MEMORANDUM

TO: Andrea Caprio, P.E., Regional Remediation Engineer

FROM: Steven Moeller, P.G., Professional Geologist 1 Steven M Moeller Digitally signed by Steven M Moeller Date: 2025.12.03 14:03:30 -05'00'

DATE: November 25, 2025

SUBJECT: RCRA COMPREHENSIVE GROUNDWATER MONITORING EVALUATION (CME) & FIELD INSPECTION REPORT

Facility: Tecumseh Redevelopment (former Bethlehem Steel)
3555 Lake Shore Drive
Lackawanna, Erie County, NY 14218
DEC Site # 915009
EPA ID – NYD002134880

BACKGROUND

The Tecumseh Redevelopment Site in Lackawanna, New York encompasses approximately 1000 acres of the former Bethlehem Steel Corporation (BSC) property located between NYS Route 5 and Lake Erie extending from south of Smokes Creek to the Buffalo Outer Harbor on the north (Figure 1). The site has approximately 2 miles of shoreline along Lake Erie. Smokes Creek passes westward across the site where it discharges to Lake Erie. The Ship Canal, located toward the northern end of the site, extends approximately 3,000 feet southward into the site from the Buffalo Outer Harbor.

The former BSC property was used for iron and steel production since the beginning of the 20th century. Iron and steelmaking operations were discontinued by the end of 1983, and by the mid-1990s, most of the steel-making facilities on the west side of Hamburg Turnpike (NYS Route 5) had been demolished. In September 2001, BSC's coke oven operation was terminated. While some buildings remain, most structures have been razed.

The former BSC property is divided into two areas, referred to as the "process area" and the "slag fill area." The "process area" was where the majority of iron and steelmaking production units were located and is generally located on naturally occurring lake sediments in the eastern portion of the Site. The "slag fill area" (SFA) is located on the western portion of the Site adjacent to Lake Erie. This area consists of approximately 440 acres which have been reclaimed from Lake Erie by filling it with iron and steelmaking slag, iron scrap, and steel scrap. Plant wastes were also disposed in the SFA.

Under the terms of a 1990 USEPA Order, Bethlehem Steel agreed to perform a RCRA Facility Investigation (RFI) to identify the nature and extent of any release(s) of hazardous

constituents from 104 Solid Waste Management Units (SWMUs). The Final RFI Report (dated October 2004) submitted to USEPA in January 2005 recommended 38 SWMUs and three watercourses (i.e., Smokes Creek, Blasdell Creek, and the South Return Water Trench) for further evaluation with a Corrective Measures Study (CMS). In a letter dated May 17, 2006, USEPA identified five additional SWMUs and two additional watercourses for further evaluation in the CMS.

The portion of the Tecumseh Property addressed by the CMS is approximately 489-acres located entirely in the City of Lackawanna, New York and encompasses the 43 SWMUs and 5 watercourses identified in the RFI and/or by USEPA as requiring further assessment (Figure 2). An Order on Consent was executed by Tecumseh Redevelopment Inc. and the NYSDEC effective June 30, 2009 for the performance of the RCRA CMS consistent with applicable Federal and New York State regulations. The Final CMS Report was issued in May 2019. In 2021, three Statements of Basis were issued for corrective measures selection for the site; the Statements of Basis divided the site into Operable Units (OUs) 01 through 10 (Figure 3).

The Acid Tar Pit (ATP) SWMU Group (comprised of SWMUs S-11 [Acid Tar Pit South; aka Landfill K], S-21 [Sludge Storage Area], S-22 [Acid Tar Pit North - Vacuum Carbonate Blowdown] and S-24 [Acid Tar Pit North of Lime Plant - Agitator Sludge]) had previously been designated OU-03; wastes from the previously designated OU-02 SWMUs (which consist of SWMUs P-9 [Tar Decanter Pit], P-18A and P-18B [Blast Furnace Hot and Cold Wells], P-76 [Coke Oven Gas Line], and AOCs B and C within S-18 [Lime and Kish Landfill R]) were stabilized and consolidated into the OU-03 containment unit by the end of 2015. The former Coke Plant & By-Products SWMU Sub-Area groundwater, primarily related to impacts from SWMUs P-11 (former Benzol Plant Tank Storage Area) and P-11A (“old” former Benzol Plant Tank Storage Area), was designated OU-04. Because there are groundwater impacts across the site that are not monitored as part of the above monitoring programs, OU-10 (Site-wide Groundwater) was established. OU-10 covers groundwater across the entire site except for the portions already addressed under previous remedial measures (i.e., OU-03 and OU-04 groundwater extraction and treatment systems) and also covers any off-site groundwater impacts from the site. See Figures 2 and 3 for the locations of these OUs/SWMUs.

Long-term groundwater monitoring at the site is currently performed at 3 SWMU/Hazardous Waste Management Unit (HWMU) groups:

- the HWMU Group;
- the OU-03 ATP SWMU Group; and
- the OU-04 former Coke Plant & By-Products SWMU Sub-Area groundwater.

Details regarding the groundwater monitoring/sampling activities performed at each of these SWMU/HWMU groups is provided in the following sections.

HWMUs

In the late 1970's, BSC filed an application with the NYSDEC under 6 NYCRR Part 360 for a permit to operate an industrial landfill in the SFA. The permit was granted in June 1978. On November 18, 1980, pursuant to RCRA Section 3005(e), BSC submitted a Part A "interim Status" application to USEPA for two solid waste disposal facilities, designated HWMU-1 and HWMU-2. HWMU-1 is comprised of two units: HWMU-1A (SWMU S-13 Tar Sludge Surface Impoundment) and HWMU-1B (SWMU S-16 Lime Stabilized Spent Pickle Liquor Sludge Landfill). HWMU-2 is also referred to as SWMU S-3 (Ammonia Still Lime Sludge and Blast Furnace Thickener Sludge Impoundment).

HWMU-1A was closed in October 1988 in accordance with a NYSDEC approved closure plan, which included installation of a final cover system. Petitions to delist the waste (that is, to remove them from regulation under federal hazardous waste laws) in HWMU-2 and HWMU-1B were submitted by BSC to USEPA on July 18, 1984 and June 20, 1985, respectively. On April 24, 1996, USEPA granted the delisting petition for HWMU-2 (Ammonia Still Lime Sludge and Blast Furnace Thickener Sludge Impoundment); subsequently, in October 1997, NYSDEC agreed to delist the waste in HWMU-2. The petition for HWMU-1B is still pending.

Annual groundwater monitoring is performed at the HWMUs in accordance with the *Groundwater Monitoring, Sampling, and Analysis Plan (GWMSAP) for HWMU-1 and HWMU-2* (1994; revised 2009 and 2017). The annual groundwater monitoring and sampling fieldwork for HWMU-1 and HWMU-2 includes:

- Measuring groundwater elevations in 21 monitoring wells and four piezometers around HWMU-1A/1B and eight monitoring wells around HWMU-2;
- Sampling groundwater from a network of four wells in the vicinity of HWMU-1A: MW-1D2, MW-1D3, MW-1D4, and MW-1U1 (upgradient);
- Sampling groundwater from a network of five wells in the vicinity of HWMU-1B: MW-1D1, MW-1D6, MW-1D7, MW-1D8, and MWN-12 (up-gradient); and
- Sampling groundwater from a network of four wells in the vicinity of HWMU-2: MW-2D2, MW-2D3, MW-2D4, and MWS-11A (upgradient).

Groundwater samples are collected with submersible pumps with dedicated tubing using low-flow techniques, or with disposable polyethylene bailers (typically a three well volume purge). Field measurements are recorded during well purging/sampling (e.g., pH, temperature, turbidity, dissolved oxygen, ORP, specific conductance and water level), along with visual and olfactory field observations Groundwater samples are analyzed for site-specific constituents of concern. Figures 4 and 5 show the monitoring well locations and Table 1 indicates the site-specific constituents of concern for each HWMU. Upon completion of the groundwater monitoring and sampling fieldwork, an *Annual Groundwater Quality Monitoring Report* is completed and submitted to the Department.

The 2021 Statements of Basis require:

- HWMU-1B (SWMU S-16) to be closed in-place, including excavation and consolidation of wastes from adjacent SWMU S-23 (Tar Pit Adjacent to

- Lime Stabilized SPL Sludge Landfill) and AOC D (tar-impacted area north of SWMU S-23) into SWMU S-16, and capping; and
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- HWMU-2 (SWMU S-3) to be closed in-place, including excavation and consolidation, shoreline revetment and slope stabilization, and capping.

Implementation of these final remedies, hopefully within the next decade, will likely necessitate modifications to the groundwater monitoring programs at both HWMUs.

OU-03 ATP SWMU Group Expedited Corrective Measure

OU-03, the ATP SWMU Group, is located adjacent to the lower reach of Smokes Creek approximately one-half mile upstream of the terminus or mouth of Smokes Creek at Lake Erie (Figure 6). The ATP Expedited Corrective Measure (ECM) is comprised of three remedial components: a soil-bentonite slurry wall keyed into native confining soils; a cover system; and a groundwater collection and pretreatment system. The approximately 40-foot-deep soil-bentonite slurry wall (the lateral component of the containment cell) was completed in the fall of 2011 and surrounds SWMUs S-11 and S-22.

Groundwater/leachate extraction wells EW-1 and EW-2, installed within the containment cell, were activated in December 2012. Groundwater/leachate is extracted from these wells via submersible pumps and conveyed to an onsite pretreatment system incorporating oil/water separation, filtration, pH adjustment and air stripping unit processes. The pretreated water is discharged to the plant sanitary sewer and ultimately the publicly operated sewerage system under a discharge permit with Erie County Sewer District No. 6. A third extraction well (EW-3) originally installed within the northern portion of the containment cell was not used due to localized groundwater quality (e.g., low pH, foaming) and other waste fill characteristics (e.g., low hydraulic conductivity) proximate to the well screen. A replacement well for EW-3, deemed “EW-3R,” was installed in the northwestern portion of the cell near piezometer P-62D and became operational in August 2015. Final waste consolidation and cover system construction was completed in late 2015.

Prior to the construction of the ATP-ECM containment cell, contamination from the Acid Tar Pits area had migrated northerly towards Smokes Creek. Although significant improvement in groundwater quality was observed following containment cell construction, downgradient concentrations in groundwater outside the ATP containment cell remained at levels significantly above NY Groundwater Quality Standards. Four additional groundwater pumping wells (PW-1 through PW-4) were installed between the containment cell and Smokes Creek and placed into service in Fall of 2015. Discharge from these external pumping wells is directed via a force main to the ATP Pretreatment System prior to permitted discharge to the Erie County sewer system.

Annual groundwater monitoring is performed at the ATP-ECM in accordance with the *Operation, Maintenance & Monitoring Plan for Expedited Corrective Measure Acid Tar*

Pits SWMU Group (2017). The annual groundwater monitoring and sampling fieldwork includes:

- Measuring groundwater elevations in 39 monitoring wells, piezometers, and extraction wells within and around the ATP containment cell and surface water elevations in Smokes Creek and Lake Erie; and
- Sampling groundwater from a network of seven downgradient wells (MWS-02, 18A, 18C, 19A, 19B, 20A, and 20B) in the vicinity of the ATP containment cell with analyses for Target Compound List (TCL) volatile organic compounds (VOCs), TCL semi-volatile organic compounds (SVOCs), arsenic, barium, chromium, lead, and cyanide.

Groundwater sampling and field parameter measurements are performed as noted above for the HWMUs. The monitoring well locations are shown on Figure 6.

Upon completion of the groundwater monitoring and sampling fieldwork, an *Annual Monitoring and Maintenance Summary Report* is completed and submitted to the Department.

An *ATP Assessment Workplan* was approved by the NYSDEC on March 15, 2023 to provide more information on how groundwater behaves in and around the ATP Containment Cell. Field work for the assessment was conducted throughout 2023 and a draft *ATP Assessment Report* was issued in May 2024. The findings of the assessment could result in changes remedy, including amendment injections between the slurry wall and Smokes Creek into the slag/fill and sand units, and modifications to the groundwater monitoring program.

OU-04 Benzol Yard and Coke By-Products SWMU Sub-Area Groundwater ECM

The OU-04 ECM for the Benzol Yard and broader Coke Plant & By-Products SWMU Sub-Area groundwater was substantially completed by March 2019. Two independent groundwater collection, conveyance, and treatment systems were installed to suppress the groundwater table within the OU-04 area: one for the northern portion (including SWMU P-11A) and one for the southern portion (including SWMU P-11 and the former Benzol Plant ICM groundwater collection system). The groundwater is collected and pumped from 59 recovery wells located within the OU-04 area. The south groundwater collection system consists of the original 11 Benzol Yard Interim Corrective Measures (ICM) recovery wells (identified as RW-1, RW-2, RW-A through RW-I) and 19 new recovery wells (identified as RWS-1 through RWS-14, RWS-6A&B, RWS-7A, RWS-8A&8B) located along the southern border of the OU-4 area to address residual groundwater contamination that was identified at monitoring wells MWN-19A and MWN-30A on adjacent Brownfield Cleanup Program (BCP) Site III-10. The northern groundwater collection system consists of 33 new recovery wells designated RWN-1 through RWN-33.

Annual groundwater monitoring is performed at OU-04 in accordance with the *Operation, Maintenance & Monitoring (OM&M) Plan for Coke Plant By-Products SWMU Group*

Groundwater Treatment System (OU-4) & Source Area Control ICM (2019; Revised 2020). The annual groundwater monitoring and sampling fieldwork includes:

- Measuring groundwater elevations in approximately 130 monitoring wells, piezometers, and recovery wells within and around OU-4 and surface water elevations in the Gateway Ship Canal and Lake Erie; and
- Sampling groundwater from a network of 17 wells in the vicinity of OU-4: MWN-09, -19A, -30A, -32A, -34A, -46A, -47A, -49A, -51AR, -54A, -55A, -66AR, -72AR, OU4PZ-6, OU4PZ-7, OU4PZ-9, and OU4PZ-11 with analyses for TCL VOCs, phenolic compounds, and PFAS compounds.

Groundwater sampling and field parameter measurements are performed as noted above for the HWMUs. Figure 7 shows the monitoring and recovery well locations. Upon completion of the groundwater monitoring and sampling fieldwork, an *Annual Summary Report for Operable Unit (OU-4) & Benzol Yard Area Source Control Interim Corrective Measure (ICM)* is completed and submitted to the Department.

In 2025, a 5-year snapshot sampling event was performed on an additional 14 wells that are not normally sampled within the groundwater plume core and periphery to evaluate OU-4 cleanup progress; the last such comprehensive sampling event was performed as a baseline in January 2019 before the OU-4 groundwater extraction/treatment system became operational in March 2019.

Since modifications have been made in 2021 and 2022 to the OU-4 groundwater treatment system and numerous recovery and monitoring wells have been added to the OU-4 system over the past few years, the current OM&M Plan is in the process of being updated. Additional groundwater recovery wells and changes to the monitoring program may be necessary in the future after superfluous facilities (Coke Ovens, buildings, stacks) are demolished throughout OU-04.

OU-10 Site-wide Groundwater Monitoring

Comprehensive site-wide groundwater monitoring events to evaluate contaminant concentrations in groundwater outside of SWMU/HWMU boundaries has only been performed sporadically at the site. Comprehensive site-wide groundwater monitoring data was presented in the *RCRA Facility Investigation Report* (RFI; 2004), the *Corrective Measures Study Report* (CMS; 2019), and a more comprehensive round of groundwater sampling was performed in April 2020 to support the development of corrective measures for the site.

Attempts were made circa 2008 to develop a *Long-term Groundwater Monitoring Plan* (LTGWMP) for the site. In December 2011, Tecumseh submitted a Draft *LTGWMP for the Corrective Measures Study (CMS) Area* as Appendix T to the *CMS Report*, with updated *LTGWMP* submittals included as Appendix T in the revised 2014 and final 2019 *CMS Report* submittals. However, these past *LTGWMP* submittals were not acceptable to the Department.

The *Final Statement of Basis - Corrective Measures Selection - Site Wide Remedial Elements, Water Courses, and Groundwater Operable Units 01, 09, and 10* (2021) required the following remedial components for OU-10 groundwater:

- Installation of additional groundwater extraction and monitoring wells;
- Enhancements to the two on-site treatment systems (within the ATP [OU-03] and Benzol Plant [OU-04] areas);
- A Groundwater Monitoring Program for site-related contaminants (in areas outside the reach of the treatment systems and at groundwater monitoring wells across the entire site and possibly off-site, as determined by the Department) to assess the effectiveness of the treatment systems and monitor groundwater conditions during pre-design investigations, remedial design, and implementation of the remedies.

A *Pre-Design Investigation Work Plan for Operable Unit OU-10* (*PDIWP*) was submitted by Benchmark Turnkey on behalf of Tecumseh Redevelopment Inc. on February 8, 2023; NYSDEC and NYSDOH provided comments on this document on June 8, 2023. A revised *PDIWP* and a letter response to comments was submitted to the Department on August 7, 2023; NYSDEC and NYSDOH provided comments on this document on January 30, 2025. The *PDIWP* is still in the process of being finalized and implemented. Following implementation of the *PDIWP*, a remedial design for the site-wide groundwater remedy must be developed, the site-wide groundwater remedy must be implemented, and the *LTGWMP* must be finalized and implemented.

Geology/Hydrology

The predominant site feature is the wedge-shaped SFA that extends into Lake Erie. This area extends from the former lake shore an average of 1,300 feet westward and now forms the eastern shoreline of Lake Erie at the site. The site geology beneath the slag-fill layer consists of lake and glacial sediments overlying bedrock. Beneath the slag-fill there is, in order, a sand layer with occasional peat deposits, lake clay/silt deposits, and glacial till overlying shale or limestone bedrock. An example geologic cross-section in the vicinity of the ATP is shown in Figures 8A and 8B.

The depth to groundwater is variable and depends upon the topography and can range from about 10 feet to over 60 feet below ground surface. Groundwater generally flows toward Lake Erie, Smokes Creek, or the Ship Canal. Groundwater occurs within the fill and sand layers in the overburden and in the bedrock beneath the site. The primary contaminants of concern (COCs) in groundwater across the site are benzene, toluene, xylenes, naphthalene, and phenols, although numerous other volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs; especially Polycyclic Aromatic Hydrocarbon [PAH] compounds), and metals are detected at concentrations above groundwater quality standards/guidance values (GWQSs/GVs). Per- and polyfluoroalkyl substances (PFAS) are also detected at concentrations above GWQSs/GVs in OU-04 groundwater, primarily in the OU-04 area. The pH of groundwater in the SFA is typically alkaline and can be over 12.5 (D002).

I. **Office Evaluation**

Prior to the field inspection, relevant documents were compiled, reviewed, and evaluated in accordance with criteria on the CME checklist. These documents included:

- Operation, Maintenance & Monitoring Plan for Expedited Corrective Measure Acid Tar Pits SWMU Group (2013; Revised 2017)
- ATP SWMU Group ECM Annual Monitoring and Maintenance Summary Report (2019-2022)
- ATP Assessment Work Plan (March 2023)
- Groundwater Monitoring, Sampling, and Analysis Plan for HWMU-1 and HWMU-2 (GWMSAP; 2017)
- HWMUs 1A, 1B, and 2 Annual Groundwater Quality Monitoring Reports (2019-
- 2023)
- Previous HWMU 1 & 2 RCRA Groundwater OMI Reports (2015 & 2022)
- Operation, Maintenance & Monitoring Plan for Coke Plant By-Products SWMU Group Groundwater Treatment System (OU-4) & Source Area Control ICM (2019; Revised 2020)
- Annual Summary Reports for Operable Unit (OU-4) & Benzol Yard Area Source Control Interim Corrective Measure (ICM) (2019-2023)
- RCRA Facility Investigation (RFI) Report for the Former Bethlehem Steel Corporation Facility, Lackawanna, New York, Parts I through VII. October 2004.
- Corrective Measures Study Report (Final), Tecumseh Redevelopment Site, Lackawanna, New York. December 2011, revised October 2014 and May 2019.
- Final Statement of Basis - Corrective Measures Selection - Bethlehem Steel (Tecumseh Redevelopment, Inc.) Site Wide Remedial Elements, Water Courses, and Groundwater Operable Units 01, 09, and 10 (2021)
- Final Statement of Basis - Corrective Measures Selection - Bethlehem Steel (Tecumseh Redevelopment, Inc.) OU-05 Slag Fill Area Zone 2 and OU-08 Slag Fill Area Zones 4 and 5 (2021)
- Final Statement of Basis - Corrective Measures Selection - Bethlehem Steel (Tecumseh Redevelopment, Inc.) OU-06 Former Petroleum Bulk Storage Sub-Area, OU-07 Coal, Coke and Ore Handling and Storage Sub-Area, and Coke Plant and By-Products Facility Sub-Area (2021)
- Recent Correspondence (2021-2025)

The completed CME checklist is provided in Attachment A. Final groundwater remedies for site-wide groundwater (OU10) at the facility, as specified in the *Final Statement of Basis - Corrective Measures Selection - Site Wide Remedial Elements, Water Courses, and Groundwater Operable Units 01, 09, and 10* (2021), have yet to be implemented. Additional groundwater extraction and/or monitoring well installations and enhancements to the two on-site treatment systems (within the ATP [OU-03] and Benzol Plant [OU-04] areas) will be necessary. Thereafter, a comprehensive Site-wide *LTGWMP*, which incorporates the SWMU/HWMU groups evaluated during this inspection, needs to be produced and implemented to allow for detection or assessment of <u>any</u> possible groundwater contamination caused by the facility.

II. **Field Evaluation**

HWMUs

On January 15, 2025, Steven Moeller, PG, conducted a field inspection at the Tecumseh Redevelopment facility during the 2024 HWMUs 1A, 1B, and 2 Annual Groundwater Sampling Event. Sampling and monitoring activities during this event were performed in general accordance with the *GWMSAP* (2017), with approved changes. This inspection included observation of groundwater sample collection activities and limited inspection of HWMUs 1A and 1B monitoring wells and surrounding areas. Photographs taken during the inspection are included in Attachment C.

Onsite Personnel: Steven Moeller (NYSDEC – PM/Inspector); Rick Dubisz and Tom Behrendt (Roux – Senior Technicians/Inspectors)

Weather: Overcast, 23^{o} F, breezy

Roux personnel performed the 2024 annual groundwater monitoring event at HWMUs 1A, 1B, and 2 in January 2025. On January 15, 2025, I observed Rick Dubisz and Tom Behrendt (Roux) purge and sample HWMU 1B wells MW-1D1 and MW-1D7. Prior to conducting any purging or sampling activities, water level and total depth measurements were recorded in each well with a Solinst Model 101 electronic water level indicator to calculate the volume of the water column in each well. The wells were purged and sampled using low-flow sampling techniques with a Proactive Monsoon submersible pump with dedicated clear polyvinyl chloride (PVC) tubing. Field water quality parameters were recorded from purge water aliquots using a Hach 2100Q turbidimeter, a Hach HQ30d dissolved oxygen (DO) meter, and a Myron L Ultrameter II (pH, temperature, specific conductance, and oxidation-reduction potential [ORP]) to ensure water quality parameters stabilized prior to sample collection. These and other field observations were recorded on field sampling forms; the Groundwater Field Forms for wells MW-1D1 and MW-1D7 are included in Attachment B. All purge water was containerized, treated with muriatic acid to lower the pH below 9.5 (if necessary), and filtered through activated carbon before discharge to the ground surface. Upon field parameter stabilization, samples were collected from the pump tubing. Immediately following collection, sample bottles were placed into a cooler filled with ice to maintain an approximate temperature of 4 degrees Celsius. The samples were later delivered under proper chain-of-custody to Eurofins/TestAmerica Laboratory in Amherst, New York, a New York State Environmental Laboratory Approval Program certified laboratory. The submersible pump was decontaminated between sampling locations using Alconox detergent and deionized water; however, submersible pump decontamination procedures were not performed in accordance with the more rigorous methods specified in *FOP 040.1 Non-Disposable and Non-Dedicated Sampling Equipment Decontamination.* Attachment C contains photographs of the field sampling activities.

I also performed a limited inspection in the vicinity of HWMUs 1A and 1B. All groundwater monitoring wells observed were locked and in reasonably good condition. The grassy

vegetative cover on the HWMU 1A (SWMU S-13) landfill appeared to be in good condition with no signs of erosion or breach by vectors. “Danger Unauthorized Personnel Keep Out” warning signage was present around both HWMUs 1A and 1B. Remnants of the green 30-mil reinforced PVC cover that formerly covered HWMU 1B (SWMU S-16) were visible on and in the vicinity of the landfill. The PVC cover was destroyed by a severe wind event sometime in late 2005. HWMU 1B (SWMU S-16), and adjacent SWMU S-23 and AOC-D, will be consolidated and covered in place in accordance with the *Statement of Basis Corrective Measures Selection for Bethlehem Steel (Tecumseh Redevelopment, Inc.) OU-05 Slag Fill Area Zone 2 and OU-08 Slag Fill Area Zones 4 and 5* (2021).

The Groundwater Field Forms included in Attachment B show that greater care should be taken to ensure the forms are filled out completely and field parameters conform to the Stabilization Criteria listed at the bottom of the form before sample collection. Use of a flow-through cell during purging would result in more reliable and representative DO data.

OU-03 ATP SWMU Group

On April 22, 2025, Steven Moeller, PG, conducted a field inspection at the Tecumseh Redevelopment facility during the OU-03 ATP SWMU Group 2025 Annual Groundwater Sampling Event. Sampling and monitoring activities during this event were performed in general accordance with the *Operation, Maintenance & Monitoring Plan for Expedited Corrective Measure Acid Tar Pits SWMU Group* (2017), with approved changes. This inspection included observation of groundwater sample collection activities and limited inspection of ATP SWMU Group monitoring wells and surrounding areas. Photographs taken during the inspection are included in Attachment C.

Onsite Personnel: Steven Moeller (NYSDEC – PM/Inspector); Tom Behrendt, Mitch Forbes, and Georgia Farry (Roux – Senior Technician/Inspector; Treatment Specialist; and Staff Geologist, respectively)

Weather: Mostly clear, 50º F, windy

Roux personnel performed the OU-03 ATP SWMU Group 2025 annual groundwater monitoring event in April 2025. On April 22, 2025, I observed Tom Behrendt, Mitch Forbes, and Geogia Farry (Roux) purge and sample wells MWS-20B, MWS-18A, and MWS-18C. Prior to conducting any purging or sampling activities, water level and total depth measurements were recorded in each well with a Solinst Model 101 electronic water level indicator to calculate the volume of the water column in each well. The wells were purged and sampled using low-flow sampling techniques. Some wells had dedicated submersible sampling pumps (e.g., MWS-20B and MWS-18A) and others were sampled with a submersible pump that was decontaminated between wells (e.g., MWS-18C). All wells had dedicated PVC tubing; Roux replaced the LDPE dedicated tubing in some wells with clear PVC tubing. Field water quality parameters were recorded from purge water aliquots using a Hach 2100Q turbidimeter, a Hach HQ30d dissolved oxygen meter, and a Myron L Ultrameter II (pH, temperature, specific conductance, and oxidation-reduction potential [ORP]) to ensure water quality parameters stabilized prior to sample collection. These

and other field observations were recorded on field sampling forms; the Groundwater Field Forms for wells MWS-20B, MWS-18A, and MWS-18C are included in Attachment B. All purge water was containerized in a 55-gallon drum for transport to the ATP Pretreatment System for processing. Upon field parameter stabilization, samples were collected from the pump tubing. Immediately following collection, sample bottles were placed into a cooler filled with ice to maintain an approximate temperature of 4 degrees Celsius. The samples were later delivered under proper chain-of-custody to Eurofins/TestAmerica Laboratory in Amherst, New York, a New York State Environmental Laboratory Approval Program certified laboratory. The non-dedicated submersible pump was decontaminated between sampling locations using Alconox detergent and deionized (DI) water; however, submersible pump decontamination procedures were not performed in accordance with the more rigorous methods specified in *FOP 040.1 Non-Disposable and Non-Dedicated Sampling Equipment Decontamination*. Attachment C contains photographs of the field sampling activities.

I also performed a limited inspection in the vicinity of the ATP-ECM containment cell. All groundwater monitoring wells observed were locked and in reasonably good condition. The grassy vegetative cover on the ATP-ECM containment cell appeared to be in good condition with no signs of erosion or breach by vectors.

OU-04 Benzol Yard and Coke By-Products SWMU Sub-Area Groundwater

On April 25, 2025, Steven Moeller, PG, conducted a field inspection at the Tecumseh Redevelopment facility during the OU-04 Benzol Yard and Coke By-Products SWMU Sub-Area 2025 Annual Groundwater Sampling Event. Sampling and monitoring activities during this event were performed in general accordance with the *Operation, Maintenance & Monitoring Plan for Coke Plant By-Products SWMU Group Groundwater Treatment System (OU-4) & Source Area Control ICM* (2019; Revised 2020), with approved modifications. This inspection included observation of groundwater sample collection activities and limited inspection of the former Coke By-Products SWMU Sub-Area monitoring wells and vicinity. Photographs taken during the inspection are included in Attachment C.

Onsite Personnel: Steven Moeller (NYSDEC – PM/Inspector); Tom Behrendt and Georgia Farry (Roux – Senior Technician/Inspector and Staff Geologist, respectively)

Weather: Overcast, 64^{o} F, calm

Roux personnel performed the OU-04 Benzol Yard and Coke By-Products SWMU Sub-Area 2025 Annual Groundwater Sampling Event in April 2025. On April 25, 2025, I observed Tom Behrendt and Geogia Farry (Roux) sample piezometer PZ-9 and purge and sample wells MWN-72AR and MWN-34A. Prior to conducting any purging or sampling activities, water level and total depth measurements were recorded in each piezometer/well with a Solinst Model 101 electronic water level indicator to calculate the volume of the water column in each well. Piezometer PZ-9 had purged to dryness on April 2, 2025 and Roux personnel were attempting to sample the piezometer with a dedicated

HDPE bailer; only partial sample volume could be obtained before the piezometer went dry again. Roux personnel planned to return later in the day to attempt to collect the remaining sample volume.

Wells MWN-72AR and MWN-34A were purged and sampled using low-flow sampling techniques. These wells were sampled with a submersible pump that was decontaminated between wells. Roux replaced the dedicated tubing in these wells with new clear PVC tubing. Field water quality parameters were recorded from purge water aliquots using a Hach 2100Q turbidimeter, a Hach HQ30d dissolved oxygen meter, and a Myron L Ultrameter II (pH, temperature, specific conductance, and oxidation-reduction potential [ORP]) to ensure water quality parameters stabilized prior to sample collection. These and other field observations were recorded on field sampling forms; the Groundwater Field Forms for PZ-9, MWN-72AR, and MWN-34A are included in Attachment B. All purge water was containerized in a 55-gallon drum for transport to the OU-04 Groundwater Treatment System for processing. Upon field parameter stabilization, samples were collected from the pump tubing. Immediately following collection, sample bottles were placed into a cooler filled with ice to maintain an approximate temperature of 4 degrees Celsius. The samples were later delivered under proper chain-of-custody to Eurofins/TestAmerica Laboratory in Amherst, New York, a New York State Environmental Laboratory Approval Program certified laboratory. The non-dedicated submersible pump was decontaminated between sampling locations using Alconox detergent and deionized (DI) water; however, submersible pump decontamination procedures were not performed in accordance with the more rigorous methods specified in *FOP 040.1 Non-Disposable and Non-Dedicated Sampling Equipment Decontamination*. Attachment C contains photographs of the field sampling activities.

I also performed a limited inspection in the Coke By-Products SWMU Sub-Area. All groundwater monitoring and extraction wells observed were secure and in reasonably good condition. No coal tar seeps were observed.

III. **Summary**

Based upon a review of site-related documents (including the OM&M/Groundwater Monitoring Plans and recent Annual Reports), inspections of groundwater sampling activities and the facility, the Department has determined that the facility is in compliance with their current monitoring programs for the 3 SWMUs/HWMU groups evaluated.

The Groundwater Field Forms included in Attachment B show that greater care should be taken to ensure the forms are filled out completely and field parameters conform to the Stabilization Criteria listed at the bottom of the form before sample collection. Use of a flow-through cell during purging would result in more reliable and representative DO data.

Submersible pump decontamination procedures were not performed in accordance with the methods specified in *FOP 040.1 Non-Disposable and Non-Dedicated Sampling Equipment Decontamination*. It is recommended that dedicated submersible pumps be

installed in all wells that are sampled as part of the long-term monitoring program for the 3 SWMUs/HWMU groups evaluated, which would eliminate the need for pump decontamination. Otherwise, decontamination procedures should follow the methods specified in *FOP 040.1 Non-Disposable and Non-Dedicated Sampling Equipment Decontamination*.

Numerous remedies are being implemented across the site in accordance with the Final Statements of Basis (2021). The OU-10 site-wide groundwater remedy will require the following remedial components:

- Installation of additional groundwater extraction and monitoring wells;
- Enhancements to the two on-site treatment systems (within the ATP [OU-03] and Benzol Plant [OU-04] areas);
- A Groundwater Monitoring Program for site-related contaminants (in areas outside the reach of the treatment systems and at groundwater monitoring wells across the entire site and possibly off-site, as determined by the Department) to assess the effectiveness of the treatment systems and monitor groundwater conditions during pre-design investigations, remedial design, and implementation of the remedies.

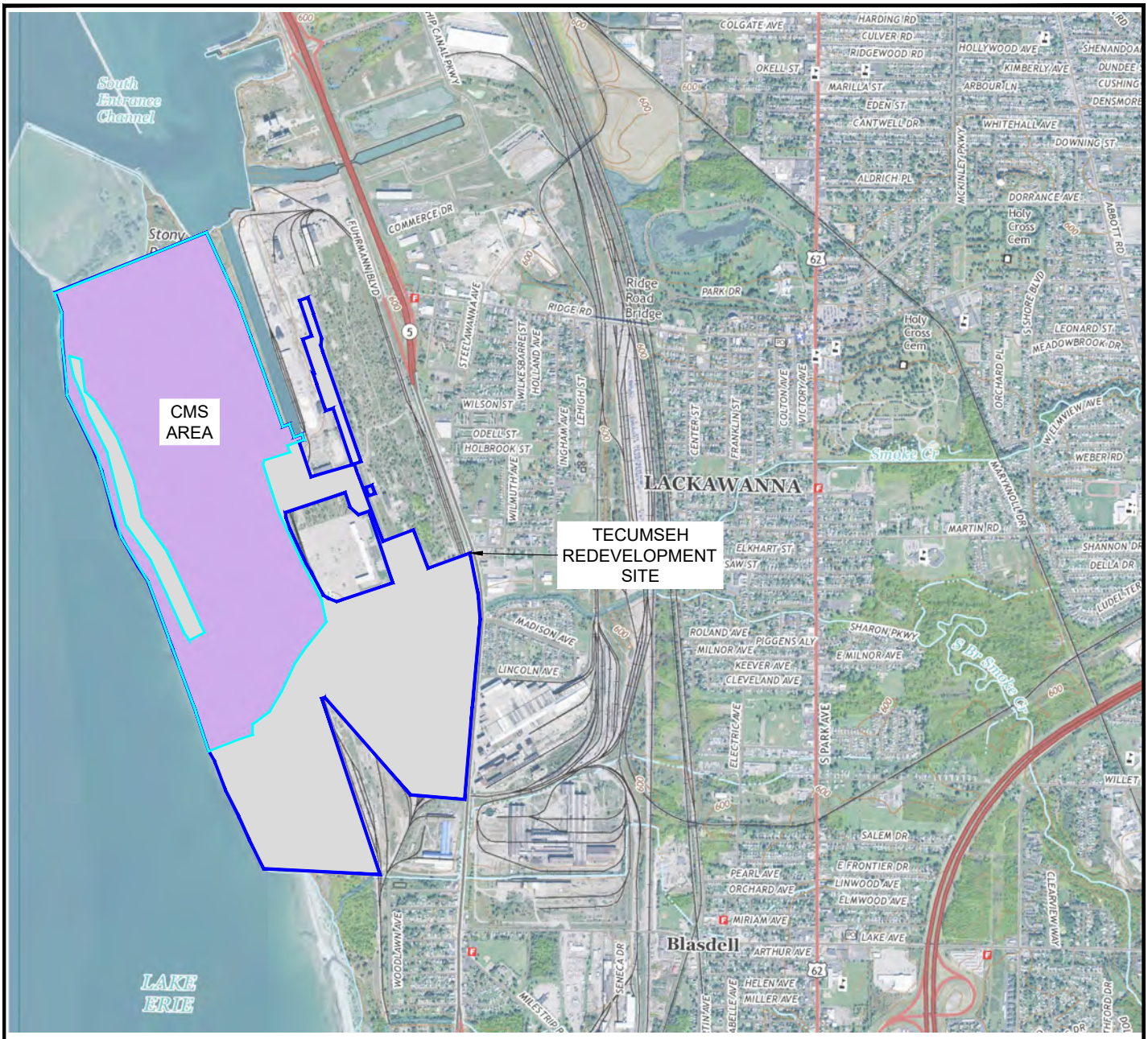
The OU-10 PDIWP is still in the process of being finalized and implemented. Following implementation of the PDIWP, a remedial design for the site-wide groundwater remedy must be developed, the site-wide groundwater remedy must be implemented, and the LTGWMP must be finalized and implemented.

ATTACHMENTS

Figures
Tables

Attachment A - CME Checklist
Attachment B - Well Purging/Sampling Logs
Attachment C - Photographs

FIGURES



TURNKEY ENVIRONMENTAL RESTORATION, LLC
2558 HAMBURG TURNPIKE
SUITE 300
BUFFALO, NY 14218
(716) 856-0635

PROJECT NO.: 0071-019-111

DATE: MAY 2019

DRAFTED BY: RFL

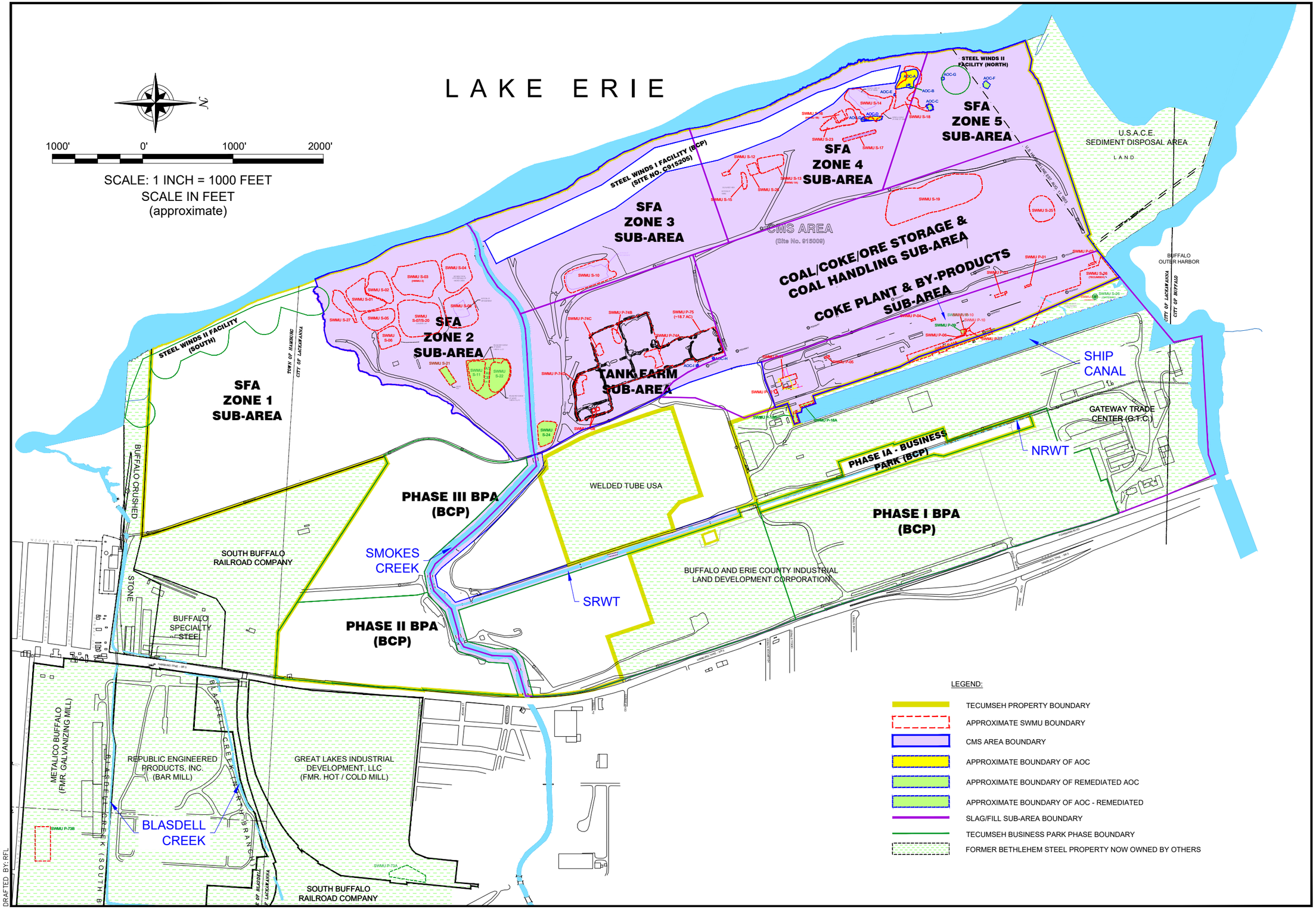
FIGURE 1

SITE LOCATION MAP

CMS AREA - FORMER BETHLEHEM STEEL SITE

LACKAWANNA, NEW YORK

F:\CAD\TurnKey\Tecumseh Redevelopment\CMS\2019 CMS Report\Figure 1-4; CMS Sub-Areas & SWMUs Req FA.dwg



DATE: MARCH 2019
DRAFTED BY: RFL

TurnKey Environmental Restoration, LLC

Benchmark Environmental Engineering & Science, PLLC

JOB NO.: 0071-017-111

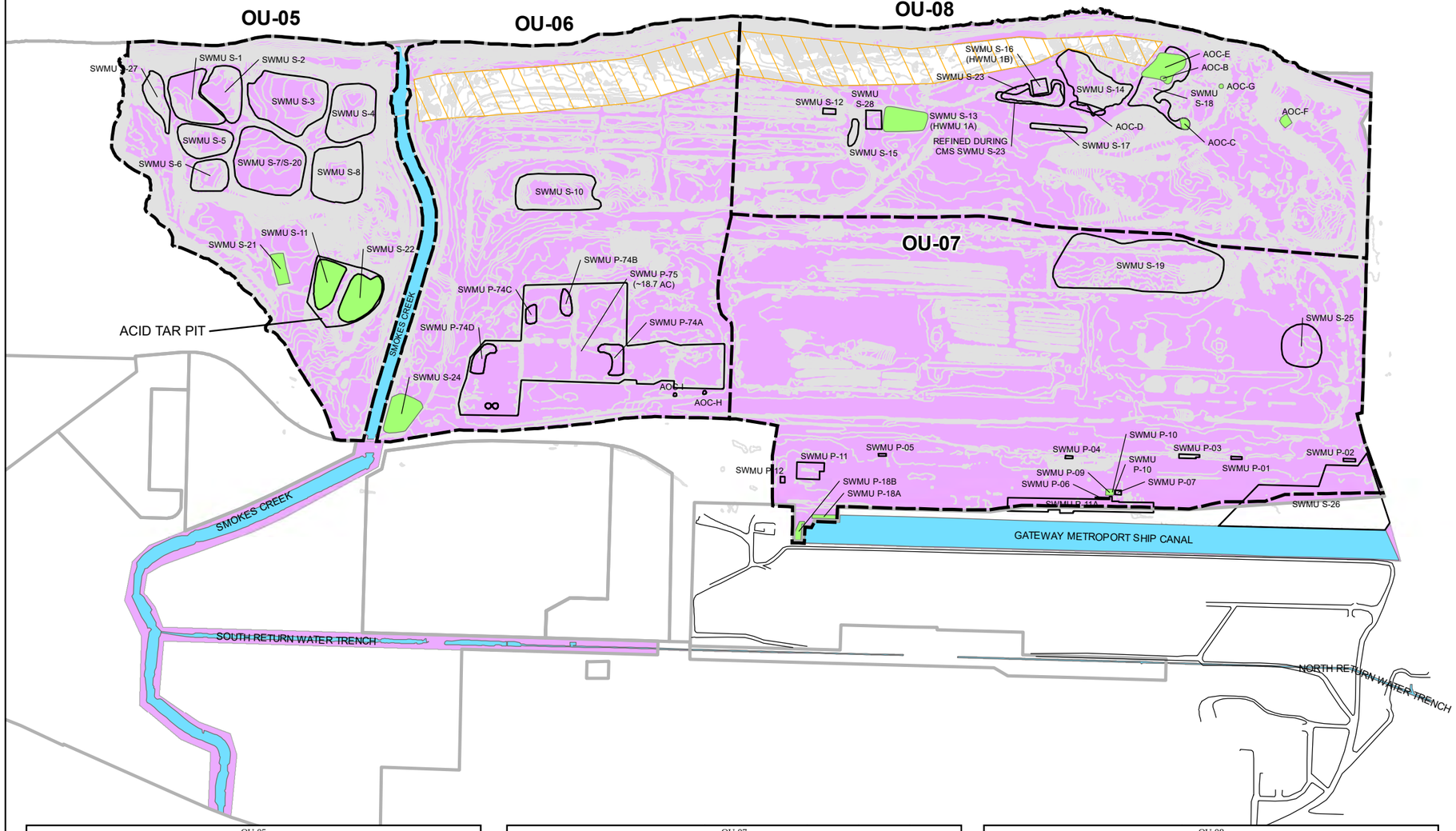
CMS SUB-AREAS W/ SWMUs, WATER COURSES & AOCs REQUIRING FURTHER ASSESSMENT

CMS REPORT

CMS AREA - FORMER BETHLEHEM STEEL SITE
LACKAWANNA, NEW YORK

PREPARED FOR
TECUMSEH REDEVELOPMENT INC.

FIGURE 2



- OU Boundaries
- Steel Winds Boundary
- Property Boundaries
- SWMU Boundaries
- SWMUs with Corrective Measures Implemented
- OU-9 Boundaries
- CMS Boundary (OU-01 & OU-10)

Notes:

OU-01 - SITE WIDE
OU-02 AOC-B, AOC-C, P-9, P-18A, P-18B, P-76
OU-03 ACID TAR PIT SWMUs S-11, S-21, S-22 AND S-24
OU-04 COKE OVEN BY-PRODUCTS SUB AREA GROUNDWATER
OU-05 SFA ZONE 2 SWMUs
OU-06 TANK FARM SWMUs
OU-07 COKE OVEN BY-PRODUCT SWMUs
OU-08 SFA ZONES 4 & 5
OU-09 WATER COURSES
OU-10 SITE-WIDE GROUNDWATER

0 500 1,000 2,000
Feet

Figure 3

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

Bethlehem Steel Operable Units

Tecumseh Redevelopment Site
Lackawanna, New York

PARSONS
301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, NY 13212 * 315-451-9560

OU-05

Site Sub-Area	SWMUs	Estimated Acres	Estimated Depth (ft)	Estimated Slag/Fill Volume (CY) and Potential			
				SW-CAMU	Close In-Place	OFF-SITE TSDF	Slag/Scrap Reclaimed
SFA -Zone 2 SWMUs	S-1	1.87	27.0		81,500		
	S-2	1.62	36.8		96,200		
	S-3	3.72	20.0		120,000		
	S-4	2.44	38.1		150,000		
	S-5	1.46	22.9		54,000		
	S-6	0.99	41.5		66,300		
	S-7/20	**3.83**	45.8	283,000			
	S-8	2.7		None			
	S-27	0.86	17.3	24,000			

OU-06

Site Sub-Area	SWMUs	Estimated Acres	Estimated Depth (ft)	Estimated Slag/Fill Volume (CY) and Potential			
				SW-CAMU	Close In-Place	OFF-SITE TSDF	Slag/Scrap Reclaimed
Tank Farm SWMUs	Group P-8, 74, 75	18.7	2.4	70,000		1,800	
SFA Zone 3 - SWMUs	S-10 (Slag Quench Area J)	2.8		None			

OU-07

Site Sub-Area	SWMUs	Estimated Acres	Estimated Depth (ft)	Estimated Slag/Fill Volume (CY) and Potential			
				SW-CAMU	Close In-Place	OFF-SITE TSDF	Slag/Scrap Reclaimed
Coke Plant SWMUs	GROUP P-1 to P-6	0.2		None			
	P-7 & P-10	0.02	31.0	1,000			
	OU-4 (P-11, P-11A, & P12)	2.5		None			
	S-26	3.3		None			
North Coal Field	S-19 (Murphy's Mountain Landfill AA)	8	4.0	10,000			41,000
	S-25	1.4		None			

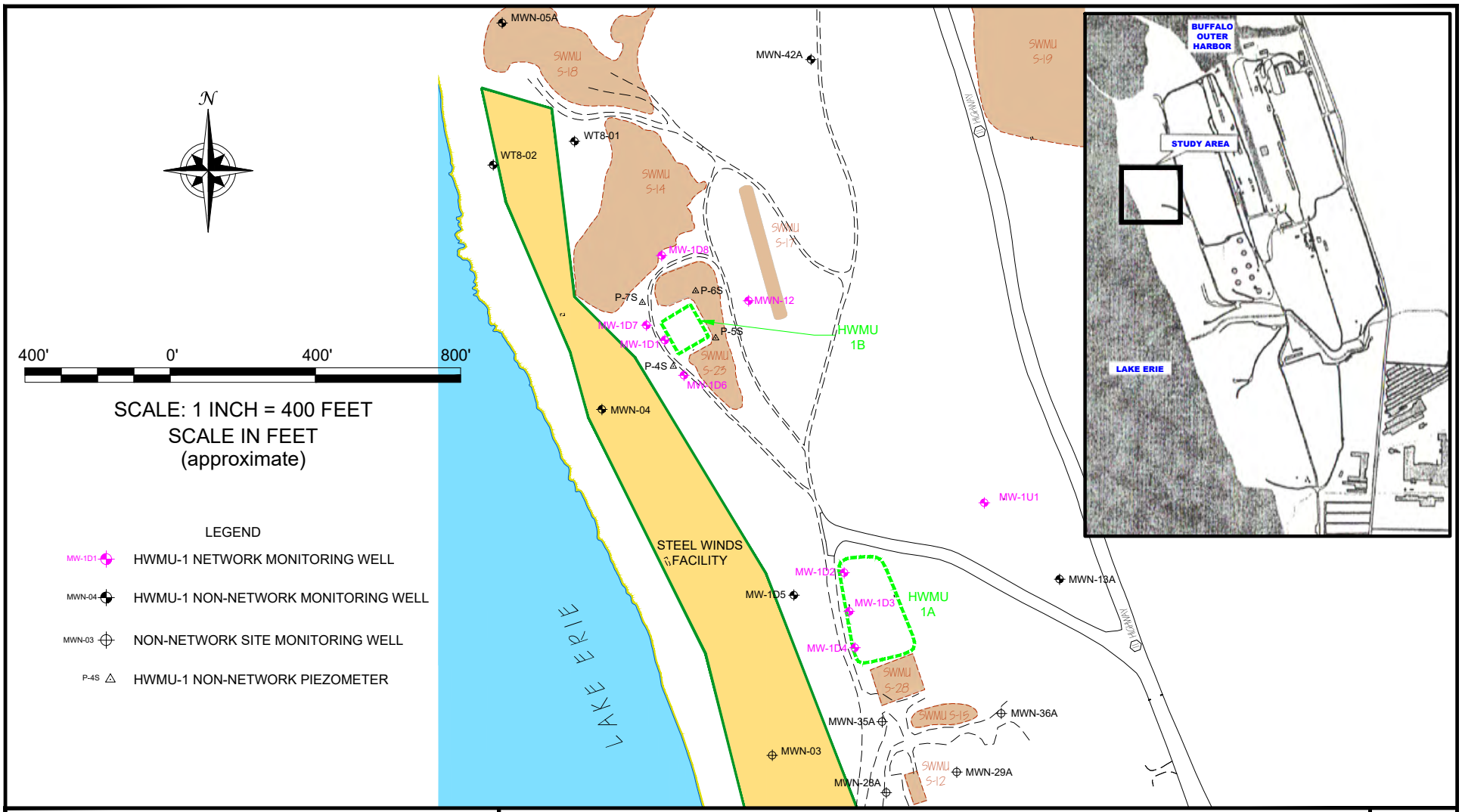
OU-08

Site Sub-Area	SWMUs	Estimated Acres	Estimated Depth (ft)	Estimated Slag/Fill Volume (CY) and Potential			
				SW-CAMU	Close In-Place	OFF-SITE TSDF	Slag/Scrap Reclaimed
SFA Zone 4 - SWMUs	S-12 (Asbestos Landfill L)	0.071	3.9	450			
	S-13 (HWMU-1A)	0.95	15.0		23,000		
	S-14 (General Rubble Landfill N)	2.51	14.1	16,000			41,000
	S-15 (General Rubble Landfill O)	0.15	4.1	1,000			
	S-16 (HWMU-1B) (Lime Stabilized Spent Pickle Liquor Sludge)	0.25	14.9		6,000		
	S23 & AOC-D Tar pit	0.85	7.3		10,000		
	S-17 (Vacuum Carbonate Blowdown Landfill Q)	0.2	3.1			1,000	
	S-18 (Lime Dust and Kish Landfill R) & AOC-A	2.24	1.2	4,200			
	S-28 (Drum Landfill)	0.29		None			

Plotted By: Sisson, Evan
Plot Date: 2/17/2021

Document Path: E:\C Drive\p005664b\NYSDEC Tecumseh\MXDs\NYSDEC Tecumseh Base Map.mxd

F:\CAD\TurnKey\Tecumseh Redevelopment\HWMU Groundwater Sampling\2017\HWMU-1 and HWMU-2 GWMSAP 2017\Figure 2; HWMU-1 Groundwater Monitoring Network.dwg



TURNKEY ENVIRONMENTAL RESTORATION, LLC
2558 HAMBURG TURNPIKE
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(716) 856-0635

PROJECT NO.: 0071-017-240

DATE: DECEMBER 2017

DRAFTED BY: BCH-CMC

HWMU-1 GROUNDWATER MONITORING NETWORK

HWMU-1 & HWMU-2 GWMSAP

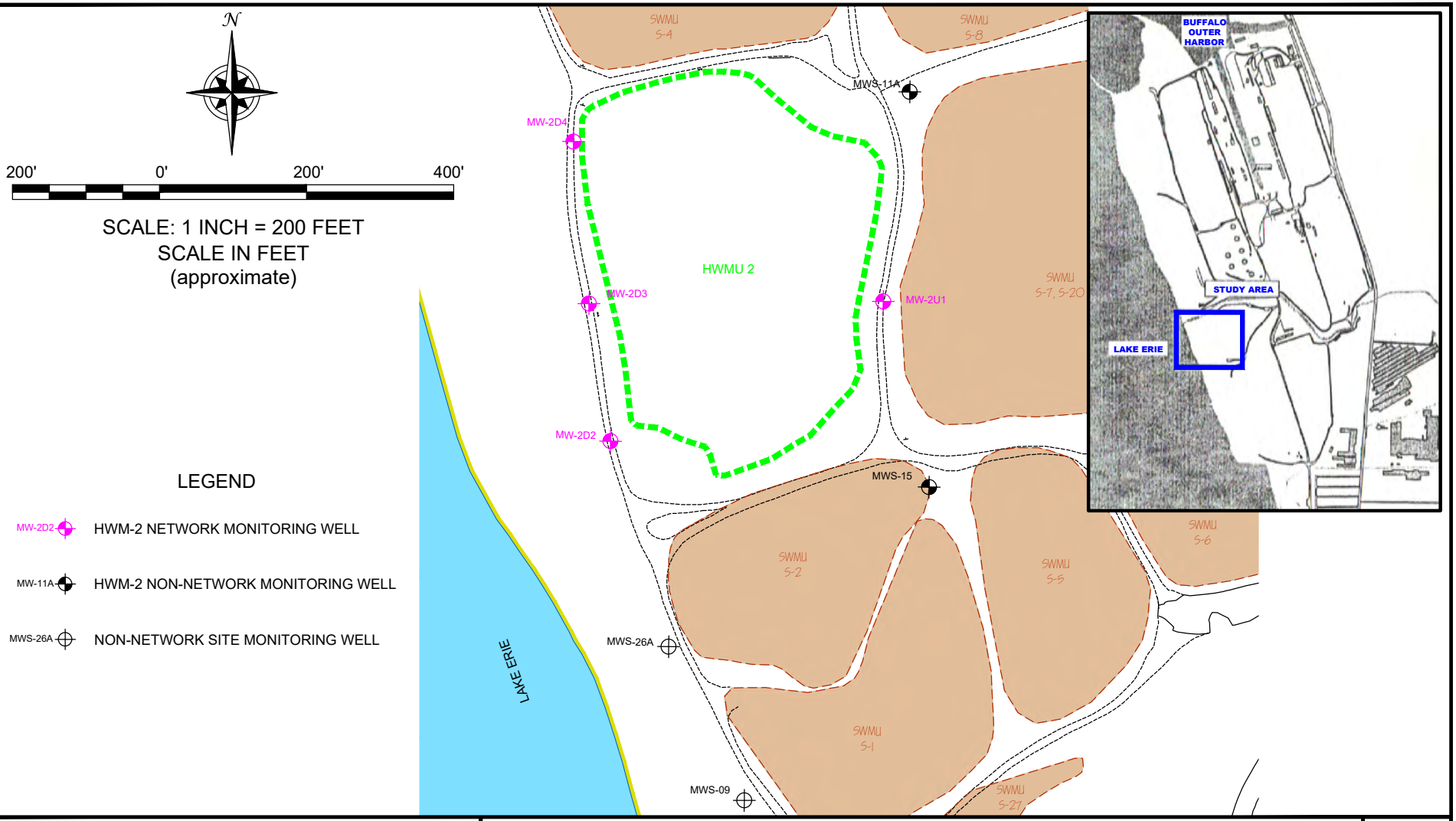
FORMER BETHLEHEM STEEL LACKAWANNA COKE DIVISION SITE
LACKAWANNA, NEW YORK

PREPARED FOR

TECUMSEH REDEVELOPMENT INC.

FIGURE 4

F:\CAD\TurnKey\Tecumseh Redevelopment\HWMU Groundwater Sampling\2017\HWMU-1 and HWMU-2 GWMSAP 2017\Figure 3; HWMU-2 Groundwater Monitoring Network.dwg



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HWMU-2 GROUNDWATER MONITORING NETWORK

HWMU-1 & HWMU-2 GWMSAP

FORMER BETHLEHEM STEEL LACKAWANNA COKE DIVISION SITE
LACKAWANNA, NEW YORK

PREPARED FOR

TECUMSEH REDEVELOPMENT INC.

FIGURE 5

PROJECT NO.: 0071-017-240

DATE: DECEMBER 2017

DRAFTED BY: BCH-CMC

F:\CAD\TurnKey\Tecumseh Redevelopment\Corrective Measures\ATP-ECM\ATP Pretreatment System O&M\Performance Monitoring Reports\2020\Figure 1; ATP SWMU Group & ECM_updated.dwg, 6/7/2021 2:49:39 PM

SWMU S-02
SWMU S-01
SWMU S-27
SWMU S-05
SWMU S-08
SWMU S-07/S-20
SWMU S-06
SWMU S-11
SWMU S-22
MWS-15
MW-2U1
MW-2U1B
MWS-11A
MWS-13
MWS-14
MWS-14B
MWS-29A
MWS-12A
MWS-12B
MWS-21A
MWS-21B
MWS-19A
MWS-19B
P-61D
P-62D
575.8
EW-2
EW-3R
EW-3
EW-1
VHC
P-64D
ATP-PW1
ATP-PW2
ATP-PW3
ATP-PW4
MWS-18C
MWS-18A
MWS-10
MWS-10B
MWS-25B
MWS-25A
MWS-23A
MWS-23B
MWS-20A
MWS-20B
MWS-24B
MWS-24A
(obstruction)
MWS-02
MWN-23B
MWN-11
P-36S
MWN-24A
MWN-24B
MWS-03
SG-02
HIGHWAY 11
HIGHWAY 9
SMOKES CREEK

LEGEND:

- CMS AREA BOUNDARY
- APPROXIMATE BOUNDARY OF SWMU FROM RFI
- ATP-ECM CONTAINMENT CELL SLURRY WALL ALIGNMENT
- MWS-02 MONITORING WELL
- P-36S EXISTING PIEZOMETER
- EW-1 GROUNDWATER EXTRACTION WELL
- VHC VERTICAL HYDRAULIC CONDUIT
- ATP-PW2 PUMPING WELLS
- APPROXIMATE ALIGNMENT OF ATP-ECM FORCE MAIN
- APPROXIMATE ALIGNMENT ATP-ECM LEACHATE EXTRACTION LINE
- MH ATP-ECM MANHOLE
- ATP-ECM CLEAN-OUT

N

200' 0' 200' 400'

SCALE: 1 INCH = 200 FEET
SCALE IN FEET
(approximate)

DATE: FEBRUARY 2021
DRAFTED BY: CMC

2558 HAMBURG TURNPIKE
SUITE 300
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(716) 856-0635

TURNKEY ENVIRONMENTAL RESTORATION, LLC

JOB NO.:

ATP SWMU GROUP & ECM
ANNUAL MONITORING & MAINTENANCE SUMMARY REPORT

TECUMSEH LACKAWANNA SITE
LACKAWANNA, NEW YORK

PREPARED FOR
TECUMSEH REDEVELOPMENT INC.

FIGURE 6

SOUTH SECTION

NORTH SECTION

III-10
BCP SITE NO. C915199J
(± 17.24 ACRES)

SWMU P-11

SWMU P-11A

SOUTH INFILTRATION GALLERY

NORTH INFILTRATION GALLERY

NEW SPLITTER BOX

TREATMENT BUILDING

JUNCTION MANHOLE

SVE TRAILER

BENZOL BLDG.

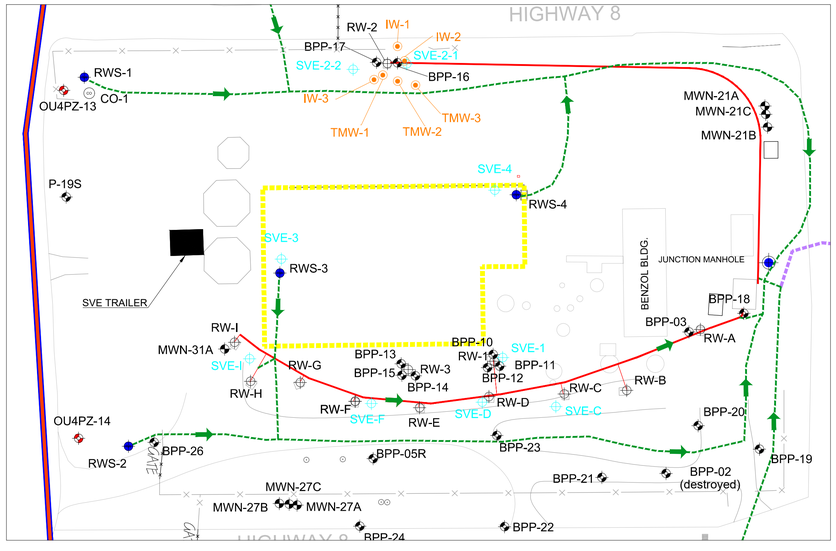
HIGHWAY 8

PLAN VIEW OF OU-4 AREA

SCALE: 1 INCH = 100 FEET
SCALE IN FEET
(approximate)

LEGEND:

- TECUMSEH PROPERTY BOUNDARY
- 2" FORCE MAIN TO TREATMENT BUILDING
- 4" FORCE MAIN TO TREATMENT BUILDING
- 4" GRAVITY PIPE TO INFILTRATION GALLERY
- INFILTRATION GALLERY PERFORATED PIPE
- NORMAL DIRECTION OF FLOW IN FORCE MAIN
- RWN-1/RW-G — GROUNDWATER RECOVERY WELL
- CO-1 — CLEAN-OUT LOCATION
- OU4PZ-1 — PIEZOMETER LOCATION
- SVE-4 — SVE WELL
- TMW-3 — TEMPORARY WELL
- OU-4 BOUNDARY
- SWMU BOUNDARY ONLY P-11 AND P-11A SHOWN
- MWN-26A — EXISTING MONITORING WELL
- 2" BENZOL YARD FORCE MAIN
- ROADWAY



PLAN VIEW OF OU-4 AREA
SCALE: 1" = 50'

REVISIONS			
NO.	BY	DATE	REMARKS
1	RFL	10/1/19	ADDRESS DEC COMMENTS

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC
TURNKEY ENVIRONMENTAL RESTORATION, LLC
2558 HAMBURG TURNPIKE, SUITE 300, BUFFALO, NY 14218, (716) 856-0599

JOB NO.: 0071-019-910

SEAL

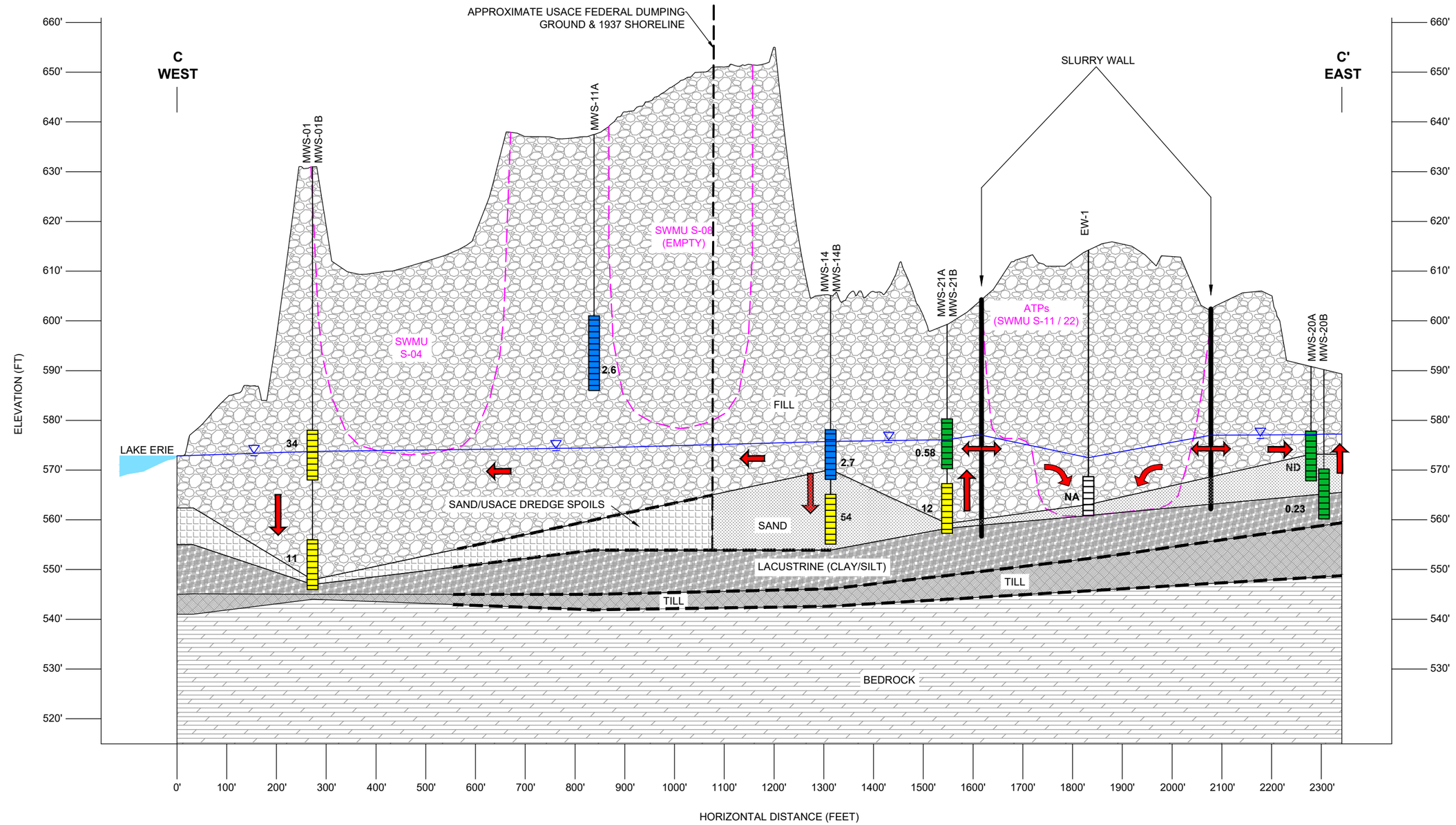
DRAWN BY: CMC/RFL
DATE: OCTOBER 2019
CHECKED BY:
APPROVED BY:

OU-4 MONITORING WELL NETWORK MAP

OPERATION, MAINTENANCE, & MONITORING PLAN

FORMER BETHLEHEM STEEL SITE
LACKAWANNA, NEW YORK
PREPARED FOR:
TECUMSEH REDEVELOPMENT INC.

Figure 7



SCALE: 10V:1H

ELEVATION DATUM NAVD 88

DATE: APRIL 2019
DRAFTED BY: RFL/CCB

F:\CAD\TurnKey\Tecumseh Redevelopment\CMS\2019 CMS Report\GW XSXNS\Benzene\FIGURE C-B; C-C' BENZENE.dwg

2558 HAMBURG TURNPIKE
SUITE 300
BUFFALO, NY 14218
(716) 856-0635

JOB NO.: 0071-019-111

GEOLOGIC SECTION C-C' W/ BENZENE PROFILE

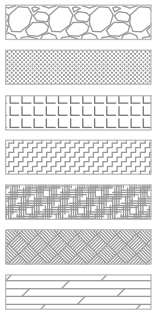
CMS REPORT

TECUMSEH LACKAWANNA SITE - CMS AREA
LACKAWANNA, NEW YORK

PREPARED FOR
TECUMSEH REDEVELOPMENT INC.

FIGURE 8A

LEGEND:



- FILL
- SAND
- SAND/USACE DREDGE SPOILS
- PEAT / ORGANIC SOIL
- LACUSTRINE (CLAY/SILT)
- TILL
- BEDROCK (SHALE)
- INFERRED LITHOLOGIC BOUNDARY
- MONITORING WELL SCREENED INTERVAL
- GROUNDWATER ELEVATION
- RECENT GW CONCENTRATION <GWQS (ug/L)
- RECENT GW CONCENTRATION >GWQS BUT <10xGWQS (ug/L)
- RECENT GW CONCENTRATION >10xGWQS BUT <100xGWQS (ug/L)
- RECENT GW CONCENTRATION >100xGWQS (ug/L)
- **10** COC CONCENTRATION (ug/L)
- HORIZONTAL / VERTICAL GROUNDWATER FLOW DIRECTION

NOTES:

1. GROUND ELEVATIONS SHOWN DERIVED FROM TABLE 4-33.
2. LAKE ERIE ELEVATION SHOWN IS THE MEAN ELEVATION FOR JANUARY 4, 2019 (573 FEET).
3. VERTICAL SCALES HAVE BEEN EXAGGERATED AS INDICATED TO SHOW GREATER DETAIL, ESPECIALLY WITH LONGER HORIZONTAL SECTION LINES (I.E. G-G').
4. SWMU LOCATIONS AND DEPTHS ARE APPROXIMATE AND BASED ON THE SITE SURVEY AND RFI DESCRIPTIONS, RESPECTIVELY.
5. SMOKES CREEK BOTTOM ELEVATIONS REFLECT POST-DREDGE AS-BUILT FINAL ELEVATIONS (E.G. POST-ICM).
6. ELEVATION DATUM NAVD 88

NYSDEC GWQS:

BENZENE = 1 ug/L
ETHYLBENZENE = 5 ug/L
TOLUENE = 5 ug/L
XYLENES = 5 ug/L
NAPHTHALENE = 10 ug/L
TOTAL PHENOLICS = 1 ug/L
T. BTEX = NO STANDARD
T. PAHs = NO STANDARD

ACRONYMS:

ND = NON-DETECT
NA = NOT APPLICABLE; NO RECENT ANALYTICAL RESULTS WERE OBTAINED FROM THIS LOCATION
GWQS = NYSDEC CLASS "GA" GROUNDWATER QUALITY STANDARD
A = WELL I.D. SUFFIX TYPICALLY DENOTES FILL UNIT WELL
B = WELL I.D. SUFFIX TYPICALLY DENOTES SAND UNIT WELL
C = WELL I.D. SUFFIX TYPICALLY DENOTES A MISC. UNIT WELL (E.G., PEAT, CLAY/SILT, TILL)
D = WELL I.D. SUFFIX TYPICALLY DENOTES A BEDROCK WELL

TurnKey Environmental Restoration, LLC
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PROJECT NO.: 0071-019-111

DATE: MAY 2019

DRAFTED BY: RFL/CMC

GEOLOGIC SECTIONS LEGEND AND NOTES

CMS REPORT

TECUMSEH LACKAWANNA SITE - CMS AREA
LACKAWANNA, NEW YORK

PREPARED FOR

TECUMSEH REDEVELOPMENT INC.

FIGURE 8B

TABLE

TABLE 1

SUMMARY OF SITE-SPECIFIC CONSTITUENTS OF CONCERN

Hazardous Waste Management Units HWMU-1 & HWMU-2
Tecumseh Redevelopment Inc.
Lackawanna, New York

Parameter	HWMU 1A	HWMU 1B	HWMU 2
Site-Specific Volatile Organic Compounds (SS-VOCs)-Method 8260C (CP-51 compounds in blue)			
Benzene	X	X	X
cis-1,2-Dichloroethene		X	
trans-1,2-Dichloroethene		X	
Ethylbenzene		X	X
Toluene	X	X	X
Trichloroethene		X	
1,2,4-Trimethylbenzene	X	X	X
1,3,5-Trimethylbenzene	X		
Vinyl chloride		X	
Xylenes, Total	X	X	X
TCL List Semi-Volatile Organic Compounds (SS-SVOCs)-Method 8270D			
Benzo(a)anthracene		X	
Bis(2-ethylhexyl) phthalate		X	
Chrysene		X	X
Naphthalene	X	X	X
Phenolic Compounds	X	X	X

Notes:

1. Parameter lists were modified in September 2009 with NYSDEC approval.

ATTACHMENT A

CME CHECKLIST

Comprehensive Groundwater Monitoring Evaluation		Y/N
I.	**Office Evaluation Technical Evaluation of the Design of the Groundwater Monitoring System**	
A.	**Review of Relevant Documents**	
1.	What documents were obtained prior to conducting the inspection: ☐RCRA Part A permit application ☐RCRA Part B permit application ☒Correspondence between the owner/operator and appropriate agencies or citizen's groups ☒Previously conducted facility inspection reports ☒Facility's contractor reports ☐Regional hydrogeologic, geologic, or soil reports ☒The facility's Sampling and Analysis Plan ☐Groundwater Assessment Program Outline (or Plan, if the facility is in assessment monitoring) ☒Other (specify): Operation, Maintenance & Monitoring Plan for Expedited Corrective Measure Acid Tar Pits SWMU Group (2013; Revised 2017); Groundwater Monitoring, Sampling, and Analysis Plan for HWMU-1 and HWMU-2 (2017); Operation, Maintenance & Monitoring Plan for Coke Plant By-Products SWMU Group Groundwater Treatment System (OU-4) & Source Area Control ICM (2019; Revised 2020)	Yes
B.	**Evaluation of the Owner/Operator's Hydrogeologic Assessment**	
1.	Did the owner/operator use the following direct techniques in the hydrogeologic assessment: ☒Logs of the soil borings/rock corings (documented by a professional geologist, scientist, or geotechnical engineer) ☒Materials tests (e.g., grain size analyses, standard penetration tests, etc.) ☒Piezometer installation for water level measurements at different depths ☒Slug tests ☒Pump tests ☒Geochemical analyses of soil samples ☐Other (specify) (e.g., hydrochemical diagrams, wash analysis):	Yes

Comprehensive Groundwater Monitoring Evaluation		Y/N
2.	Did the owner/operator use the following indirect technique to supplement direct techniques data: ☐ Geophysical well logs ☐ Tracer studies ☐ Resistivity and/or electromagnetic conductance ☐ Seismic survey ☐ Hydraulic conductivity measurements of cores ☒ Aerial photography ☐ Ground penetrating radar ☐ Other (specify):	Yes
3.	Did the owner/operator document and present the raw data from the site hydrogeologic assessment? In RFI (2004) and CMS (2019) Reports	Yes
4.	Did the owner/operator document methods (criteria) used to correlate and analyze the information? In RFI (2004) and CMS (2019) Reports	Yes
5.	Did the owner/operator prepare the following: ☒ Narrative description of geology ☒ Geologic cross sections ☒ Geologic and soil maps ☒ Boring/coring logs ☒ Structure contour maps of the differing water bearing zones and confining layer ☒ Narrative description and calculation of groundwater flows ☒ Water table/potentiometric map ☒ Hydrologic cross sections	Yes
6.	Did the owner/operator obtain a regional map of the area and delineate the facility? Yes If yes, does the site map show: ☒ Surficial geology features ☒ Streams, rivers, lakes, or wetlands near the facility ☐ Discharging or recharging wells near the facility	Yes
7.	Did the owner/operator obtain a regional hydrogeologic map? If yes, does this hydrogeologic map indicate: ☐ Major areas of recharge/discharge ☐ Regional groundwater flow direction ☐ Potentiometric contours which are consistent with observed water level elevations	No

Comprehensive Groundwater Monitoring Evaluation			Y/N
8.	Did the owner/operator prepare a facility site map? If yes, does the site map show: ☒Regulated units of the facility (e.g., landfill areas, impoundments) ☒Any seeps, springs, streams, ponds, or wetlands ☒Location of monitoring wells, soil borings, or test pits		Yes
9.	How many regulated units does the facility have? 10 OUs If more than one regulated unit then, ☐Does the waste management area encompass all regulated units? ☐Is a waste management area delineated for each regulated unit?		
C.	**Characterization of Subsurface Geology of Site**		
1.	Soil boring/test pit program:		
	a.	Were the soil borings/test pits performed under the supervision of a qualified professional?	Yes
	b.	Did the owner/operator provide documentation for selecting the spacing for borings?	Yes
	c.	Were the borings drilled to the depth of the first confining unit below the uppermost zone of saturation or ten feet into bedrock?	Some
	d.	Indicate the method(s) of drilling: ☒Auger (hollow or solid stem) ☐Mud rotary ☐Reverse rotary ☐Cable tool ☐Jetting ☐Other (specify):	
	e.	Were continuous sample cores taken?	Some
	f.	How were the samples obtained (checked method(s)) ☒Split spoon ☒Shelby tube, or similar ☒Rock coring ☐Ditch sampling ☒Other (explain): Test Pits	
	g.	Were the continuous sample cores logged by a qualified professional in geology?	Yes

Comprehensive Groundwater Monitoring Evaluation		Y/N
h.	Does the field boring log include the following information: ☒Hole name/number ☒Date started and finished ☒Driller's name ☒Hole location (i.e., map and elevation) ☒Drill rig type and bit/auger size ☒Gross petrography (e.g., rock type) of each geologic unit ☐Gross mineralogy of each geologic unit ☐Gross structural interpretation of each geologic unit and structural features (e.g., fractures, gouge material, solution channels, buried streams or valleys, identification of depositional material) ☒Development of soil zones and vertical extent and description of soil type ☒Depth of water bearing unit(s) and vertical extent of each ☒Depth and reason for termination of borehole ☒Depth and location of any contaminant encountered in borehole ☒Sample location/number ☒Percent sample recovery Narrative descriptions of: ☒Geologic observations ☐Drilling observations	Yes
i.	Were the following analytical tests performed on the core samples: ☐Mineralogy (e.g., microscopic tests and x-ray diffraction) Petrographic analysis: ☐Degree of crystallinity and cementation of matrix ☐Degree of sorting, size fraction (i.e., sieving), textural variations ☐Rock type(s) ☒Soil type ☐Approximate bulk geochemistry ☐Existence of microstructures that may affect or indicate fluid flow ☒Falling head tests ☐Static head tests ☐Settling measurements ☐Centrifuge tests ☐Column drawings	Some

Comprehensive Groundwater Monitoring Evaluation		Y/N
D.	**Verification of Subsurface Geological Data**	
1.	Has the owner/operator used indirect geophysical methods to supplement geological conditions between borehole locations?	No
2.	Do the number of borings and analytical data indicate that the confining layer displays a low enough permeability to impede the migration of contaminants to any stratigraphically lower water-bearing units?	Yes
3.	Is the confining layer laterally continuous across the entire site? General present across most of site; however, absent in two small areas beneath the Tank Farm and at the mouth of Smokes Creek.	No
4.	Did the owner/operator consider the chemical compatibility of the site-specific waste types and the geologic materials of the confining layer?	No
5.	Did the geologic assessment address or provide means for resolution of any information gaps of geologic data?	Yes
6.	Do the laboratory data corroborate the field data for petrography?	NA
7.	Do the laboratory data corroborate the field data for mineralogy and subsurface geochemistry?	NA
E.	**Presentation of Geologic Data**	
1.	Did the owner/operator present geologic cross sections of the site?	Yes
2.	Do cross sections: ☒Identify the types and characteristics of the geologic materials present ☒Define the contact zones between different geologic materials ☐Note the zones of high permeability or fracture ☒Give detailed borehole information including: ☒Location of borehole ☒Depth of termination ☒Location of screen (if applicable) ☒Depth of zone(s) of saturation ☐Backfill procedure	Yes
3.	Did the owner/operator provide a topographic map which was constructed by a licensed surveyor?	Yes

Comprehensive Groundwater Monitoring Evaluation			Y/N
4.	Does the topographic map provide: ☒Contours at a maximum interval of two feet ☒Locations and illustrations of man-made features (e.g., parking lots, factory buildings, drainage ditches, storm drain, pipelines, etc.) ☒Descriptions of nearby water bodies ☐Descriptions of off-site wells ☒Site boundaries ☒Individual RCRA units ☒Delineation of the waste management area(s) ☒Well and boring locations		Yes
5.	Did the owner/operator provide an aerial photograph depicting the site and adjacent off-site features?		Yes
6.	Does the photograph clearly show surface water bodies, adjacent municipalities, and residences and are these clearly labeled?		Yes
F.	**Identification of Groundwater Flow Paths**		
1.	Groundwater flow direction		
	a.	Was the well casing height measured by a licensed surveyor to the nearest 0.01 feet?	Yes
	b.	Were the well water level measurements taken within a 24 hour period?	Yes
	c.	Were the well water level measurements taken to the nearest 0.01 feet?	Yes
	d.	Were the well water levels allowed to stabilize after construction and development for a minimum of 24 hours prior to measurements?	Yes
	e.	Was the water level information obtained from (check appropriate one): ☐Multiple piezometers placed in single borehole ☐Vertically nested piezometers in closely spaced separate boreholes ☒Monitoring wells	Yes
	f.	Did the owner/operator provide construction details for the piezometers?	Yes

Comprehensive Groundwater Monitoring Evaluation		Y/N
	g. How were the static water levels measured (check method(s)). ☒Electric water sounder ☐Wetted tape ☐Air line ☐Other (explain):	
	h. Was the well water level measured in wells with equivalent screened intervals at an equivalent depth below the saturated zone?	Yes
	i. Has the owner/operator provided a site water table (potentiometric) contour map?	Yes
	• Do the potentiometric contours appear logical and accurate based on topography and presented data?	Yes
	• Are groundwater flow lines indicated?	Yes
	• Are static water levels shown?	Yes
	• Can hydraulic gradients be estimated?	Yes
	j. Did the owner/operator develop hydrologic cross sections of the vertical flow component across the site using measurements from all wells?	Yes
	k. Do the owner/operator's flow nets include: ☐Piezometer locations ☐Depth of screening ☐Width of screening ☐Measurements of water levels from all wells and piezometers	NA
2.	Seasonal and temporal fluctuations in groundwater:	
	a. Do fluctuations in static water levels occur? If yes, are the fluctuations caused by any of the following: ☐Off-site well pumping ☒Tidal processes or other intermittent natural variations (e.g., river stage, etc.) ☒On-site well pumping ☐Off-site, on-site construction or changing land use patterns ☐Deep well injection ☒Seasonal variations ☐Other (specify):	Yes

Comprehensive Groundwater Monitoring Evaluation			Y/N
	b.	Has the owner/operator documented sources and patterns that contribute to or affect the groundwater patterns below the waste management?	Yes
	c.	Do water level fluctuations alter the general groundwater gradients and flow directions?	Yes
	d.	Based on water level data, do any head differentials occur that may indicate a vertical flow component in the saturated zone?	Yes
	e.	Did the owner/operator implement means for gauging long-term effects on water movement that may result from on-site or off-site construction or changes in land-use patterns?	Yes
3.	Hydraulic conductivity:		
	a.	How were hydraulic conductivities of the subsurface materials determined? ☒Single-well tests (slug tests) ☒Multiple-well tests (pump tests) ☐Other (specify):	Yes
	b.	If single-well tests were conducted, was it done by: ☒Adding or removing a known volume of water ☐Pressurizing well casing	Yes
	c.	If single well tests were conducted in a highly permeable formation, were pressure transducers and high-speed recording equipment used to record the rapidly changing water levels?	Yes
	d.	Since single well tests only measure hydraulic conductivity in a limited area, were enough tests run to ensure a representative measure of conductivity in each hydrogeologic unit?	Yes
	e.	Is the owner/operator's slug test data (if applicable) consistent with existing geologic information (e.g., boring logs)?	Yes

Comprehensive Groundwater Monitoring Evaluation			Y/N
	f.	Were other hydraulic conductivity properties determined? If yes, provide any of the following data, if available: ☐ Transmissivity ☐ Storage coefficient ☒ Leakage ☒ Permeability ☒ Porosity ☐ Specific capacity ☒ Other (specify): Recharge; Groundwater Flow Velocities	Yes
4.	Identification of the uppermost aquifer:		
	a.	Has the extent of the uppermost saturated zone (aquifer) in the facility area been defined? If yes,	Yes
		• Are soil boring/test pit logs included?	Yes
		• Are geologic cross-sections included?	Yes
	b.	Is there evidence of confining (competent, unfractured, continuous, and low permeability) layers beneath the site? If yes, • How was continuity demonstrated?	Yes
	c.	What is hydraulic conductivity of the confining unit (if present)? 6.8E-8 cm/sec average How was it determined? Laboratory testing of core samples	
	d.	Does potential for other hydraulic communication exist (e.g., lateral discontinuity between geologic units, facies changes, fracture zones, cross cutting structures, or chemical corrosion/alteration of geologic units by leachage? If yes or no, what is the rationale? Chemical impacts observed in bedrock wells	Yes
G.	**Office Evaluation of the Facility's Groundwater Monitoring System Monitoring Well Design and Construction:** These questions should be answered for each different well design present at the facility. 1. Drilling Methods:		

Comprehensive Groundwater Monitoring Evaluation		Y/N
a.	What drilling method was used for the well? ☒Hollow-stem auger ☐Solid-stem auger ☒Water rotary ☐Air rotary ☐Reverse rotary ☒Cable tool ☐Jetting ☐Air drill w/ casing hammer ☒Other (specify): Rock Coring	Various
b.	Were any cutting fluids (including water) or additives used during drilling? If yes, specify: • Type of drilling fluid: Water • Source of water used: unknown • Foam • Polymers • Other	Yes
c.	Was the cutting fluid, or additive, identified?	NA
d.	Was the drilling equipment steam-cleaned prior to drilling the well? • Other methods	Some
e.	Was compressed air used during drilling? If yes, • Was the air filtered to remove oil?	No
f.	Did the owner/operator document procedure for establishing the potentiometric surface? If yes, • How was the location established?	Yes
g.	Formation samples	
	• Were formation samples collected initially during drilling?	Yes
	• Were any cores taken continuous?	Some
	• If not, at what interval were samples taken?	Various

Comprehensive Groundwater Monitoring Evaluation				Y/N
	• How were the samples obtained? ☒Split spoon ☒Shelby tube ☒Core drill ☐Other (specify):			Various
	• Identify if any physical and/or chemical tests were performed on the formation samples (specify):			Various
2.	Monitoring Well Construction Materials			
	a. Identify construction materials (by number) and diameters (ID/OD)	Material	Diameter	Various
	• Primary Casings	Stainless Steel, PVC, Steel	Various	
	• Secondary or outside casings (double construction)	Steel	Various	
	• Screens	Stainless Steel, PVC, Porous Teflon	Various	
	b. How are the sections of casing and screen connected? • Pipe sections threaded			T & C
	c. Were the materials steam-cleaned prior to installation? • If no, how were the materials cleaned?_____			Unknown
3.	Well Intake Design and Well Development			
	a. Was a well intake screen installed?			Yes
	• What is the length of the screen for the well?			Various
	• Is the screen manufactured?			Yes
	b. Was a filter pack installed?			Yes
	• What kind of filter pack was employed? Sand			

Comprehensive Groundwater Monitoring Evaluation	Y/N
• Is the filter pack compatible with formation materials?	Yes
• How was the filter pack installed?	Various
• What are the dimensions of the filter pack?	Various
• Has a turbidity measurement of the well water ever been made? During well development and sampling	Yes
• Have the filter pack and screen been designed for the in situ materials?	Yes
c. Well development	
• Was the well developed?	Yes
• What technique was used for well development? ☐ Surge block ☒ Bailer ☐ Air surging ☒ Water pumping ☐ Other (specify):	Various
4. Annular Space Seals	
a. What is the annular space in the saturated zone directly above the filter pack filled with: ☒ Sodium bentonite (specify type and grit) ☐ Cement (specify neat or concrete) ☐ Other (specify):	
b. Was the seal installed by: ☐ Dropping material down the hole and tamping ☒ Dropping material down the inside of hollow-stem auger ☒ Tremie pipe method ☐ Other (specify):	
c. Was a different seal used in the unsaturated zone? If yes,	Yes
• Was this seal made with ☐ Sodium bentonite (specify type and grit) ☒ Cement (specify neat or concrete) ☐ Other (specify):	

Comprehensive Groundwater Monitoring Evaluation			Y/N
		• Was this seal installed by ☐ Dropping material down the hole and tamping ☒ Dropping material down the inside of hollow stem auger ☐ Other (specify):	
	d.	Is the upper portion of the borehole sealed with a concrete cap to prevent infiltration from the surface?	Yes
	e.	Is the well fitted with an above-ground protective device? Yes; and bumper guards? Some	
	f.	Has the protective cover been installed with locks to prevent tampering?	Yes
H.	**Evaluation of the Facility's Detection Monitoring Program**		
1.	Placement of Downgradient Detection Monitoring Wells:		
	a.	Are the groundwater monitoring wells or clusters located immediately adjacent to the waste management area?	Yes
	b.	How far apart are the detection monitoring wells?	Varies
	c.	Does the owner/operator provide a rationale for the location of each monitoring well or cluster?	Yes
	d.	Does the owner/operator identify the well screen lengths of each monitoring well or clusters?	Yes
	e.	Does the owner/operator provide an explanation for the well screen lengths of each monitoring well or cluster?	Yes
	f.	Do the actual locations of monitoring wells or clusters correspond to those identified by the owner/operator?	Yes
2.	Placement of Upgradient Monitoring Wells:		
	a.	Has the owner/operator documented the location of each upgradient monitoring well or cluster?	Yes
	b.	Does the owner/operator provide an explanation for the location(s) of the upgradient monitoring well(s)?	Yes
	c.	What length screen has the owner/operator employed in the background monitoring well(s)?	Various

Comprehensive Groundwater Monitoring Evaluation			Y/N
	d.	Does the owner/operator provide an explanation for the screen length(s) chosen?	Yes
	e.	Does the actual location of each background monitoring well or cluster correspond to that identified by the owner/operator?	Yes
I.	**Office Evaluation of the Facility's Assessment Monitoring Program**		
1.	Does the assessment plan specify:		
	a.	The number, location, and depth of wells?	Yes
	b.	The rationale for their placement and identify the basis that will be used to select subsequent sampling locations and depths in later assessment phases?	Yes
2.	Does the list of monitoring parameters include all hazardous waste constituents from the facility?		No
	a.	Does the water quality parameter list include other important indicators not classified as hazardous waste constituents? Field Parameters	Yes
	b.	Does the owner/operator provide documentation for the listed wastes which are not included?	Yes
3.	Does the owner/operator's assessment plan specify the procedures to be used to determine the rate of constituent migration in the groundwater?		Yes
4.	Has the owner/operator specified a schedule of implementation in the assessment plan?		Yes
5.	Have the assessment monitoring objectives been clearly defined in the assessment plan?		Yes
	a.	Does the plan include analysis and/or re-evaluation to determine if significant contamination has occurred in any of the detection monitoring wells?	Yes
	b.	Does the plan provide for a comprehensive program of investigation to fully characterize the rate and extent of contaminant migration from the facility?	No

Comprehensive Groundwater Monitoring Evaluation			Y/N
	c.	Does the plan call for determining the concentrations of hazardous wastes and hazardous waste constituents in the ground water?	Yes
	d.	Does the plan employ a quarterly monitoring program?	No
6.	Does the assessment plan identify the investigatory methods that will be used in the assessment phase?		Yes
	a.	Is the role of each method in the evaluation fully described?	Yes
	b.	Does the plan provide sufficient descriptions of the direct methods to be used?	Yes
	c.	Does the plan provide sufficient descriptions of the indirect methods to be used?	No
	d.	Will the method contribute to the further characterization of the contaminant movement?	NA
7.	Are the investigatory techniques utilized in the assessment program based on direct methods?		Yes
	a.	Does the assessment approach incorporate indirect methods to further support direct methods?	No
	b.	Will the planned methods called for in the assessment approach ultimately meet performance standards for assessment monitoring?	Yes
	c.	Are the procedures well defined?	Yes
	d.	Does the approach provide for monitoring wells similar in design and construction as the detection monitoring wells?	Yes
	e.	Does the approach employ taking samples during drilling or collecting core samples for further analysis?	Yes
8.	Are the indirect methods to be used based on reliable and accepted geophysical techniques?		NA
	a.	Are they capable of detecting subsurface changes resulting from contaminant migration at the site?	NA

Comprehensive Groundwater Monitoring Evaluation			Y/N
	b.	Is the measurement at an appropriate level of sensitivity to detect groundwater quality changes at the site?	NA
	c.	Is the method appropriate considering the nature of the subsurface materials?	NA
	d.	Does the approach consider the limitations of these methods?	NA
	e.	Will the extent of contamination and constituent concentration be based on direct methods and sound engineering judgment? (Using indirect methods to further substantiate the findings.)	Yes
9.	Does the assessment approach incorporate any mathematical modeling to predict contaminant movement?		Yes
	a.	Will site specific measurements be utilized to accurately portray the subsurface?	Yes
	b.	Will the derived data be reliable?	Yes
	c.	Have the assumptions been identified?	Yes
	d.	Have the physical and chemical properties of the site-specific wastes and hazardous waste constituents been identified?	Yes
J.	**Conclusions**		
1.	Subsurface geology		
	a.	Has sufficient data been collected to adequately define petrography and petrographic variation?	Yes
	b.	Has the subsurface geochemistry been adequately defined?	Yes
	c.	Was the boring/coring program adequate to define subsurface geologic variation?	Yes
	d.	Was the owner/operator's narrative description complete and accurate in its interpretation of the data?	Yes
	e.	Does the geologic assessment address or provide means to resolve any information gaps?	Yes
2.	Groundwater flow paths		

Comprehensive Groundwater Monitoring Evaluation			Y/N
	a.	Did the owner/operator adequately establish the horizontal and vertical components of groundwater flow?	Yes
	b.	Were appropriate methods used to establish groundwater flow paths?	Yes
	c.	Did the owner/operator provide accurate documentation?	Yes
	d.	Are the potentiometric surface measurements valid?	Yes
	e.	Did the owner/operator adequately consider the seasonal and temporal effects on the groundwater?	Yes
	f.	Were sufficient hydraulic conductivity tests performed to document lateral and vertical variation in hydraulic conductivity in the entire hydrogeologic subsurface below the site?	Yes
3.	Uppermost Aquifer		
	a.	Did the owner/operator adequately define the uppermost aquifer?	Yes
4.	Monitoring Well Construction and Design		
	a.	Do the design and construction of the owner/operator's groundwater monitoring wells permit depth discrete groundwater samples to be taken?	Yes
	b.	Are the samples representative of groundwater quality?	Yes
	c.	Are the groundwater monitoring wells structurally stable?	Yes
	d.	Does the groundwater monitoring well's design and construction permit an accurate assessment of aquifer characteristics?	Yes
5.	Detection Monitoring		
	a.	Downgradient Wells • Do the location, and screen lengths of the groundwater monitoring wells or clusters in the detection monitoring system allow the immediate detection of a release of hazardous waste or constituents from the hazardous waste management area to the uppermost aquifer?	Yes

Comprehensive Groundwater Monitoring Evaluation			Y/N
	b.	Upgradient Wells • Do the locations and screen lengths of the upgradient (background) groundwater monitoring wells ensure the capability of collecting groundwater samples representative of upgradient (background) groundwater quality including any ambient heterogenous chemical characteristics?	Yes
6.	Assessment Monitoring		
	a.	Has the owner/operator adequately characterized site hydrogeology to determine contaminant migration?	Yes
	b.	Is the detection monitoring system adequately designed and constructed to immediately detect any contaminant release?	Yes
	c.	Are the procedures used to make a first determination of contamination adequate?	Yes
	d.	Is the assessment plan adequate to detect, characterize, and track contaminant migration?	Yes
	e.	Will the assessment monitoring wells, given site hydrogeologic conditions, define the extent and concentration of contamination in the horizontal and vertical planes?	Yes
	f.	Are the assessment monitoring wells adequately designed and constructed?	Yes
	g.	Are the sampling and analysis procedures adequate to provide true measures of contamination?	Yes
	h.	Do the procedures used for evaluation of assessment monitoring data result in determinations of the rate of migration, extent of migration, and hazardous constituent composition of the contaminant plume?	Yes
	i.	Are the data collected at sufficient frequency and duration to adequately determine the rate of migration?	Yes
	j.	Is the schedule of implementation adequate?	Yes
	k.	Is the owner/operator's assessment monitoring plan adequate?	Yes
	l.	If the owner/operator had to implement his assessment monitoring plan, was it implemented satisfactorily?	Yes

Comprehensive Groundwater Monitoring Evaluation		Y/N
II.	**Field Evaluation**	
A.	**Groundwater Monitoring System**	
1.	Are the numbers, depths, and locations of monitoring wells in agreement with those reported in the facility's monitoring plan? (See Section 3.2.3.)	Yes
B.	**Monitoring Well Construction**	
1.	Identify construction material and diameter a. Primary casing: b. Secondary or outside casing:	Various
2.	Is the upper portion of the borehole sealed with concrete to prevent infiltration from the surface?	Yes
3.	Is the well fitted with an above-ground protective device?	Yes
4.	Is the protective cover fitted with locks to prevent tampering? If a facility utilizes more than a single well design, answer the above questions for each well design?	Yes
III.	**Review of Sample Collection Procedures**	
A.	**Measurement of Well Depths /Elevation**	
1.	Are measurements of both depth to standing water and depth to the bottom of the well made?	Yes
2.	Are measurements taken to the 0.01 feet?	Yes
3.	What device is used? Electronic Water Level Indicator	
4.	Is there a reference point established by a licensed surveyor?	Yes
5.	Is the measuring equipment properly cleaned between well locations to prevent cross contamination?	Yes
B.	**Detection of Immiscible Layers**	
1.	Are procedures used which will detect light phase immiscible layers?	No

Comprehensive Groundwater Monitoring Evaluation		Y/N
2.	Are procedures used which will detect heavy phase immiscible layers?	No
C.	**Sampling of Immiscible Layers**	
1.	Are the immiscible layers sampled separately prior to well evacuation?	NA
2.	Do the procedures used minimize mixing with water soluble phases?	NA
D.	**Well Evacuation**	
1.	Are low yielding wells evacuated to dryness?	Yes
2.	Are high-yielding wells evacuated so that at least three casing volumes are removed? Low-flow Sampling Methods are used	NA
3.	What devices are used to evacuate the wells? Submersible pump; LDPE bailers	
4.	If any problems are encountered (e.g., equipment malfunction) are they noted in a field logbook? Field Data Sheets	Yes
E.	**Sample Withdrawal**	
1.	For low yielding wells, are samples for volatiles, pH, and oxidation/reduction potential drawn first after the well recovers?	Yes
2.	Are samples withdrawn with either fluorocarbon/resin or stainless steel (316, 304 or 2205) sampling devices? Fluorocarbon materials no longer used	No
3.	Are sampling devices either bottom-valve bailers or positive gas displacement bladder pumps?	No
4.	If bailers are used, is fluorocarbon/resin coated wire, single strand stainless steel wire, or monofilament used to raise and lower the bailer? Fluorocarbon materials no longer used	No
5.	If bladder pumps are used, are they operated in continuous manner to prevent aeration of the sample?	NA
6.	If bailers are used, are they lowered slowly to prevent degassing of the water?	Yes

	Comprehensive Groundwater Monitoring Evaluation	Y/N
7.	If bailers are used, are the contents transferred to the sample container in a way that minimizes agitation and aeration?	Yes
8.	Is care taken to avoid placing clean sampling equipment on the ground or other contaminated surfaces prior to insertion into the well?	Yes
9.	If dedicated sampling equipment is not used, is equipment disassembled and thoroughly cleaned between samples? Decontamination procedures were not in accordance with those specified in *FOP 040.1 Non-Disposable and Non-Dedicated Sampling Equipment Decontamination*	No
10.	If samples are for inorganic analysis, does the cleaning procedure include the following sequential steps: ☐ Dilute acid rinse (HNO_3 or HC1)	No
11.	If samples are for organic analysis, does the cleaning procedure include the following sequential steps: ☒ Nonphosphate detergent wash ☒ Tap water rinse ☒ Distilled/deionized water rinse ☐ Acetone rinse ☐ Pesticide-grade hexane rinse	Some
12.	Is sampling equipment thoroughly dry before use?	No
13.	Are equipment blanks taken to ensure that sample cross-contamination has not occurred?	Some
14.	If volatile samples are taken with a positive gas displacement bladder pump, are pumping rates below 100 ml/min?	NA
F.	**In-situ or Field Analyses**	
1.	Are the following labile (chemically unstable) parameters determined in the field: ☒ pH ☒ Temperature ☒ Specific conductivity ☒ Redox potential ☐ Chlorine ☒ Dissolved oxygen ☒ Turbidity ☐ Other (specify):	Some

Comprehensive Groundwater Monitoring Evaluation		Y/N
2.	For in-situ determinations, are they made after well evacuation and sample removal?	NA
3.	If sample is withdrawn from the well, is parameter measured from a split portion?	Yes
4.	Is monitoring equipment calibrated according to manufacturers' specifications and consistent with SW-846?	Yes
5.	Are the date, procedure, and maintenance for equipment calibration documented in the field logbook? Field Data Sheets	Yes
IV.	**Review of Sample Preservation and Handling Procedures**	
A.	**Sample Containers**	
1.	Are samples transferred from the sampling device directly to their compatible containers?	Yes
2.	Are sample containers for metals (inorganics) analyses polyethylene with polypropylene caps?	Yes
3.	Are sample containers for organics analysis glass bottles with fluorocarbon resin lined caps?	Yes
4.	If glass bottles are used for metals samples are the caps fluorocarbon resin-lined?	NA
5.	Are the sample containers for metal analyses cleaned using these sequential steps: ☐ Nonphosphate detergent wash ☐ 1:1 nitric acid rinse ☐ Tap water rinse ☐ 1:1 hydrochloric acid rinse ☐ Tap water rinse ☐ Distilled/deionized water rinse	**Pre-cleaned containers provided by the Lab**
6.	Are the sample containers for organic analyses cleaned using these sequential steps: ☐ Nonphosphate detergent/hot water wash ☐ Tap water rinse ☐ Distilled/deionized water rinse ☐ Acetone rinse ☐ Pesticide-grade hexane rinse	**Pre-cleaned containers provided by the Lab**
7.	Are trip blanks used for each sample container type to verify cleanliness?	Yes

Comprehensive Groundwater Monitoring Evaluation		Y/N
B.	**Sample Preservation Procedures**	
1.	Are samples for the following analyses cooled to 4°C: *VOCs*, *SVOCs* ☐ TOC ☐ TOX ☐ Chloride ☒ Phenolic Compounds ☐ Sulfate ☐ Nitrate ☐ Coliform bacteria ☐ Cyanide ☐ Oil and grease ☐ Hazardous constituents (261, Appendix VIII)	**All samples cooled on ice after collection**
2.	Are samples for the following analyses acidified to pH<2 with HNO_3: ☐ Iron ☐ Manganese ☐ Sodium ☒ Total metals (site-specific) ☐ Dissolved metals ☐ Fluoride ☐ Endrin ☐ Lindane ☐ Methoxychlor ☐ Toxaphene ☐ 2,4-D ☐ 2,4,5-TP Silvex ☐ Radium ☐ Gross alpha ☐ Gross beta	**Pre-cleaned, pre-preserved containers provided by the Lab**
3.	Are samples for the following analyses field acidified to pH<2 with H_2S0_4: ☐ Phenols ☐ Oil and grease	**Pre-cleaned, pre-preserved containers provided by the Lab**
4.	Is the sample for TOC analyses field acidified to pH <2 with HCl?	NA
5.	Is the sample for TOX analysis preserved with 1 ml of 1.1 M sodium sulfite?	NA

Comprehensive Groundwater Monitoring Evaluation		Y/N
6.	Is the sample for cyanide analysis preserved with NaOH to pH >12?	Yes
C.	**Special Handling Considerations**	
1.	Are organic samples handled without filtering?	Yes
2.	Are samples for volatile organics transferred to the appropriate vials to eliminate headspace over the sample?	Yes
3.	Are samples for metal analysis split into two portions?	No
4.	Is the sample for dissolved metals filtered through a 0.45 micron filter? No dissolved metals analyses	NA
5.	Is the second portion not filtered and analyzed for total metals? Samples for Total Metals analyses are not filtered	Yes
6.	Is one equipment blank prepared each day of groundwater sampling?	No
V.	**Review of Chain-of-Custody Procedures**	
A.	**Sample Labels**	
1.	Are sample labels used?	Yes
2.	Do they provide the following information: ☒Sample identification number ☒Name (initials) of collector ☒Date and time of collection ☒Place of collection ☒Parameter(s) requested and preservatives used	Yes
3.	Do they remain legible even if wet?	Yes
B.	**Sample Seals**	
1.	Are sample seals placed on those containers to ensure samples are not altered?	No
C.	**Field Logbook**	
1.	Is a field logbook maintained? Field Data Sheets (Groundwater Elevation Measurement Sheets, Groundwater Field Forms, Equipment Calibration Log Sheets, Chain-of-Custody Forms)	Yes

Comprehensive Groundwater Monitoring Evaluation		Y/N
2.	Does it document the following: ☒Purpose of sampling (e.g., detection or assessment) ☒Location of well(s) ☒Total depth of each well ☒Static water level depth and measurement technique ☐Presence of immiscible layers and detection method ☐Collection method for immiscible layers and sample identification numbers ☒Well evacuation procedures ☐Sample withdrawal procedure ☒Date and time of collection ☐Well sampling sequence ☒Types of sample containers and sample identification number(s) ☒Preservative(s) used ☒Parameters requested ☒Field analysis data and method(s) ☐Sample distribution and transporter Field observations ☐Unusual well recharge rates ☒Equipment malfunction(s) ☐Possible sample contamination ☒Sampling rate	Some
D.	**Chain-of-Custody Record**	
1.	Is a chain-of-custody record included with the samples?	Yes
2.	Does it document the following: ☒Sample ID ☒Initials of collector ☒Date and time of collection ☒Sample type ☒Station location ☒Number of containers ☒Parameters requested ☒Signatures of persons involved in chain-of-custody ☒Inclusive dates of custody	Yes
E.	**Sample Analysis Request Sheet**	
1.	Does a sample analysis request sheet accompany the samples?	No

Comprehensive Groundwater Monitoring Evaluation		Y/N
2.	Does the request sheet document the following: ☐ Name of person receiving the sample ☐ Date of sample receipt ☐ Duplicates ☐ Analysis to be performed	NA
VI.	**Review of Quality Assurance/Quality Control**	
A.	Is the validity and reliability of the laboratory and field generated data ensured by a QA/QC program?	Some
B.	Does the QA/QC program include:	
1.	Documentation of any deviation from approved procedures?	Yes
2.	Documentation of analytical results for: ☒ Blanks ☒ Standards ☒ Duplicates ☒ Spiked samples ☒ Detection limits for each parameter being analyzed	Yes
C.	Are approved statistical methods used?	Yes
D.	Are QC samples used to correct data?	Some
E.	Are all data critically examined to ensure it has been properly calculated and reported? The laboratory performs an internal evaluation of their data and procedures, but no independent third-party data validation is performed	Some
VII.	**Surficial Well Inspection and Field Observation**	
A.	Are the wells adequately maintained?	Yes
B.	Are the monitoring wells protected and secure?	Yes
C.	Do the wells have surveyed casing elevations?	Yes
D.	Are the groundwater samples turbid?	Some
E.	Have all physical characteristics of the site been noted in the inspector's field notes (i.e., surface waters, topography, surface features)?	As needed

Comprehensive Groundwater Monitoring Evaluation		Y/N
F.	Has a site sketch been prepared by the field inspector with scale, north arrow, locations) of buildings, locations) of regulated units, locations of monitoring wells, and a rough depiction of the site drainage pattern? Site figures were printed out prior to the field inspection for any notes/markup	No
VIII.	**Conclusions**	
A.	Is the facility currently operating under the correct monitoring program according to the statistical analyses performed by the current operator? The current monitoring program is being performed in general accordance with the appropriate approved Monitoring Plans.	Yes
B.	Does the groundwater monitoring system, as designed and operated, allow for detection or assessment of any possible groundwater contamination caused by the facility? The groundwater monitoring programs for the SWMU/HWMU groups evaluated during this inspection (i.e, the OU3 ATP SWMU Group, HWMUs 1 and 2, and the OU-04 Benzol Yard and Coke By-Products SWMU Sub-Area Groundwater ECM) currently appear to have adequate monitoring systems/programs. Final groundwater remedies for site-wide groundwater (OU10) at the facility, as specified in the *Final Statement of Basis - Corrective Measures Selection - Site Wide Remedial Elements, Water Courses, and Groundwater Operable Units 01, 09, and 10* (2021), have yet to be implemented. Additional groundwater extraction and/or monitoring well installations and enhancements to the two on-site treatment systems (within the ATP [OU-03] and Benzol Plant [OU-04] areas) will be necessary. Thereafter, a comprehensive *Site-wide Long-term Groundwater Monitoring Plan* needs to be produced and implemented to allow for detection or assessment of <u>any</u> possible groundwater contamination caused by the facility.	Some

Comprehensive Groundwater Monitoring Evaluation		Y/N
C.	Do the sampling and analysis procedures permit the owner/operator to detect and, where possible, assess the nature and extent of a release of hazardous constituents to groundwater from the monitored hazardous waste management facility? Additional monitoring well installations will be required once the final groundwater remedies for the facility have been implemented. A comprehensive *Site-wide Long-term Groundwater Monitoring Plan*, which incorporates the SWMU/HWMU groups evaluated during this inspection, will need to be produced and implemented.	Some

ATTACHMENT B

WELL PURGING/SAMPLING LOGS

HWMUs

ROUX

GROUNDWATER FIELD FORM

Project Name: Tecumseh Humic Gum Date: 11/15/25
Location: Project No.: Field Team:

Well No. MW-101			Diameter (inches): 4			Sample Date / Time: 11/15/25			
Product Depth (fbTOR):			Water Column (ft):			DTW when sampled:			
DTW (static) (fbTOR): 33.31			One Well Volume (gal):			Purpose: ☐ Development ☐ Sample ☑ Purge & Sample			
Total Depth (fbTOR): 49.95			Total Volume Purged (gal):			Purge Method: Low Flow			
Time	Water Level (fbTOR)	Acc. Volume (gallons)	pH (units)	Temp. (deg. C)	SC (uS)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor
0945	0 Initial		10.33	11.3	3367	41	2.15	+8	clear
	35.14	2	10.17	11.1	3149	13	1.31	-30	clear
	2 36.41	3	10.05	8.9	3134	13.9	1.66	-39	clear
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	10								
Sample Information:									
1005	S1 33.33	5	9.94	8.5	3114	51	1.47	+22	clear
1005	S2 33.35	5N	10.04	8.6	3110	50	1.36	+23	clear

Well No. MW 102			Diameter (inches): 4			Sample Date / Time: 11/12/25			
Product Depth (fbTOR):			Water Column (ft):			DTW when sampled:			
DTW (static) (fbTOR): 42.30			One Well Volume (gal):			Purpose: ☐ Development ☐ Sample ☑ Purge & Sample			
Total Depth (fbTOR): 49.5			Total Volume Purged (gal):			Purge Method: Low Flow			
Time	Water Level (fbTOR)	Acc. Volume (gallons)	pH (units)	Temp. (deg. C)	SC (uS)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor
	0 Initial		12.37	11.9	2584	51	1.77	-202	turbid
	1								
0953	2 42.30		12.36	11.4	2328	27	~~1.41~~ 2.38	-231	clear
	3								
0959	4 42.20	3.5	12.49	11.1	2032	18	1.89	-241	clear
	5								
	6								
	7								
	8								
	9								
	10								
Sample Information:									
0900	S1 42.30	4	12.51	11.3	2110	17	1.42	-211	clear
	S2		12.50	11.5	2180	17.3	1.36	-210	clear

REMARKS:

Note: All water level measurements are in feet, distance from top of riser.

Volume Calculation

Diam.	Vol (g/ft)
1"	0.041
2"	0.163
4"	0.653
6"	1.469

Stabilization Criteria

Parameter	Criteria
pH	± 0.1 unit
SC	± 3%
Turbidity	± 10%
DO	± 0.3 mg/L
ORP	± 10 mV

PREPARED BY:

ROUX

GROUNDWATER FIELD FORM

Project Name: Tremont Humic Gwm
Location:
Project No.:
Date: 1/15/25
Field Team: NLD JAS

Well No. MW 106			Diameter (inches): 2"			Sample Date / Time: 1/15/25			
Product Depth (fbTOR):			Water Column (ft):			DTW when sampled:			
DTW (static) (fbTOR): 38.11			One Well Volume (gal): 0.3			Purpose: ☐ Development ☐ Sample ☑ Purge & Sample			
Total Depth (fbTOR): 42.15			Total Volume Purged (gal):			Purge Method: Low Flow			
Time	Water Level (fbTOR)	Acc. Volume (gallons)	pH (units)	Temp. (deg. C)	SC (uS)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor
1403	0 Initial		11.21	10	3084	1/4	2.75	+10	clear
1414	1 38.41		11.13	10.4	6514		—	+13	clear
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	10								
Sample Information:									
1410	S1 39.03	1.50	11.38	10.5	4119	12	1.39	-45	clear
	S2		11.41	10.4	4111	12	1.33	-46	" "

Well No. MW 107			Diameter (inches): 2"			Sample Date / Time: 1/15/25			
Product Depth (fbTOR):			Water Column (ft):			DTW when sampled:			
DTW (static) (fbTOR): 37.12			One Well Volume (gal):			Purpose: ☐ Development ☐ Sample ☑ Purge & Sample			
Total Depth (fbTOR): ~~41.35~~ 45.35			Total Volume Purged (gal):			Purge Method: Low Flow			
Time	Water Level (fbTOR)	Acc. Volume (gallons)	pH (units)	Temp. (deg. C)	SC (uS)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor
1023	0 Initial		9.11	9.2	3020	17.4	3.43	+83	clear
1034	1 37.24	2	8.59	8.7	2902	12.6	2.95	+71	" "
	2	4	8.53	8.6	2936	9.72	1.38	-156	clear
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	10								
Sample Information:									
1045	S1 37.51	4	8.63	8.2	2913	6.35	1.42	-107	clear
	S2	1	8.72	8.2	2910	6.11	1.41	-111	clear

REMARKS:

Note: All water level measurements are in feet, distance from top of riser.

Volume Calculation

Diam.	Vol. (g/ft)
1"	0.041
2"	0.163
4"	0.653
6"	1.469

Stabilization Criteria

Parameter	Criteria
pH	± 0.1 unit
SC	± 3%
Turbidity	± 10%
DO	± 0.3 mg/L
ORP	± 10 mV

PREPARED BY:

OU-03 ATP SWMU GROUP

ROUX

GROUNDWATER FIELD FORM

Project Name: ATP Tecumseh
Location: Lakeview Project No.: Date: 4/22/25
Field Team: MTF / TAD / GAF

Well No. MW-18A			Diameter (inches): 2"			Sample Date / Time: 4/22/25 1228			
Product Depth (fbTOR): –			Water Column (ft): 6.70			DTW when sampled: 25.5			
DTW (static) (fbTOR): 22.8			One Well Volume (gal): 1.09			Purpose: ☐ Development ☐ Sample ☒ Purge & Sample			
Total Depth (fbTOR): 30.18			Total Volume Purged (gal): 3.5			Purge Method: Low Flow			
Time	Water Level (fbTOR)	Acc. Volume (gallons)	pH (units)	Temp. (deg. C)	SC (uS)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor
1109	0 Initial	0	8.8	13.9	2800	218	[illegible]	4	Cloudy, sulfur odor
1112	1 26.21	2	9.55	12.7	2513	13	1.58	13	Clear, sulfur odor
1115	2 26.64	2.5	9.51	13.2	2622	18.7	2.26	4	Clear, slight odor
1118	3 27.7	2.5	9.38	13.2	2699	11.4	1.67	32	↓
1122	4 TOP 27.98	3	9.24	13.6	2757	17.8	2.26	55	↓
1127	5 DRY	3.5	9.12	14.1	2792	18.5	2.67	26	Clear, sulfur odor
	6				[illegible]				
	7								
	8								
	9								
	10								
Sample Information:									
1228	S1 25.5	–	6.53	14.0	2940	47.9	0.96	-56	Clear, sulfur odor
1233	S2 TOP 27.98	–	8.19	13.6	2813	35.5	1.83	-111	↓

Well No. MW-18C			Diameter (inches): 2"			Sample Date / Time: 4/22/25 1217			
Product Depth (fbTOR):			Water Column (ft): 16.4			DTW when sampled: 29.1			
DTW (static) (fbTOR): 21.6			One Well Volume (gal): 2.68			Purpose: ☐ Development ☐ Sample ☒ Purge & Sample			
Total Depth (fbTOR): 38.08			Total Volume Purged (gal): 3.75			Purge Method: Low Flow			
Time	Water Level (fbTOR)	Acc. Volume (gallons)	pH (units)	Temp. (deg. C)	SC (uS)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor
1149	0 Initial	0	6.83	14.6	3547	>1000	0.43	-102	Cloudy, sulfur odor
1153	1 25.35	1	6.39	13.9	3853	>1000	1.28	-101	↓
1156	2 25.81	1.25	6.05	13.7	4300	>1000	1.73	-87	↓ (Getting less cloudy)
1201	3 26	1.5	5.38	13.7	5436	>1000	1.62	-49	↓
1204	4 26.3	1.5	4.74	13.5	7156	257	1.21	-9	↓
1207	5 27.73	2	5.55	13.9	4752	229		-56	↓
1211	6 28.78	2.25	5.06	13.5	5786	298	1.68	-45	↓
1213	7 28.85	2.5	5.16	13.6	5163	233	0.57	-48	↓
	8 [illegible]	[illegible]							
	9								
	10								
Sample Information:									
1217	S1 29.15	2.75	4.78	13.5	6182	254	0.60	-39	Cloudy, sulfur odor
1222	S2 30.1 ↑ TOP	3.25	5.12	13.7	5270	262	0.73	-45	↓

REMARKS:

Note: All water level measurements are in feet, distance from top of riser.

Volume Calculation

Diam.	Vol. (g/ft)
1"	0.041
2"	0.163
4"	0.653
6"	1.469

Stabilization Criteria

Parameter	Criteria
pH	± 0.1 unit
SC	± 3%
Turbidity	± 10%
DO	± 0.3 mg/L
ORP	± 10 mV

PREPARED BY: TAB

ROUX

GROUNDWATER FIELD FORM

Project Name: ATP, Tecumseh — Date: 4/22/25

Location: Lincoln — Project No.: — Field Team: TAB/ MFF

Well No. MWS-20A			Diameter (inches): 2"			Sample Date / Time: 4/22/25 955			
Product Depth (fbTOR): –			Water Column (ft): 5.46			DTW when sampled: 17.16			
DTW (static) (fbTOR): 16.82			One Well Volume (gal): 0.88			Purpose: ☐ Development ☐ Sample ☒ Purge & Sample			
Total Depth (fbTOR): 22.28			Total Volume Purged (gal): 4.5			Purge Method: Low Flow			
Time	Water Level (fbTOR)	Acc. Volume (gallons)	pH (units)	Temp. (deg. C)	SC (uS)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor
935 ~~17.09~~	0 Initial	0	7.95	13.5	1385	~~4545.0~~	4.32	197	clear No odor
944	1 17.04	1.25	8.55	11.3	919.4	12.6	4.83	186	" "
946	2 17.16	1.75	9.10	11.1	880.9	12.7	4.96	185	" "
948	3 17.16	2.25	9.28	11.0	895.7	9.06	4.25	186	" "
951	4 17.16	3.25	9.33	11.1	852.9	10.1	4.29	186	" "
955	5 17.16	4.0	9.37	11.0	877.0	4.85	4.22	187	" "
	6								
	7								
	8								
	9								
	10								
Sample Information:									
955	S1 17.16	4.5	9.38	11.5	867.7	4.50	4.55	189	" "
1005	S2 17.16	5.0	9.35	11.5	890.9	4.83	5.52	197	" "

Well No. MWS-20B			Diameter (inches): 2"			Sample Date / Time: 4/22/25			
Product Depth (fbTOR): –			Water Column (ft): 13.16			DTW when sampled: 17.69			
DTW (static) (fbTOR): 17.5			One Well Volume (gal): 2.14			Purpose: ☐ Development ☐ Sample ☒ Purge & Sample			
Total Depth (fbTOR): 30.66			Total Volume Purged (gal): 3.50			Purge Method: Low Flow			
Time	Water Level (fbTOR)	Acc. Volume (gallons)	pH (units)	Temp. (deg. C)	SC (uS)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor
1016	0 Initial	0	6.89	12.1	2260	>1000	3.67	48	Sl. N. odor
1019	1 17.77	1.0	7.05	13.1	1083	111	2.25	-49	" "
1021	2 17.72	1.50	7.33	13.4	1050	25.3	2.11	-44	clear "
1024	3 17.77	2.0	7.46	13.4	1020	15.5	1.93	-28	clear "
1027	4 17.72	2.50	7.58	12.9	1103	10.4	2.29	-21	clear "
1031	5 17.72	3.00	7.59	13.3	1124	9.31	2.27	-14	clear "
	6								
	7								
	8								
	9								
	10								
Sample Information:									
1035	S1 17.69	3.50	7.64	13.3	1174	7.18	1.70	-1	" "
1042	S2 17.69	4.0	7.65	13.2	1173	7.15	1.74	-7	" "

REMARKS:

Note: All water level measurements are in feet, distance from top of riser.

Volume Calculation

Diam.	Vol. (g/ft)
1"	0.041
2"	0.163
4"	0.653
6"	1.469

Stabilization Criteria

Parameter	Criteria
pH	± 0.1 unit
SC	± 3%
Turbidity	± 10%
DO	± 0.3 mg/L
ORP	± 10 mV

PREPARED BY: TAB

OU-04 BENZOL YARD & COKE BY-PRODUCTS SWMU SUB-AREA GROUNDWATER

ROUX

GROUNDWATER FIELD FORM

Project Name: OU4 GMW Tecumseh
Location: Lackawanna Project No.: Date: 4/23/25
Field Team: TAB/MTF/GAF

Well No. OU4 PZ-9 | Diameter (inches): 2" | Sample Date / Time: 4/28/25
Product Depth (fbTOR): | Water Column (ft): 1.30 | DTW when sampled: 16.34
DTW (static) (fbTOR): 16.31 | One Well Volume (gal): .21 | Purpose: ☐ Development ☐ Sample ☒ Purge & Sample
Total Depth (fbTOR): 17.67 | Total Volume Purged (gal): 0.25 | Purge Method: Bailer

	Time		Water Level (fbTOR)	Acc. Volume (gallons)	pH (units)	Temp. (deg. C)	SC (uS)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor
4/23	1120	0	Initial	0	11.62	14.2	1247	17.4	7.26	-2	Clear, no odor
	1125	1	DRY	.25	11.54	13.7	1252	[illegible]	[illegible]883	1	↓
		2	[illegible]					8.26			
		3									
		4									
		5									
		6									
		7									
		8									
		9									
		10									
4/28	**Sample Information:** 1634 not enough volume for post										
	0908	S1	16.[illegible]	0							
	0915	S2	16.34	0.3	11.85	13.1	1427	[illegible]	7.54	156	Clear, p odor

6088

Well No. OU4 PZ-12 | Diameter (inches): 2" | Sample Date / Time: 4/23/25 1150
Product Depth (fbTOR): | Water Column (ft): 6.33 | DTW when sampled: 13.5
DTW (static) (fbTOR): 12.94 | One Well Volume (gal): 1.03 | Purpose: ☐ Development ☐ Sample ☒ Purge & Sample
Total Depth (fbTOR): 19.27 | Total Volume Purged (gal): 3.5 | Purge Method: Low Flow

Time		Water Level (fbTOR)	Acc. Volume (gallons)	pH (units)	Temp. (deg. C)	SC (uS)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor
1140	0	Initial	0	7.68	16.2	1487	>1000	0.61	-147	Black, strong petroleum odor
1142	1	13.4	1	7.04	14.6	1545	>1000	0.84	-136	↓
1143	2	13.5	1.25	6.92	14.3	1556	>1000	0.51	-130	↓
1145	3	13.6	2	6.84	14.2	1549	>1000	1.69	-117	↓
1148	4	13.5	3	6.80	15.3	1549	826	0.97	-116	Cloudy, strong odor
1149	5	13.5	3.25	6.78	16.0	1544	328	1.06	-115	↓
	6									
	7									
	8									
	9									
	10									
Sample Information:										
1150	S1	13.5	3.5	6.77	14.5	1549	268	1.22	-109	Cloudy, strong odor
1152	S2	13.5	4	6.82	14.5	1551	233	1.95	-101	↓

REMARKS:

Note: All water level measurements are in feet, distance from top of riser.

Volume Calculation

Diam.	Vol. (g/ft)
1"	0.041
2"	0.163
4"	0.653
6"	1.469

Stabilization Criteria

Parameter	Criteria
pH	± 0.1 unit
SC	± 3%
Turbidity	± 10%
DO	± 0.3 mg/L
ORP	± 10 mV

PREPARED BY: TAB

ROUX

GROUNDWATER FIELD FORM

Project Name: OU4 GMW Tecumseh
Location: Lackawanna
Project No.:
Date: 4/25/25
Field Team: TAB/GAF

Well No. MWN 72AR | Diameter (inches): 2" | Sample Date / Time: 4/25/25 1036
Product Depth (fbTOR): | Water Column (ft): 9.23 | DTW when sampled: 10.69
DTW (static) (fbTOR): 9.14 | One Well Volume (gal): 1.50 | Purpose: ☐ Development ☐ Sample ☒ Purge & Sample
Total Depth (fbTOR): 18.37 | Total Volume Purged (gal): 3 | Purge Method: Low Flow

Time		Water Level (fbTOR)	Acc. Volume (gallons)	pH (units)	Temp. (deg. C)	SC (uS)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor
1023	0	Initial	0	6.25	15.3	1951	>1000	1.39	30	Black, petroleum odor
1026	1	10.64	0.75	6.60	14.8	1645	263	2.27	-28	Cloudy, petroleum odor
1028	2	10.61	1.75	6.72	13.6	1456	46.9	1.79	-54	Clear, petroleum odor
1031	3	10.61	2	6.81	12.3	1352	11.4	1.27	-66	↓
1034	4	10.67	2.5	6.85	12.0	1304	7.53	1.66	-74	↓
1035	5	10.67	2.75	6.88	11.5	1264	4.34	1.45	-77	↓
	6									
	7									
	8									
	9									
	10									
Sample Information:										
1036	S1	10.69	3	6.88	11.1	1260	9.74	2.10	-83	Clear, petroleum odor
1042	S2	10.71	3.75	6.98	11.2	1230	6.68	2.53	-75	↓

Well No. MWN 34A | Diameter (inches): 2" | Sample Date / Time: 4/25/25 1126
Product Depth (fbTOR): | Water Column (ft): 9.12 | DTW when sampled: 16.90
DTW (static) (fbTOR): 11.98 | One Well Volume (gal): 1.49 | Purpose: ☐ Development ☐ Sample ☒ Purge & Sample
Total Depth (fbTOR): 21.10 | Total Volume Purged (gal): 1.75 | Purge Method: Low Flow

Time		Water Level (fbTOR)	Acc. Volume (gallons)	pH (units)	Temp. (deg. C)	SC (uS)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor
1112	0	Initial	0	7.51	12.7	658.5	423	4.33	14	Cloudy, sulfur odor
1114	1	13.60	0.5	7.28	12.1	653.7	84	4.62	24	Clear, sulfur odor
1117	2	14.31	0.75	7.23	11.7	652.3	53.3	4.12	37	↓
1121	3	15.16	1.25	7.13	11.3	651.0	53.1	3.71	48	↓
1123	4	16.05	1.5	7.22	11.4	649.0	21.4	3.93	55	↓
[redacted]	5	[redacted]	[redacted]			[redacted]				↓
	6									
	7									
	8									
	9									
	10									
Sample Information:										
1126	S1	16.90	1.75	7.18	11.5	650.3	14.9	4.28	61	Clear, sulfur odor
1134	S2	17.50	2.25	7.35	11.5	665.7	14.9	[redacted]	74	↓

REMARKS: Sheen on water from 74AR

Note: All water level measurements are in feet, distance from top of riser.

Volume Calculation

Diam.	Vol. (g/ft)
1"	0.041
2"	0.163
4"	0.653
6"	1.469

Stabilization Criteria

Parameter	Criteria
pH	± 0.1 unit
SC	± 3%
Turbidity	± 10%
DO	± 0.3 mg/L
ORP	± 10 mV

PREPARED BY:

ATTACHMENT C

PHOTOGRAPHS

HWMUs

Eastward view of temporary cover on HWMU-1B (SWMU S-16) and purging/sampling at well MW-1D1.

View (from left to right) of water level indicator tape, submersible pump power cord, and dedicated pump tubing in well MW-1D1 during purging/sampling.

Filling VOC sample vial from end of pump tubing at well MW-1D1.

12-volt electric submersible sampling pump.

View of submersible pump 12-volt deep cycle battery and low-flow controller box (left). View of instruments used to record field parameters (right).

Installing submersible pump and tubing into well MW-1D7 (left). Measuring depth to water and bottom in MW-1D7 (right).

Southward view of HWMU 1A (SWMU S-13).

Southeastward view of north side of HWMU 1A (SWMU S-13) showing grassy cover and warning signage.

OU-03 ATP SWMU GROUP

Well MWS-20B (left) and instruments used to record field parameters (right).

Well MWS-18A (left; showing power cord from dedicated submersible pump at wellhead) and well MWS-18C (right; no dedicated submersible pump).

DI Water and Alconox Powder used for decontaminating the non-dedicated submersible pump (left). Tom Behrendt decontaminating the non-dedicated submersible pump over a 5-gallon pail (right).

Pouring collected purge water into a 55-gallon drum for transport to the ATP Pretreatment System for processing. Grassy ATP-ECM containment cell in background.

OU-04 BENZOL YARD & COKE BY-PRODUCTS SWMU SUB-AREA GROUNDWATER

Northward view of piezometer PZ-9 on west side of Coke By-Products area.

Collecting sample with a bailer at piezometer PZ-9 (left). Installing new dedicated clear PVC tubing in well MWN-72AR (right).

Collecting sample from end of pump tubing at well MWN-72AR (left). Measuring field parameters at well MWN-72AR; in background, Tom is pulling non-dedicated submersible pump from MWN-72AR (right).

Purging at well MWN-34A (left). Groundwater Purging/Sampling Field Form (right).