and complexity of the excavation activities required for the Upper Level SWMUs, a total of 21 post-excavation bottoms and 24 sidewall samples were required (Figure 12).

4.2 Sampling Methods

The sampling and analysis methods were conducted in accordance with the NYSDEC-approved Upper Level and G2 Work Plans. All sampling activities were conducted in accordance with the quality assurance and quality control (QA/QC) procedures detailed in the *RCRA Quality Assurance Project Plan for the RCRA Interim Corrective Measures Work Plan Upper Level SWMUs* (RCRA QAPjP) [17]. Soil samples were collected and handled in accordance with SPRU-RC-119, “Sample Collection” [18].

The H2 Tank Farm and H2 Building slabs rested on undisturbed till. Sample locations in subgrade till were not conducive (i.e., too hard and stiff) for the collection of some samples using standard VOC sampling techniques. Therefore, these samples were collected using powered hand tools (i.e., drill with core bit). This approach was approved by NYSDEC as part of the Upper Level Work Plan. All soil (non-till) confirmation samples were collected using standard VOC sampling techniques. The laboratory analytical method was followed as described in Section 4.4. Additional requirements and methods required to support sampling activities were described in the Upper Level and G2 Work Plans.

4.3 Post-Excavation Confirmatory Soil Sampling

Confirmation sampling was conducted in accordance with the Upper Level and G2 Work Plans. Sampling and analysis, data management, and QA/QC activities were performed in accordance with the RCRA QAPjP.

A discussion of the confirmation sampling data results is provided in Section 4.5. An evaluation of the results shows that the sample concentrations are less than the project SCOs for all constituents except for iron, aluminum, and calcium. Iron concentrations were detected in a reasonable range between samples, consistent with expected values for background. The results in the gray till for both G2 and H2 for iron (15,500–32,100 mg/kg) are above the SCO (2,000 mg/kg) listed in NYSDEC CP-51 *Soil Cleanup Guidance* [19]. Aluminum (4,930–12,200 ppm) and calcium (10,600–36,900 ppm) were also above their SCOs of 10,000 ppm. However, the concentrations of these metals are consistent with background values for the KAPL site of 35,700 mg/kg iron; 11,700 ppm aluminum; and 31,600 mg/kg calcium. Therefore, the results for these metals did not require further analysis. The original sample at SHS01 showed an exceedance of the SCO for acetone, so this location was further remediated into the native till. The resample at SHS01 was found to be below SCOs for all analytes.

A full presentation of the confirmation sample results and comparison with the SCOs are provided in the Preliminary Data Reports, which are included in this report as Attachment 3 (Upper Level SWMUs), Attachment 4 (G2 AOC Phase 1), and Attachment 5 (G2 AOC Phase 2). Table 4 lists the 48 soil/till confirmation samples that were collected along with the analyses performed for the Upper Level SWMUs. Table 5 lists the 30 soil/till samples that were collected along with the analyses performed for the G2 AOC. The final analysis and summary of results is discussed in Section 4.5.

Table 4. Upper Level SWMU Sample List

Sample	Collection Date	Analyses		
		VOC	SVOC	METALS
S01	07/19/18	X	X	X
S02	07/19/18	X	X	X
S03	07/19/18	X	X	X
S04	07/19/18	X	X	X
S05	07/18/18	X	X	X
S06	07/18/18	X	X	X
S07	07/19/18	X	X	X
S08	07/20/18	X	X	X
S09	07/18/18	X	X	X
S10	07/18/18	X	X	X
S11	07/19/18	X	X	X

Sample	Collection Date	Analyses		
		VOC	SVOC	METALS
S12	07/20/18	X	X	X
S13	05/18/18	X	X	X
S14	07/18/18	X	X	X
S15	07/18/18	X	X	X
S16	07/19/18	X	X	X
S17	08/09/18	X		X
S18	08/09/18	X		X
S19	07/18/18	X	X	X
SET01	07/10/18	X		X
SFT01	08/22/18	X		X
SHS01 (initial sample)	05/18/18	X	X	X
SHS01 (post-excavation confirmation)	07/10/18	X		X
SW01	07/16/18	X	X	X
SW02	07/16/18	X	X	X
SW03	07/16/18	X	X	X
SW04	07/19/18	X	X	X
SW05	07/19/18	X	X	X
SW06	07/20/18	X	X	X
SW06D	07/20/18	X	X	X
SW07	08/09/18	X		X
SW08	08/09/18	X		X
SW09	08/09/18	X		X
SW10	08/09/18	X		X
SW11	08/09/18	X		X
SW12	07/20/18	X	X	X
SW13	07/20/18	X	X	X
SW14	07/20/18	X	X	X
SW15	07/19/18	X	X	X
SW16	07/19/18	X	X	X
SW17	07/10/18	X		X
SW18	07/10/18	X		X
SW19	07/10/18	X		X
SW20	07/10/18	X		X
SW21	07/19/18	X	X	X
SW21D	07/19/18	X	X	X
SW22	07/18/18	X	X	X
SW23	07/19/18	X	X	X
SW24	07/18/18	X	X	X

Table 5. G2 AOC Sample List

Sample	Collection Date	Analyses		
		VOC	SVOC	Metals
G2ESOL01	09/25/17	X	X	X
G2ESOL02	09/25/17	X	X	X
G2ESOL03	09/25/17	X	X	X
G2ESOL04	08/09/18	X		X
G2SOL01	10/26/17	X	X	
G2SOL01D	09/25/17	X		
G2SOL02	09/25/17	X		
G2SOL03	08/09/18	X		
G2SOL04	08/09/18	X	X	X
G2SOL05	08/09/18	X		
G2SOL05D	08/09/18	X		
G2SOL06	10/26/17	X	X	
G2SOL07	10/26/17	X	X	
G2SOL08	08/09/18	X		
G2SOL09	09/25/17	X		
G2SOL10	08/09/18	X		
G2SOL11	09/25/17	X		
G2SOL12	09/25/17	X		
G2SWSOL01	09/25/17	X		
G2SWSOL02	09/25/17	X		
G2SWSOL03	08/09/18	X		
G2SWSOL04	09/25/17	X		
G2SWSOL05	09/25/17	X		
G2SWSOL06	09/25/17	X		
G2SWSOL07	09/25/17	X		
G2SWSOL08	08/09/18	X		
G2SWSOL09	08/09/18	X		
G2SWSOL10	08/09/18	X		
G2SWSOL11	08/09/18	X		
G2SWSOL12	08/09/18	X		

4.4 Laboratory Analyses

The laboratory analyses were conducted as stated in the RCRA QAPjP. All samples collected for off-site analysis were sent to a New York Department of Health Environmental Laboratory Approval Program (ELAP)-certified and a DOECAP-audited laboratory. Other laboratory requirements for analysis and QC are found in the laboratory statement of work.

The laboratory analyses conducted for each of the Upper Level SWMUs and G2 Building AOC are listed below:

- H2 Processing Facility (SWMU-030): TAL metals, SVOCs, and TCL VOCs (Note: The building emergency tunnel exit surface spill location samples received TCL VOCs and TAL metals analyses only).
- H2 Tank Farm (SWMU-031): TAL metals, TAL SVOCs, and TCL VOCs.
- G2/H2 tunnel (SWMU-057): TAL metals and TCL VOCs.
- Fractionation Tanks 2 (SWMU-082): TCL VOCs and TAL metals (Note: One sample collected at north edge of fractionation tank THDS-1 surface spill location only).
- G2 Building AOC (AOC-008): TCL VOCs, TAL metals, TAL SVOCs (Note: All sample locations were analyzed for VOCs. Five sample locations were analyzed for metals and seven sample locations for SVOCs, including the four locations that exceeded the SCO levels in the west basement and three of the "E" locations along the east side [Figure 13]).

Past experience has shown low responses of laboratory analysis of internal standards in gray till samples analyzed for VOCs, which results in the data being qualified for usability. The Upper Level and G2 Work Plans and associated QAPjP allows for the gray till samples to be analyzed using a modified Method 8260, whereby analysis is performed using the low-level purge and trap and the medium-level methanol extraction. NYSDEC agreed that re-analysis for low-level purge and trap is not needed to confirm the matrix effect from the till on the low internal standard responses. The lower of the usable reporting limits from the two analyses (base and modified Method 8260) were used for reporting non-detect levels. The lower method detection limits were typically achieved in the undiluted sample vs. the diluted sample. Gray till samples were identified on the Chain-of-Custody to alert General Engineering Laboratories (GEL) to perform the dual analysis.

4.4.1 Preliminary Data Reports

Once the sampling indicated that an area had met the SCOs, the results of the excavation and confirmation sampling program were summarized in a Preliminary Data Report (PDR). Separate PDRs were developed for the Upper Level SWMUs and for the G2 Building AOC; they are included as Attachments 3 (H2 SWMUs), 4 (G2 AOC Phase 1), and 5 (G2 AOC Phase 2) to this report. The PDRs were developed to support any decisions regarding additional required remediation or sampling and to confirm that the corrective actions had been completed.

The PDRs for the SWMUs and AOC were prepared and submitted to NYSDEC for review and approval in an effort to expedite the backfilling in the excavation areas. The PDRs included the excavated areas and sample confirmation locations as well as summaries and evaluation of validated analytical results received from GEL. The NYSDEC reviewed the PDRs and provided the approval to backfill the areas.

4.4.2 Laboratory Data Deliverables and Data Validation

The laboratory data deliverables and data validation were conducted in accordance with the NYSDEC-approved Upper Level and G2 Work Plans. Most samples were analyzed by GEL, and a few of the organic compound analyses were performed by Adirondack Lab. Both laboratories are NYS Department of Health ELAP-certified. Analytical Services Protocol Category B deliverable data packages were provided for each sample delivery group. A detailed description of laboratory reporting and data validation protocol is provided in the RCRA QAPjP.

The alternative field sampling collection method used for the till samples (Section 4.2) required modified sample handling, including methanol extraction and analysis (Section 4.4) by the laboratory. This alternative methodology was described in the NYSDEC-approved Upper Level Work Plan. Laboratory data validation was conducted by GEL in accordance with the alternative sampling and analyses methodology.

Per NYSDEC requirements, the complete analytical dataset, including laboratory and third-party validation results has been uploaded in the NYSDEC-approved electronic data deliverable (EDD) format.

Laboratory data validation was performed and reported within the data summary reports. Analytical data validation involves evaluation of all sample-specific information generated from sample collection to receipt of the final data package. Copies of the data forms were annotated for qualification as discussed in the validation report and were attached to the report. The GEL data sample summary reports for the Upper Level SWMUs and G2 Building AOC are included in the PDRs in Attachments 3, 4, and 5. Complete electronic copies (PDFs) of the Category B Analytical Services Protocol data packages are included under separate cover as Appendix 1 to this report.

In addition, personnel conducted complete third-party data validation analysis on the laboratory data packages to verify the overall adequacy and completeness of the data and documented the results in a separate report. The data validation process was conducted in accordance with EPA guidance provided in EPA 540-R-08-005, *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* [20], and EPA/240/R-02/004, *Guidance on Environmental Data Verification and Data Validation* [21], and other documents referenced in Section 5.0 of the data validation report. The data validation report for data collected in accordance with the Upper Level and G2 Work Plans is included as Attachment 8.

Data validation analyses fall within the six criteria categories listed below. Significant conditions that may have affected data quality are summarized below and are presented in detail in Attachment 8.

1. Sample preservation and holding time
2. Initial and continuing calibration
3. Analyte identification and quantitation
4. Laboratory- and field-generated blanks
5. Laboratory control sample and matrix spike recoveries
6. Laboratory- and field-generated duplicates

The most significant data validation criteria noted was with respect to VOC analyte identification and quantitation. As expected, VOC surrogates and internal standards (IS) prepared for the neat (undiluted) analysis of the grey till (soil) samples experienced significant failures. The IS and surrogate failures for VOC analyses were eliminated in the samples analyzed using methanol dilution and extraction. This was consistent with prior experience with VOC analyses conducted on the grey till samples. Based on the IS and surrogate results, the majority of the neat VOC analyte results reported as not detected ("U"-qualified) by the laboratory were re-qualified UJ during the data validation process. The "UJ"-qualification indicates that the analyte was not detected, but that the sample detection and quantitation limits are approximated. Additional information on the data validation and qualification process is included in Attachment 8.

The majority of the VOC analytes reported as detected or estimated ("J"-qualified) by the laboratory in the neat (undiluted) samples were retained as detected or estimated and were assigned a "J+" qualification (indicating potential high bias) based on the data validation process. The J-qualified data indicates that the analyte was positively identified, but the result is approximated. "J"-qualified data may also represent a potential high (J+) or low (J-) bias. All VOC and SVOC analytes reported as detected (and qualified) are included in Table 6 and Table 7, respectively.

Several other data validation issues noted with respect to laboratory control sample and matrix spike recoveries, and laboratory-generated duplicates are discussed in detail in Attachment 8. Many of the issues noted in the data validation report were attributed to matrix effects and analysis of the grey till samples. In general, the vast majority of the data was considered useable and of good quality.

As shown in Table 8, only a small number of VOC and SVOC analytes were rejected based on data validation results. A total of 31 individual analyte results were rejected (R-qualified) based on a combination of failed data quality criteria noted with respect to quantification of laboratory internal standards, compound identification, matrix spike and surrogate recoveries, laboratory duplicate recoveries, and estimated values less than sample quantitation limits. All except one of the rejected analyte results were reported on neat (undiluted) samples as noted in Table 7. Qualifier reason codes used to identify the data quality issues are also included in Table 7. All metals results were considered valid and are provided in Table 9.

4.5 Summary of Data Results

The data analyses including the review of laboratory data reports and data validation results indicate that all organic results are below the SCOs for all analytes. The final results for toluene and arsenic, the only CoCs detected above their corresponding SCOs during site characterization, as well as all other VOCs and SVOCs, were well below their respective SCOs. With the exception of iron, aluminum, and calcium, all metals analyzed during confirmation were also below their respective residential or groundwater SCOs. As described in the PDRs, the iron results in the gray till in both G2 and H2 (15,500 – 32,100 mg/kg) are above the SCO (2,000 mg/kg) listed in *CP-51 Soil Cleanup Guidance* applicable to residential criteria [19]. Aluminum (4,930–12,200 ppm) and calcium (10,600–36,900 ppm) were also above their SCOs of 10,000 ppm. However, the concentrations of these metals are consistent with background values for the KAPL site of 35,700 mg/kg iron; 11,700 ppm aluminum; and 31,600 mg/kg calcium. All field sampling and data analyses activities were conducted in accordance with NYSDEC-approved Upper Level [2] and G2 Work Plans [3] and referenced documents. The final data results include the applicable data qualifiers applied by both GEL and any additional or modified qualifiers applied through the third-party data validation process. Data results for the Upper Level SWMUs and G2 AOC are summarized below.

Complete electronic copies of the Category B Analytical Services Protocol data packages are included under separate cover as Appendix 1 to this report.

4.5.1 Upper Level SWMU Data Results

The final validated data results including all detected or estimated VOC and SVOC analytes for the Upper Level SWMU and G2 AOC samples are summarized in Table 6 and Table 7, respectively. The VOC and SVOC sample analytes that were rejected based on data validation are listed in Table 8. Toluene, the primary CoC, was not detected in any Upper Level SWMU confirmation samples. All toluene results for the Upper Level SWMUs were not detected and were qualified "U" (non-detect) or "UJ" (analyte was not detected; the sample detection and quantitation limits are approximated). All Minimum Detection Limits (MDL) reported for non-detects were well below the SCO of 700 ppb for toluene.

Thirteen other VOCs were detected and estimated in one or more samples (11 analytes "J+" qualified; one analyte "J"-qualified) at concentrations well below their corresponding SCOs as shown in Table 6**.** The results for all other VOC and SVOC analytes for the Upper Level SWMUs were reported and validated as not detected with detection limits well below their corresponding MDLs.

An area with a positive detection for acetone (Sample #SHS01 was 74 ppb, which is greater than the SCO of 50) was remediated and the resampled location was non-detect for all VOC analytes. All other VOC and SVOC detections reported for the Upper Level SWMUs were below SCOs. All metals data results for the Upper Level SWMUs and the AOC are included in Table 9. Three metals (aluminum, calcium, and iron) were detected at concentrations exceeding their SCOs in the majority of the samples. However, as discussed in Section 4.3, these constituents were detected at concentrations within a reasonable range and consistent with background values measured at the KAPL site (11,700 mg/kg aluminum; 31,600 mg/kg calcium; and

35,700 mg/kg iron). All other metal results were below their corresponding SCOs for both the Upper Level SWMUs and the G2 AOC.

4.5.2 G2 AOC Data Results

Toluene, the primary CoC, was detected at five locations with estimated concentrations ("J" qualified) up to 0.543 ppb. These values are well below the SCO of 700 ppb. Five other VOCs were detected with results estimated ("J+" qualified or "J"-qualified) at concentrations well below their corresponding SCOs as indicated in Table 6. The results for all other VOC and SVOC analytes for the G2 AOC were reported and validated as not detected with detection limits well below their corresponding MDLs.

Table 6. VOC Analytes Detected in Upper Level SWMUs and G2 AOC

Sample No.	All units ug/kg	1,2,3-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2-Butanone	Acetone	Carbon disulfide	Chloroform	Methylene chloride	Tetrachloro-ethene	Toluene	Trichloroethene	Trichlorofluoro-methane	Vinyl chloride
	SCO [a]	*20000 [b]*	*3400 [c]*	*1100*	*2400*	*1800*	*50*	*50*	*2700 [c]*	*370*	*50*	*1300*	*700*	*470*	*NC*	*20*
G2ESOL01								2.06 J					0.426 J			
G2ESOL02												0.734 J (46.4 J) [f]		0.421 J		
G2ESOL03													0.543 J			
G2SOL01D													0.402 J			
G2SOL03													0.331 J+			
G2SOL04														0.448 J+ (23.9 J+) [f]		
G2SOL08									2.29 J+							
G2SOL10									2.97 J+							
G2SWSOL09													0.528 J		17.8 J+ [e]	
S01						0.405 J+					3.43 J+					
S03									3.41 J+							
S05									1.60 J+							
S09			0.408 J+													
S10									2.07 J+							
S17		1.98 J+	1.73 J+					4.18 J+	3.48 J+							
S18										1.48 J+	0.368 J			1.72 J+ (32.2 J+) [f]	0.537 J+	
SHS01 [d]							6.92	74.4 J								
SW05		0.560 J+	0.458 J+													
SW07									1.95 J+		15.9 J+					
SW09									4.05 J+							
SW10														4.70 J+ (105 J+) [f]		
SW11														0.382 J+		
SW14									1.85 J+							
SW15											2.38 J+					
SW21		1.95 J+														
SW21D																1.75 J+
SW22									2.45 J+							
SW23		2.08 J+	1.67 J+	0.349 J+	0.644 J+	0.840 J+										
SW24			0.479 J+													

NOTE: All results in table are from neat (undiluted) sample runs unless otherwise noted.

[a] Source: NYCRR Table 375-6.8(b) Soil Cleanup Objectives based on the more restrictive value for residential use or groundwater protection unless otherwise noted

[b] CP-51 / Soil Cleanup Guidance based on protection of ecological resources

[c] CP-51 / Soil Cleanup Guidance based on protection of groundwater

[d] Acetone and 2-Butanone results are from initial sampling event; SHS01 post-excavation sample was analyzed via methanol extraction (dilution factor=50) and was non-detect for all VOC analytes.

[e] Sample result reported for methanol dilution (dilution factor=50); neat (undiluted) sample result was non-detect.

[f] Result in parentheses is methanol extraction run (dilution factor=50).

NC = No criteria

Table 7. SVOC Analytes Detected in Upper Level SWMUs and G2 AOC

Sample No.	All units ug/kg	Benzo(b)-fluoranthene	Di-n-butylphthalate	Dimethyl-phthalate	Di-n-octylphthalate	Fluoranthene	Phenanthrene	Pyrene
	SCO [a]	***1000***	***8100*** [b]	***100000***	***100000*** [b]	***100000***	***100000***	***100000***
G2SOL01				460 J+				
G2SOL06				490 J+				
G2SOL07				520 J+				
S19						14.2 J	14.5 J	
SHS01		2.48 J						
SW06					108 J+			
SW21D			11.5 J					
SW22						32.1 J	21.7 J+	21.4 J

[a] Source: NYCRR Table 375-6.8(b) Soil Cleanup Objectives based on the more restrictive value for residential or groundwater protection unless noted.
[b] CP-51 / Soil Cleanup Guidance based on groundwater protection.

Table 8. Rejected Analytical Results for Upper Level SWMUs and G2 AOC

Sample_No	Parameter	Result (ug/kg)	Validation Qualifier	Qualifier Reason_Code	MDL	Dilution Factor
G2SOL03	1,2,3-Trichlorobenzene	0.674	R	1,10,14,21	0.331	1
G2SOL03	1,2,4-Trichlorobenzene	0.663	R	1,10,14,21	0.331	1
G2SOL04	cis-1,2-Dichloroethylene	35.1	R	1,14,21	16.7	50
G2SOL08	1,2,4-Trichlorobenzene	1.08	R	1,10,14,21	0.298	1
G2SOL08	1,4-Dichlorobenzene	0.645	R	1,10,14,21	0.298	1
G2SOL08	Acetone	3.48	R	1,10,14,21	2.98	1
G2SOL10	1,2,4-Trichlorobenzene	1.22	R	1,10,14,21	0.319	1
G2SOL10	Acetone	3.95	R	1,10,14,21	3.19	1
S17	1,2-Dichlorobenzene	0.7	R	1,10,14,21	0.318	1
S17	1,4-Dichlorobenzene	0.996	R	1,10,14,21	0.318	1
S18	1,2,3-Trichlorobenzene	1.21	R	1,10,14,21	0.316	1
S18	1,2,4-Trichlorobenzene	1.07	R	1,10,14,21	0.316	1
S18	1,3-Dichlorobenzene	0.379	R	1,10,14,21	0.316	1
S18	1,4-Dichlorobenzene	0.705	R	1,10,14,21	0.316	1
S18	cis-1,2-Dichloroethylene	0.368	R	1,10,14,21	0.316	1
SW07	1,2,3-Trichlorobenzene	0.848	R	1,10,14,21	0.322	1
SW07	1,2,4-Trichlorobenzene	1.2	R	1,10,14,21	0.322	1
SW07	1,3-Dichlorobenzene	0.451	R	1,10,14,21	0.322	1
SW07	1,4-Dichlorobenzene	0.751	R	1,10,14,21	0.322	1
SW07	Acetone	4.74	R	1,10,14,21	3.22	1
SW08	1,2,4-Trichlorobenzene	0.456	R	1,10,14,21	0.326	1
SW08	1,4-Dichlorobenzene	0.326	R	1,10,14,21	0.326	1
SW21	1,2,4-Trichlorobenzene	2.1	R	1,10,11,14,18,21	0.304	1
SW21	1,2-Dichlorobenzene	0.74	R	1,10,11,14,18,21	0.304	1
SW21	1,3-Dichlorobenzene	0.71	R	1,10,11,14,18,21	0.304	1
SW21	1,4-Dichlorobenzene	0.953	R	1,10,11,14,18,21	0.304	1
SW21	Vinyl chloride	2.74	R	1,10,11,14	0.304	1
SW06	Hexachlorocyclopentadiene	ND	R	11,18	108	1
SW06D	Hexachlorocyclopentadiene	ND	R	11,18	108	1
SW22	Benzo(a)anthracene	17.1	R	1,21	10.7	1
SW22	Chrysene	10.7	R	1,21	10.7	1

Qualifier Reason Code Definitions:

1	Compound identification criteria were not met.
10	Internal standard (IS) or carrier criteria were not met when affecting quantitation.
11	Matrix Spike (MS) or MS Duplicate (MSD) recovery was not within the control limits.
14	Surrogate or tracer spike recovery is out of specification.
18	The laboratory duplicate or MSD reproducibility was not within control limits.
21	Result is above detection, but less than the sample quantitation limit.

Table 9. Metals Results for Upper Level SWMUs and G2 AOC

Sample No.	All units mg/kg (ppm)	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium[c]	Silver	Sodium	Thallium	Vanadium	Zinc
	SCO [a]	*10000 [b]*	*12 [b]*	*16*	*350*	*14*	*2.5*	*10000 [b]*	*36*	*30*	*270*	*2000 [b]*	*400*	*NC*	*2000*	*0.73*	*130*	*NC*	*4*	*8.3*	*NC*	*5*	*100*	*2200*
G2ESOL01			ND	7.81 J	59.9		ND UJ		13	10.1		24200	2.53		430	0.0217	23.4		1.66 J	0.136 J		ND UJ		55.6 J
G2ESOL02			ND	7.05	56		0.117 UJ		13	13.5		24600	3.76		538	0.0661	26		1.61 J	0.15 J		ND UJ		338 J
G2ESOL03			ND	6.9	50.1		ND UJ		12.9	11.2		24400	4.19		577	0.028	25.3		1.48 J	ND		ND UJ		59.4 J
G2ESOL04		7190	ND UJ	6.29 J	51.5 J+	0.493 J	ND U	13400 J	11.4 J+	9.34 J	22.3 J+	18900	9.36 J+	5760 J	377	0.0247	21.6 J	851 J+	0.86 J-	0.476 J+	64.8 J	ND UJ	14 J	48 J
G2SOL04		8250		8.87 J-	46.1 J	0.576 J	0.29 J+	17300 J	13.7 J	12.2	35.7	23300	11.9	7270 J	508	0.0221	26.3 J	893 J	0.565 J	0.443 J+	203 J+		16.3 J	54.9 J
S01		7510		7.3	60.2	0.609		24400	12.6	10.7 J+	26.9	23200	11.5	9210	415	0.0238	25.1	1190	0.775 J	0.614 J+	98.4 J-	1.09 J	16.5	50.3
S02		6230		7.77	63.7	0.545		22000	10.6	9.79 J+	24.9	20100	10.9	9800	395	0.02	22.7	1440	0.671 J	0.569 J+	108 J-	0.788 J	13.6	50.7
S03		6780		6.95	60.4	0.549		21000	11.3	9.94 J+	26.2	21300	10.9	9400	407	0.0273	23.1	1300	0.798 J	0.637 J+	108 J-	0.807 J	14.6	51.5
S04		5720		7.05	47.2	0.491 J		20900	9.74	8.94 J+	23.6	18800	10.4	8530	381	0.0271	20.6	1190	0.754 J	0.577 J+	90 J-	0.887 J	12.7	49.9
S05		10600		9.41	83.1	0.744		29400	16.9	12.7	43.3	30200	12.1	14700	551	0.0276	29.9	1840	0.778	0.844 J+	88	1.35 J	22	84.2
S06		10700		8.36	93.6	0.791		20300	17.3	12.9	32.2	28600	12.6	10400	463	0.0301	30.3	1840	0.711	0.873 J+	86.2	1.5 J	22.2	56
S07		6030		7.53	53.1	0.49		20900	10.4	9.29 J+	24	18900	10.4	8610	380	0.0252	21.2	1140	0.675 J	0.526 J+	64.3 J-	0.793 J	13.3	49.9
S08		9270		8.91	75.4	0.655		19400	13.7	11.7	27.9	24000	11.9	9050	429	0.0246	25.9	1660	0.786 J	0.357 J-	112 J+		18.1	50.8 J+
S09		10300		9.16	76.1 J	0.763	0.128 J	24600	16.9	13	41.8 J	29100	14.9	11700	628	0.0289	30.8	1790 J	0.768 J-	0.803 J+	64.6	1.29 J	22	110 J
S10		10600		9.05	68.5	0.759		18500	17.5	13.6	31.5	28600	15.3	10200	436	0.0242	32.8	1810	0.745	0.877 J+	74.1	1.46 J	21.6	53.6
S11		7360		8.07	67	0.592		21600	12.7	11.2 J+	28.3	23500	12.6	9720	423	0.0273	26.1	1300	0.842 J	0.694 J+	80.5 J-	0.955 J	15.7	56.6
S12		9660		8.79	68.4	0.642		36900	14.3	11.3	28.8	24100	12	9180	440	0.0202	26	1670	0.875 J	0.19 J-	122 J+		18.1	62.4
S13		12000 J			0.652			37 J+	21.6 J		4.29 J	56.3	0.754 J	352 J	10.3 J	0.0306	0.547 J				27.7 J+		0.87	21.1
S14		11600		8.89	153	0.847		22200	18.9	12.8	32.5	29300	12.5	10600	488	0.028	30.9	2140	0.84	0.888 J+	75.5	1.47 J	23.9	62.3
S15		10000		8.45	68.3	0.772		31900	16.5	11.9	29.5	30800	13.5	14700	854	0.0301	29.1	1840	0.806	0.885 J+	62.6	1.28 J	21.8	50
S16		9470		7.49	79.9	0.673		21500	18	12.2	30.3	27400	12.8	9010	468	0.0267	29.5	1230	0.839 J	0.843 J+	82.7 J-	1.37 J	20	58
S17		5310		4.58 J	30.6 J+	0.37 J	0.23 J+	12500 J	9.18 J+	7.93 J	20.8 J+	15500	11.9 J+	6170 J	317	0.0262	17.8 J	754 J	0.651 J-	0.295 J+	79.7 J+	ND UJ	10.3 J	36.7 J
S18		7460		6.81 J-	49.8 J+	0.544 J	0.141 J+	25200 J	12 J+	9.81	24.7 J+	21500	10.2 J+	9880 J	432	0.348	22.1 J	990 J+	0.521 J	0.321 J+	175 J+		15.6 J	56.2 J
S19		12200		8.69	109	0.863		19800	19.4	12.7	32.7	30100	12.9	10700	466	0.0295	31.1	2230	0.855	0.915 J+	74.2	1.35 J	24.3	56.8
SET01		10000		8.52	74.1	0.701		22100	16.8	13.3	33.6	28300	13.8	10200	524	0.179	31.6	1260	0.779 J	0.728 J+	66.9	1.25 J	21.5	59.1
SFT01		6750	0.919 J	8.8	47.7	0.501 J	0.12 J	18800 J	11	7.43 J	25.1	17700	15.4	9960 J	365	0.0422	16	753	0.513 J	0.338 J+	56 J+		15.4	158
SHS01		9800	0.462 J	8.21	52.7 J	0.626		17000	16.1	12	32.7	27100	13.6	9570	478	0.0293	28.5	977 J	0.818 J	0.751 J+	51.4	1.3 J	19.5	58.3
SW01		8530	ND UJ	9.13	50.3 J	0.594		20000	14.5	12.9 J+	31.1	24700	18 J	9190	405	0.0245	29.8 J	1120 J	0.863 J	0.645 J+	63.3	1.15 J	17.4	48
SW02		9040	ND UJ	7.82	63.3	0.656		21600	14.8	11.1 J+	29.5	25300	11.4	9720	441	0.0223	26.6	1280	0.876 J	0.627 J+	90.7	1.12 J	18.9	51.4
SW03		8190	ND UJ	6.89	51.8	0.621		19400	13.5	10 J+	26.6	23400	11	9240	444	0.0217	24.6	1100	0.815 J	0.588 J+	89.1	1.16 J	17.2	48.6
SW04		7530		7.89	58.1	0.588		22900	12.9	10.6 J+	28.2	23600	11.5	8990	445	0.0226	25	1390	0.808 J	0.725 J+	93.4 J-	1.1 J	16.3	54.3
SW05		6620		7.82	55.3	0.554		21300	11.1	9.72 J+	25.4	21400	10.9	9690	394	0.0235	22.7	1450	0.918 J	0.736 J+	102 J-	0.966 J	14.5	51.3
SW06		9760		9.88	77.8	0.724		20900	14.7	11.8	29.2	25500	12.5	9810	453	0.0258	27.1 J	1720 J	0.818 J	0.323 J-	134 J+		20.2	54.8 J
SW06D		8990		8.98	66.5	0.64		21500	13.6	10.8	27.6	24000	12	9390	419	0.023	25.7 J	1660 J	0.877 J	0.274 J-	130 J+		18.8	53.4 J
SW07		6110		4.97 J-	44.6 J+	0.378 J	0.231 J+	16400 J	9.78 J+	7	19.9 J+	16800	6.49 J+	6460 J	427	0.0227	16.7 J	768 J	0.629 J	0.275 J+	178 J+		12 J	43.8 J
SW08		8150		8.48 J-	57.6 J	0.553 J	0.242 J+	20900 J	13.2 J+	10.2	31 J+	22800	9.86 J+	8600 J	477	0.0186	23.8 J	1050 J+	0.713 J	0.482 J+	256 J+		16.6 J	83 J
SW09		7060		6.16 J-	50.1 J+	0.519 J	0.172 J+	19100 J	11.3 J+	8.83	21.6 J+	19300	8.09 J+	7440 J	444	0.0241	19.6 J	932 J	0.615 J	0.348 J+	189 J+		14.6 J	46.6 J
SW10		8180		7.68 J-	62.1 J	0.574 J	0.283 J+	22300 J	13.3 J+	10.4	28.3 J+	22700	9.63 J+	9100 J	451	0.0159	23.7 J	1100 J+	0.65 J	0.41 J+	344 J+		16.7 J	64.3 J
SW11		8500		7.49 J-	59.5 J	0.575 J	0.237 J+	17500 J	14.3 J	10.6	28.4 J+	22900	12.4 J+	8390 J	428	0.0241	24.7 J	1030 J+	0.688 J	0.424 J+	143 J+		17.2 J	56.6 J
SW12		9110		9.12	69.8	0.641		20100	13.9	10.9	27.6	23600	12.4	9280	416	0.0257	25.5	1670	0.798 J	0.379 J-	122 J+		18.2	60
SW13		8860		8.87	75.8	0.633		18500	13.5	11	31.8	23800	12.2	8880	418	0.029	26.1	1590	0.895 J	0.35 J-	114 J+		17.6	53
SW14		9340		9.71	66.3	0.655		19400	14.4	11.7	33.8	25300	13.5	9490	473	0.0296	28	1610	0.81 J	0.352 J-	105 J+		18.2	190
SW15		6310		8.11	56	0.519 J		19600	11	9.89 J+	23.8	20600	11.5	8880	399	0.0259	23.8	1120	0.896 J	0.571 J+	42.1 J-	0.872 J	13.5	50.9
SW16		7080		7.69	58.7	0.542		18100	12	10.1 J+	26	21500	10.6	8850	389	0.0296	24	1170	0.778 J	0.661 J+	53.4 J-	0.912 J	14.7	49.6
SW17		4930	ND UJ	9.05	18.9	0.383 J	0.129 J	13600	8.2	14	21.2	16700	24	5680	347		27.7	551	0.743 J	0.432 J+	89.3	0.807 J	9.59	40.5
SW18		10200		8.94	53.1	0.706		10600	16.6	12.3	35.3	29200	13.8	7400	523	0.0595	31.2	797	0.657 J	0.893 J+	140	1.41 J	21	71.2
SW19		9460		7.96	81.6	0.682		32000	15.8	12.6	35.3	26300	13.3	9670	513	0.027	29.5	1170	0.764 J	0.569 J+	105	1.25 J	19.2	60.7
SW20		10700		8.73	76.7	0.754		13500	17.2	13.5	33.8	29200	14.8	7570	547	0.0242	32.4	938	0.778 J	0.791 J+	68.2	1.35 J	21.8	74
SW21		7800	ND UJ	7.86	66.1	0.622		29700	13.9	10.4 J+	28.8	22700	11.1	10100	410	0.0271	25.1 J	1180 J	0.754 J	0.576 J+	63.1 J-	1.01 J	16.7	54.4 J
SW21D		10100		12.4	71.8 J	0.844	ND UJ	30800 J	15.2	12.8	31.4	32100	14.3 J-	9970	767	0.0255	28.7	1160 J+	0.812 J	0.201 J-	85.8	1.53 J+	19.5	61.4 J
SW22		10500		8.59	81.4	0.761		19200	16.9	12	32.2	27800	12.3	10200	466	0.0288	28.9	1750	0.759	0.865 J+	70.8	1.6 J	21.6	65.3
SW23		8000		7.53	64.6	0.586		18500	13.3	11.3	27.9	24400	13.4	8820	452	0.0286	26.5	1060	0.951 J	0.798 J+	84.7 J-	0.988 J	16.2	53.6
SW24		11500		8.57	81.6	0.81	0.169 J	21000	18.3	11.7	35.4	28400	11.8	10800	475	0.0266	29	2040	0.798	0.837 J+	107	1.44 J	23.3	138

NOTE: All results in table are from neat (undiluted) sample runs unless otherwise noted.

[a] Source: NYCRR Table 375-6.8(b) Soil Cleanup Objectives based on the more restrictive value for residential use or groundwater protection unless noted.

[b] CP-51 / Soil Cleanup Guidance based on protection of ecological resources

[c] Selenium analyses runs used a dilution factor of 2.

NC = No criteria

Metals analysis for samples G2SOL04 and G2ESOL04 were below their corresponding SCOs for all analytes except iron and calcium. Iron was reported at 23,300 ppm and 18,900 ppm, with an SCO of 2,000 ppm. Calcium was reported at 17,300 ppm and 13,400 ppm, above the SCO of 10,000 ppm. As discussed in Section 4.3, these constituents were detected at concentrations within a reasonable range and are consistent with the site background concentrations.

The results of the data analysis confirm that the chemical concentrations remaining on the SPRU site are less than the applicable SCO criteria. Therefore, it can be concluded that corrective action requirements associated with the RCRA permit have been met and that the SPRU Upper Level SWMUs and G2 Building AOC (AOC-008) warrant an NFA determination.

5.0 SITE RESTORATION

Backfill of the SPRU Upper Level excavations was performed in two steps. The first occurred in November 2017 after Phase 1 of the G2 VOC AOC. The remainder of the Upper Level backfill started in October 2018 after completion of the H2, H2/G2 Tunnel, and G2 Phase 2 excavations.

Off-site borrow material used as fill material on site was provided from a NYSDEC-permitted source and evaluated in accordance with NYSDEC requirements, including CP-51[19] and DER-10, Section 5.4(e) [4]. The request for importing fill as submitted to NYSDEC is included as Attachment 10, with the supporting laboratory analyses provided as Attachment 11. A separate request for importing top soil for the final restoration is provided as Attachment 12. Clean material excavated as layback or overburden during the remediation was evaluated for reuse on site as backfill in accordance with DER-10 and DOE requirements. The documentation and NYSDEC approval for importing material for the Upper Level backfill and for reuse of the on-site material and associated laboratory analyses is provided as Attachment 13. Some of the approved material was used to backfill the H2 excavation, with the remainder placed in the Red Pines area portion of the North Field Land Area on the KAPL site.

The layout of the restored Upper Level is shown in Figure 14, which can be compared to the pre-demolition site layout shown in Figure 2. For site restoration, an electronic file (D-size plot) of the final site layout and grading is provided in Appendix 2. This documents the final site conditions as required per DER-10 Section 5.8(b)(8). Photographs of the restored Upper Level SWMUs (H2 area) and the G2 AOC are provided in Figure 9 and Figure 11, respectively.

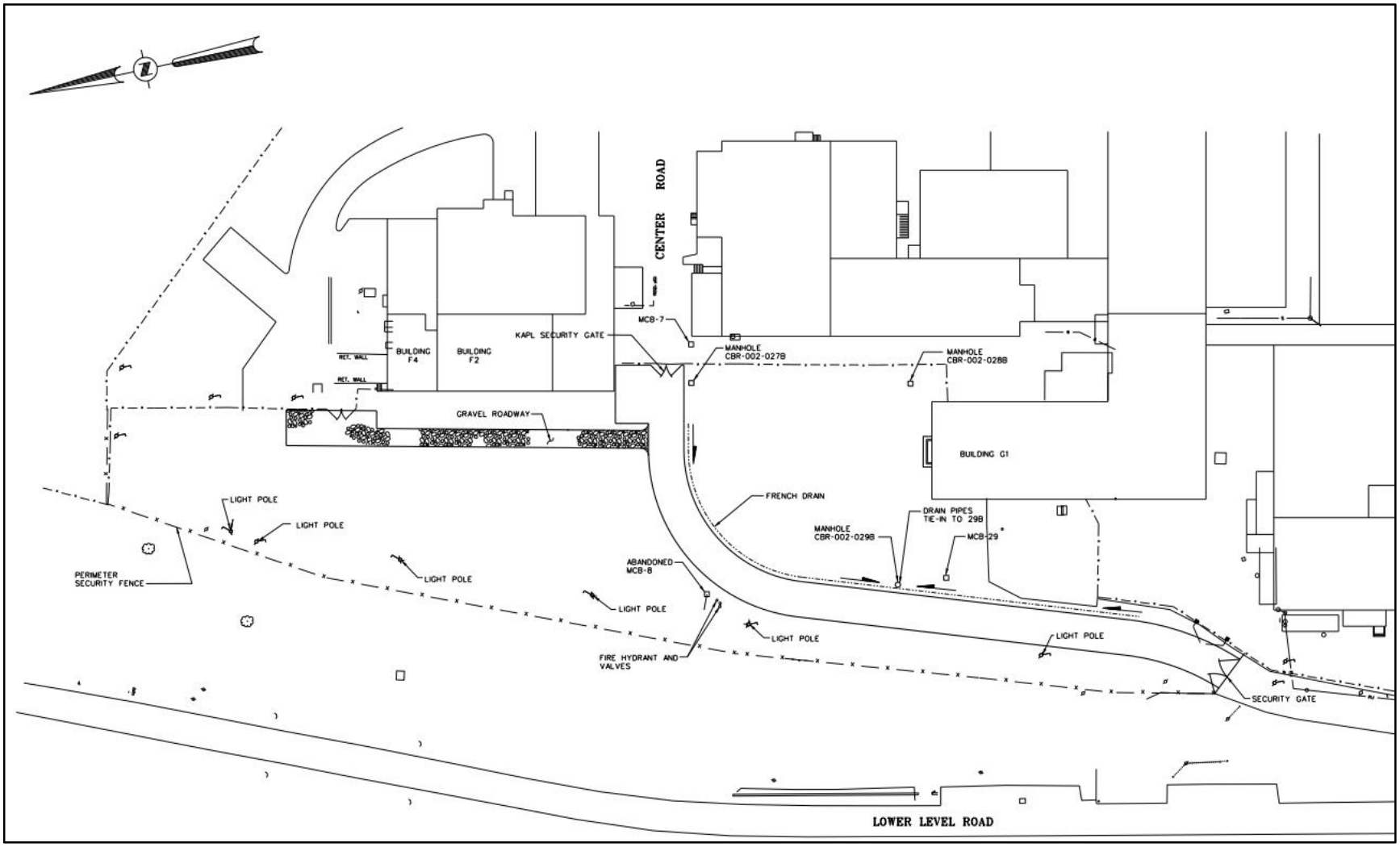

Figure 14. SPRU Upper Level Restored Layout

REFERENCES

[1] NYSDEC, 2016, 6 New York Codes, Rules, and Regulations Part 373 Hazardous Waste Management Permit for SPRU Facility (Permit No. 4-4224-00024/00055).

[2] SPRU-ENV-020, RCRA Interim Corrective Measure Work Plan for the Upper Level SWMUs.

[3] SPRU-ENV-017, RCRA Interim Corrective Measure Work Plan G2 Area of Concern (AOC-008).

[4] NYSDEC 2010a, DER-10 Technical Guidance for Site Investigation and Remediation, DER-10, May 3, 2010.

[5] EPA SW-846 (2006 version). Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, latest edition, U.S. Environmental Protection Agency, Washington, D.C.

[6] DOE, 2006, Engineering Evaluation/Cost Analysis for the Separations Process Research Unit Disposition Project, U.S. Department of Energy, December 2006.

[7] Letter from NYSDEC re: DOE- SPRU Facility, Notification of Solid Waste Management Units, "Frac Tanks 1" and "Frac Tanks 2," 12/2/11, dated July 30, 2012.

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[16] Email Winterberger (NYSDEC) to Davis (DOE), RE: Revised Sampling Locations, July 17, 2018.

[17] SPRU-ENV-007, Quality Assurance Project Plan for the RCRA Interim Corrective Measures Work Plans.

[18] SPRU-RC-119, Sample Collection.

[19] NYSDEC 2010b, CP-51 / Soil Cleanup Guidance, October 21, 2010.

[20] EPA 540-R-08-005, Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use, 2009, U.S. Environmental Protection Agency, Washington, D.C

[21] EPA, 2008. EPA/240/R-02/004. Guidance on Environmental Data Verification and Data Validation - EPA QA/G-8, 2008, U.S. Environmental Protection Agency, Washington, D.C.

ATTACHMENTS

Attachment 1 NYSDEC Letter for SWMU-081 and SWMU-082

Attachment 2 NYSDEC NFA Determination Letter for SWMU-085 and SWMU-086

Attachment 3 Preliminary Data Report Upper Level SWMUs

Attachment 4 Phase 1 Preliminary Data Report G2 Building Area of Concern (AOC-008)

Attachment 5 Phase 2 Preliminary Data Report G2 Building Area of Concern (AOC-008)

Attachment 6 NYSDEC Approval of Soil Confirmation Sample Locations

Attachment 7 NYSDEC Approval of Post-Remediation Stormwater Discharge

Attachment 8 SPRU Upper Level Soil Confirmation Data Validation Report

Attachment 9 Well Decommissioning Documentation

Attachment 10 Request to Import Backfill Phase 1

Attachment 11 Phase 1 Backfill Supporting Chemical Analyses

Attachment 12 Request to Import Top Soil

Attachment 13 Phase 2 Backfill Plan – Import and Reuse Material

APPENDICES

Appendix 1 Laboratory Data Packages *(provided electronically*)

Appendix 2 Final Site Layout and Grading (*provided as inserts and electronically*)