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September 23, 2019 Project Reference #18687

Mr. Thomas Wentland and Mr. Lee Delcore
Wisconsin Department of Natural Resources
1155 Pilgrim Rd, PO Box 408
Plymouth, WI 53073-0408

RE: Work Plan for Groundwater Sampling and Site Restoration
Former Moss-American Facility
8716 N. Granville Rd, Milwaukee, WI

Dear Mr. Wentland and Mr. Delcore:

The Sigma Group, Inc. (Sigma) is pleased to present this Work Plan to implement the groundwater sampling and site restoration at the above-referenced property (hereinafter "the site") as directed in the Scope of Work prepared by the Wisconsin Department of Natural Resources (WDNR) in August 2019. This Work Plan details the activities set forth in the Scope of Work which are intended to prepare the site for regulatory case closure and meet the conditions of the Record of Decision (ROD) issued by the United States Environmental Protection Agency (USEPA). While an estimated project cost and tentative schedule was submitted in Sigma's Proposal dated August 9, 2019, this Work Plan details activities and a proposed schedule of work to meet the site closure goals.

BACKGROUND

Site Location: The former Moss-American facility is located south of W. Brown Deer Rd. between N. 91st St. and N. 107th St. The site is located in the northwest ¼ of the northwest ¼ of Section 8, Township 8 North, Range 21 East, Milwaukee County. Specifically, the former Moss-American facility is located in the northwestern section of the City of Milwaukee east of the intersection of N. 107th St. and N. Granville Rd, at 8716 N. Granville Road. The 88-acre site includes the former location of the Moss-American creosoting facility, several miles of the Little Menomonee River - a portion of which flows through the eastern half of the site - and adjacent flood plain soils. After creosote operations ceased, approximately 23-acres of the site were purchased by the Union Pacific Railroad for loading and storage. The remaining area of approximately 65-acres of land is undeveloped Milwaukee County park land. A Site Map is included as **Figure 1**.

Brief Site History: Creosote operations were conducted at the former Moss American facility from approximately 1921 to 1976, and waste products were discharged to settling ponds which in turn discharged to the Little Menomonee River adjacent to the site. Contaminated soil, groundwater, and sediment were found within the facility and downstream along the river for several miles. In 1983, the facility was proposed for inclusion on the National Priorities List (NPL) pursuant to Section 105 of CERCLA

(Comprehensive Environmental Response, Compensation, and Liability Act) due to soil and groundwater contamination resulting from the creosote operations. Subsequent site investigations conducted by the USEPA in late 1980s identified the presence of free product liquids associated with site groundwater, and soil contamination. Most of the site soil contamination was associated with former creosote processing areas. Relatively high concentrations of petroleum-related constituents including polycyclic aromatic hydrocarbons (PAHs) as well as benzene, toluene, ethylbenzene and xylenes (BTEX) were detected in the upper 10 feet of site soil. Shallow groundwater was also identified with relatively high petroleum impacts (PAHs and BTEX) no deeper than 20 feet below ground surface (bgs). River sediments were also identified with petroleum impacts.

In accordance with the ROD (1990) and ROD Amendment (1998), two rounds of remedial activities have been completed on site. The first round of remedial activities was conducted in the early 2000's and led by the USEPA. Remedial activities included:

- excavation of highly contaminated soils and on-site treatment;
- on-site placement of the treated and lower contaminated soils under an appropriate cover
- re-vegetation of the excavated areas;
- removal and off-site disposal of highly contaminated sediments from sections of the Little Menomonee River;
- construction of a new channel and redirection of river flow into the new channel; and,
- a groundwater remedy consisting of a funnel-and-gate system with in-situ aerobic treatment of the contaminated groundwater prior to its flow to the river.

The second round of remedial activities was conducted in 2017-2018 and led by the WDNR. Remedial activities included:

- excavation of soils contaminated with free product and disposal at a hazardous waste landfill; and,
- In situ treatment of contaminated soils with a chemical oxidant.

At this point in the site history, pending the results of the planned groundwater monitoring, a case closure request may be appropriate.

Project Team: The project team is as follows:

Client:
Wisconsin DNR
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Plymouth, WI 53073-0408
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Analytical Laboratory:
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Sheetpile Removal, Concrete Asphalt Pad Removal, Grading
Underground Power Corporation
4451 S. 27th St.
Franksville, WI 53126
Telephone: (262) 835-9500

Gate Supply and Installation
Northway Fence
N57 W13250 Shenandoah Drive, Suite 200
Menomonee Falls, WI 53051
Telephone: (262) 781-7382

WORK PLAN

The Work Plan activities are detailed below by Task. The tasks as stated in the Scope of Work are listed in italics, followed by specific details.

Task 1 - Groundwater Monitoring Well Installation

During the 2017-2018 active remediation, multiple groundwater monitoring wells were abandoned in areas that were excavated. Some of those monitoring wells will need to be replaced to evaluate remedial effectiveness. The scope and budget estimate shall be based on the installation of up to seven NR 141 compliant groundwater monitoring wells to a depth of up to 20 feet bgs each. The cost should account for investigative waste determination efforts and disposal. Hazardous wastes must be handled through the State's Hazardous Waste Contractor, Veolia Environmental Services and include no more than a 10% oversight markup.

- Monitoring well installation - Seven ch. NR 141 compliant groundwater monitoring wells will be installed. The location of the groundwater monitoring wells will be selected at the direction of WDNR. The boreholes will be blind drilled to the selected depth using standard hollow stem auger drilling methods. Each well will be constructed of 2-in diameter, 10-ft long PVC screen set at a depth of a maximum of 20 feet bgs and completed with a 2-inch diameter PVC riser and stick-up with protective casing. Soil boring and monitoring well construction logs will be completed in accordance with ch. NR 141. Sigma's Standard Operating Procedures (SOP) #03 and #08, included in **Attachment 1**, will be followed as applicable.

- Elevation and Location Survey – Following completion of well installation activities, an engineering survey will be performed to establish the location and elevation of the newly installed wells.

- Well Development – Following the requirements of ch. NR 141, and as described in Sigma's SOP #9, the newly installed monitoring wells/piezometers will be developed prior to groundwater sampling to ensure hydraulic connection with the saturated medium. The groundwater generated during the well development process will be contained in 55-gallon drums for disposal as hazardous waste by Veolia North America, as described in Sigma' SOP #27.

- Investigative Waste - Drill cuttings will be contained in drums. Waste characterization will be performed, and cuttings will be disposed accordingly, as described in Sigma's SOP #27, included in **Attachment 1**.

Task 2- Quarterly Groundwater Performance Monitoring, Well Maintenance and Reporting (8 events)

As of August 2018, 49 groundwater monitoring points remain and include 29 site monitoring wells, 9 site piezometers, and 11 monitoring wells within the remedial reaches of the river restoration. With six additional monitoring wells being installed and one damaged point to be abandoned and replaced, the total number of sampling points within the monitoring network will be 55. The budget estimate should be based on a per well amount for all costs associated with sampling and laboratory analysis for:

- *BTEX (benzene, toluene, ethylbenzene, & xylene)*
- *PAHS (acenaphthylene, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzoo(a, h)anthracene, fluorene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene*
- *field parameters. (groundwater elevation, pH, temperature, turbidity, specific conductance, oxidation-reduction potential, dissolved oxygen)*

Data for each groundwater monitoring event shall be summarized, tabulated and submitted to the WDNR within 30 days of receipt of the results from the laboratory. All monitoring wells should be inspected at the time of sampling and their condition included in the report with recommendations for any necessary maintenance or repair work. The report should also include recommendations related to sampling frequency, if quarterly monitoring is not warranted for all 55 monitoring points, based on the laboratory results.

The cost should account for investigative waste determination efforts and disposal. Hazardous wastes must be handled through the State's Hazardous Waste Contractor, Veolia Environmental Services, and include no more than a 10% oversight markup.

- Groundwater Monitoring – Sigma plans to complete eight rounds of groundwater sampling events. Groundwater monitoring will include water level measurements and the collection of field parameters including dissolved oxygen, reduction-oxidation potential, pH, temperature, turbidity, and specific conductance. Groundwater samples will be collected and submitted for laboratory analysis of BTEX and PAH (EPA Method 8260 and 8270SIM, respectively). Groundwater

samples will be collected following Sigma's SOPs #10, #11, #12, and #26 in **Attachment 1**.

- Sampling Point Inspection – Sampling points will be inspected, and maintenance activities completed as directed by the WDNR.

- Investigative Waste – Purge water generated during sampling will be disposed as hazardous waste by Veolia North America.

- Quarterly Report – Following completion of the groundwater monitoring field activities and receipt of the laboratory reports the site data will be summarized, tabulated, and evaluated, including a report on well condition. As the first rounds of data are collected, Sigma will evaluate the consistency of data with historic results and may make recommendations to reduce the frequency of monitoring.

Task 3 - Railroad Property Excavation and Restoration

The area to be excavated and restored on the railroad property covers approximately 3.2 acres and is a rectangular piece of land, 700 by 200 feet on the eastern boundary of the railroad property adjacent to the Milwaukee County Parks property. Excavation and restoration will consist of:

a. *Removal, transportation and disposal/recycling of two concrete slabs used in the original site remediation work performed by Kerr McGee/Tronox,*
b. *Removal, transportation and disposal/recycling of one asphalt pad used by Kerr McGee/Tronox during the original site remediation and used again during the 2017-2018 groundwater optimization as a staging area for contractor equipment and a truck scale,*
c. *Approximately 180 linear feet of sheet piling is to be cut-off a minimum of two feet below ground surface. The budget estimate for this work item should be based on a per linear foot basis for cutting, removal, dry-scraping, brushing, transportation, and disposal/recycling.*
d. *Grading areas of removed slabs and sheet pile.*

- Sigma plans to coordinate and supervise the completion of these restoration activities as stated in the Scope of Work. It is important to note that excavation and grading work will be phased to maintain the access road for use during groundwater monitoring activities throughout the sampling period.

Task 4 - Sampling to Support Development of Institutional Controls and Continuing Obligations

Development of institutional controls (ICs) and continuing obligations (COs) will be a cooperative effort between the WDNR and EPA. The existing deed instruments will be reviewed to determine continued applicability. Any data-gaps, particularly in the near-surface direct contact zone, may require limited soil sampling to define the necessary extent of the cap. For budget estimation purposes, provide per foot costs for advancement,

sampling, and abandonment of up to 30 soil borings to a depth of 4 feet bgs. Also provide a cost for laboratory analysis (BTEX and PAHs), tabulation and reporting of the results. The cost should account for the investigative waste determination efforts and disposal. Hazardous wastes must be handled through the State's Hazardous Waste Contractor, Veolia Environmental Services and include no more than a 10% oversight markup.

- Sigma will work with the WDNR project manager to identify the appropriate location of soil sampling. Once the locations are selected, Sigma plans to advance the soil borings using Geoprobe direct push methods. Soil boring, soil sampling, and investigative waste disposal are detailed in Sigma's SOPs #03, #04, #05, #15, #26, and #27 in **Attachment 1**.

Task 5 - Summary Report and Closure Packet Preparation
The case file for this site is extensive. It is anticipated that the site will close in the future with ICs and/or COs. Prepare a summary report of all activity associated with this scope of work, and if deemed warranted and directed by the WDNR, prepare a closure packet per NR 726 Wis. Admin. Code.

- Sigma plans to complete the following items for this task:
    - File review- File review will in part aid the planning of the location of the shallow soil borings discussed in Task 4, as well as aid the preparation of summary and case closure report documents.
    - Summary Report – Sigma will prepare a summary report as stated in the Scope of Work.
    - Closure Report – Sigma can prepare a closure packet as stated in the Scope of Work, if directed by the WDNR.
    - Monitoring well abandonment – Sigma will abandon some or all of the groundwater monitoring wells, as directed by the WDNR. Monitoring well abandonment will be performed in accordance with ch. NR 141 and Sigma's SOP #15 (**Attachment 1**) and likely occur following the WDNR granting of case closure.

Task 6 - Remedial System Sheet Piling Removal and Disposal Activities
Approximately 1,200 linear feet of sheet piling (Figure 1) is to be cut-off a minimum of two feet below the ground surface. The budget estimate for this work item should be on a per linear foot basis for cutting, removal, dry-scraping, brushing, transportation, and disposal/recycling of 1,200 linear feet of sheet pile. The sheet pile removal areas are to be filled and graded to match surrounding ground surface.

- Sigma plans to coordinate and supervise the completion of these restoration activities as stated in the Scope of Work. Grading will be phased to maintain access to groundwater monitoring wells throughout the sampling activities.

Task 7 - Provide and Install 3 Access Gates: 2-16' Barrier Gates & 1-30' Double Leaf
Three gates will be installed to control access to areas disrupted by the site activities. Gate specifications are provided in Attachment A. The budget estimate should be based on site prep, gate purchase and installation. The location of the gates is planned as follows:

Gate 1 - This gate will control access to Milwaukee County Park property northeast of the source area. It will be located at the western end of West Heather Avenue (See Figure 2). The green star marks the planned gate location.

Gate 2 - This gate will be located near the intersection of Bradley Road and 91st Street and control access to what was used as the main staging area for equipment and office trailers during the Kerr McGee/Tronox phase of the project (See Figure 3). The green star marks the proposed gate location.

Gate 3 - This gate will be located on Calumet Road near the Little Menomonee River and a historic haul road. (See Figure 4). The gate is intended to limit access for illegal dumping. The green star marks the proposed gate location.

- Sigma plans to coordinate the completion of the gate installation as stated in the Scope of Work. The subcontractor Northway Fence will provide and install the gates similar to the type of gate specified in the Scope of Work.

Task 8 - Debris Clean-up of 4.5 Acres
The 4.5-acre parcel is in the NE corner of the former source area, on the north side of the river (Figure 2). The area was used for staging soil and gravel during the initial remediation phase. Clean-up will include removal and proper disposal of waste and debris that has accumulated at the location. For budget estimation, calculate the volume to be removed and provide a unit cost for disposal at a licensed facility.

- Sigma plans to coordinate and supervise the loading and hauling of the debris and waste present within this parcel. It is assumed that all the waste materials generated during the removal process are non-hazardous and will be managed accordingly.

Task 9 - Preparation for Restoration of Calumet Haul Road Removal Site, Shallow Wetland Scrape
Plans for restoration of the Calumet Haul Road includes performing a shallow wetland scrape (Figure 4). Conceptually, the southern 500 feet of the former haul road base will be removed to discourage illegal and ecologically damaging activities. To prepare for this activity, provide a cost estimate to evaluate the depth and nature of the road bed materials along that stretch.

- Sigma plans to complete this activity concurrently with the shallow soil borings, using a Geoprobe direct push machine to determine the depth of road bed materials.

PROJECT SCHEDULE

Sigma has prepared a Proposed Project Schedule, included as **Table 1**. The schedule is detailed by task below. Sigma will maintain frequent communication with WDNR to inform WDNR of the project schedule.

- Task 1: Groundwater Monitoring Well Installation - The groundwater monitoring well installation is currently scheduled for September 24-25, 2019.

- Task 2: Quarterly Groundwater Performance Monitoring, Well Maintenance and Reporting- The first quarterly round of groundwater monitoring is currently scheduled for September 30, 2019 and is estimated to take 2 weeks. Sigma plans to submit the first quarterly Groundwater Monitoring & Well Maintenance Report within four weeks of receipt of laboratory results.

- Task 3: Railroad Property Excavation and Restoration – The concrete and asphalt pads and sheet piling removal is scheduled for fall 2019. The site grading is scheduled for June 2021, in order to maintain site access for groundwater sampling activities. Ideally, site grading will be completed after groundwater sampling is completed, and after the determination of the necessity of any direct contact soil cap.

- Task 4: Sampling to Support Development of Institutional Controls and Continuing Obligations – The shallow soil sampling will be performed after completion of the following activities: a) sheet piling removal activities; b) receipt of the initial groundwater monitoring laboratory results; c) review of existing shallow soil analytical results; and d) identification of suitable locations for sampling to fill the data gap.

- Task 5: Summary Report and Closure Packet Preparation – File review will begin this fall/winter. Following completion of groundwater and soil sampling activities, and site restoration activities, a summary report will be prepared. Future potential work, depending on direction from WDNR, includes submittal of a request for regulatory case closure and the abandonment of some or all of the groundwater monitoring wells.

- Task 6: Remedial System Sheet Piling Removal and Disposal Activities – Sheet piling removal and grading of sheet pile removal areas are scheduled for fall 2019.

- Task 7: Provide and Install 3 Access Gates: 2-16′ Barrier Gates & 1-30′ Double Leaf– Gate installation will be scheduled following the completion of Task 8, Debris Clean-up of 4.5 acres.

- Task 8: Debris Clean-up of 4.5 Acres – Debris clean up will be scheduled as soon as possible pending contractor availability. Because this task is not necessarily weather dependent, it may be scheduled in late fall/winter 2019/2020.

- Task 9: Preparation for Restoration of Calumet Haul Road Removal Site, Shallow Wetland Scrape – An evaluation of roadbed materials will be scheduled concurrently with Task 4, sampling shallow soil for a potential direct cap within the site.

Sigma is pleased to begin work on the project and to assist the WDNR in the goal of accomplishing regulatory closure on this historic contaminated site. Please feel free to contact the undersigned should you have any questions or wish to discuss the work.

Sincerely,

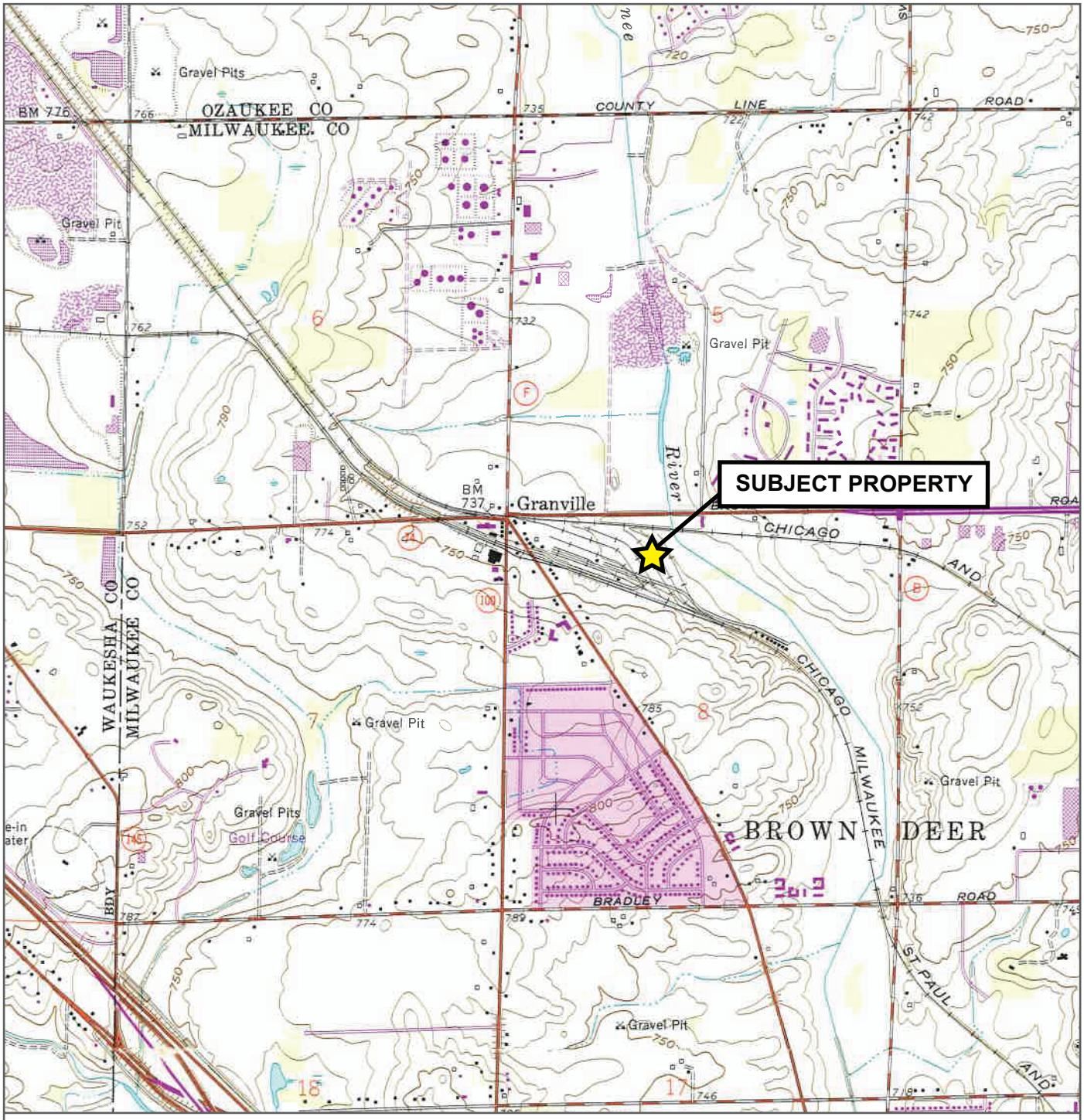
THE SIGMA GROUP, INC.

Andrea Lorenz
Project Engineer

Mafizul Islam, P.E.
Project Manager

Attachments:

Figure 1	Site Map
Table 1	Proposed Project Schedule
Attachment 1	Select Sigma Standard Operating Procedures



N

Scale 1 : 24,000
1 inch = 2,000 feet

Located in the Northwest 1/4 of Section 8, T8N, R21E
USGS Menomonee Falls Quadrangle (1958, photorevised 1971 and 1976)
7.5 minute, 1 : 24,000 Topographic Map Collection

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SITE LOCATION MAP

MOSS-AMERICAN SITE
8716 N. GRANDVILLE ROAD
MILWAUKEE, WISCONSIN

FIGURE
1

Project: 13701 | Directory: Figures | Filename: 13701_Fig 1_SLM | Created By: SLO | Date: 03/26/2013

Table 1
Project Schedule
Moss American Groundwater Sampling and Site Restoration
Milwaukee, Wisconsin
September 2019

Years 1 and 2 from Table 2	*Year 1*												*Year 2*											
Calendar Year	2019				2020														2021					
Calendar Month	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
Draft and Final Workplan	X																					
1. Groundwater Monitoring Well Installation	X																					
2a. Quarterly Groundwater Monitoring & Well Maintenance	X			X			X			X			X			X			X			X
2b. Quarterly Groundwater Monitoring & Well Maintenance Report	X			X			X			X			X			X			X			X
3a. Removal, transportation and disposal/recycling of two concrete slabs	X	X	X																			
3b. Removal, transportation and disposal/recycling of one asphalt pad	X	X	X																			
3c. Cutting, removal, dry-scraping, brushing, transportation and disposal/recycling of approximately 180 linear feet of sheet piling	X	X	X																			
3d. Grading areas of removed slabs and sheet pile																						X
4a. Development of ICs and COs		X											X									
4b. Advancement, sampling, and abandonment of up to 30 soil borings to a depth of 4 feet bgs			X																			
4c. Laboratory analysis (BTEX and PAHs)			X																			
4d. Tabulation and Reporting of Results				X									X									
5a. Final Report Preparation		X							X													X
5b. Closure Packet Preparation		X							X	X											X	X
6a. Removal, dry-scraping, brushing, transportation and disposal/recycling of 1,200 linear feet of sheet pile	X	X	X																			
6b. Grading	X	X	X																			
7. Access Gate site prep, gate purchase and installation	X	X	X																			
8a. Removal of waste and debris	X	X	X																			
8b. Transport and Disposal of waste and debris	X	X	X																			
9. Preparation for Restoration of Calumet Haul Road Removal Site, Shallow Wetland Scrape			X																			

ATTACHMENT 1

Select Sigma Standard Operating Procedures

SOP 3: Completion of Soil Borings

Hollow Stem Auger Drilling

Hollow stem augers and steel split-spoon samplers will be used to drill and sample select soil locations. The drilling activities will be completed in general accordance with ASTM standards: D420-87, D1452-80, and D-1586-84. All equipment that may come in contact with the soil samples (i.e., augers, drill rods, center bit, etc.) will be decontaminated with Alconox Solution before the drilling commences and between the borehole locations.

Soil samples will be collected in two-foot continuous intervals utilizing two-inch diameter and 18-inch long steel split spoons. To collect soil samples, first a hole will be drilled utilizing 4¼-inch inside diameter auger flights to a depth of the first sampling interval. Then, the inner rods and center drill bit will be removed leaving the auger fights in place to keep the borehole open. A clean split-spoon will be driven into the soil with a 140-pound hammer striking the drill rod assembly attached to the rod from a height of 30 inches or appropriate hydraulic hammer method. The number of hammer blows required to drive the split spoon into the soil for the last 12 inches will be counted and recorded as the standard penetration resistance (N value). When the split spoon reaches the bottom of the sampling interval, it will be retracted, disconnected from the inner drill rods, and opened to allow access to the soil sample. The inner rods and the center drill bit will then be inserted into the augers and the borehole will be drilled to the next sampling depth interval. The process will continue until the last soil sample is retrieved.

Prior to reinserting the split-spoon for retrieval of another soil sample, the split-spoon will be decontaminated to prevent cross-contamination between the sampling intervals. Sampling equipment decontamination procedures will follow ***SOP 25: Cleaning/ Decontamination of Equipment***.

The information collected during drilling will be presented on final borehole logs that will be prepared on *WDNR Form 4400-122*. The logs will include information on sampling intervals, N Value, and other pertinent information related to the drilling activities.

Following soil boring advancement, soil cuttings generated during drilling will be collected in 55-gallon drums. The drums will be properly labeled and left on site pending receipt of laboratory results and subsequent approval for disposal at a licensed facility.

Geoprobe Advancement

The soil borings will be advanced with a Geoprobe unit designed to retrieve a soil sample from a desired depth interval. The Geoprobe utilizes a two-inch diameter probe rod to reach the desired sampling depth. A clean disposable acetate liner dedicated to each four- or five-foot soil horizon is inserted into the sampling spoon. The sampling spoon is advanced to the desired soil horizon with a hydraulically driven percussion hammer.

When the liner containing soil is brought to the surface and removed from the sampling spoon, the liner is cut open to allow access to the soil. Soil samples will then be collected following ***SOP 5: Soil / Sediment Sample Collection and Analyses***.

Prior to reinserting the sampling spoon for retrieval of another soil sample, the sampling spoon will be decontaminated to prevent cross-contamination between the sampling intervals. A new acetate liner will be inserted into the sampling spoon to be advanced to the next depth interval. The sampling procedure will be repeated at four- or five-foot continuous depth intervals until the termination depth of each boring.

The information collected during drilling will be presented on the final borehole logs that will be prepared on *WDNR Form 4400-122*. The logs will include information on sampling intervals and other pertinent information related to the Geoprobe drilling activities.

Following soil boring advancement, soil cuttings generated during drilling will be collected in 55-gallon drums. The drums will be properly labeled and left on site pending receipt of laboratory results and subsequent approval for disposal at a licensed facility. The used polyethylene liners will be disposed of as general solid waste at a licensed disposal facility.

Hand Auger Advancement

The hand auger is advanced manually by turning the hand auger handle in a clock-wise direction while applying a downward force.

Once the hand auger has been advanced to the desired depth, it is removed from the sampling location by pulling straight up. The hand auger containing the soil is then brought to the surface, and the soil is transferred to a Ziploc® bag for classification and temporary storage prior to laboratory containerization.

Prior to reinserting the hand auger for retrieval of another soil sample, the hand auger collection tube will be decontaminated to prevent cross-contamination between the sampling intervals. The sampling procedure will be repeated until the end of each boring.

The information collected during drilling will be presented on the final borehole logs that will be prepared on *WDNR Form 4400-122*. The logs will include information on sampling intervals and other pertinent information related to the hand auger activities.

Following hand auger advancement, soil cuttings generated during drilling will be collected in 55-gallon drums. The drums will be properly labeled and left on site pending receipt of laboratory results and subsequent approval for disposal at a licensed facility.

SOP 4: PID and FID Field Screening and Visual Soil Classification

A portion of each soil sample will be screened for volatile compound vapors, using a PID. The PID will be equipped with a 10.6 or 11.7 eV lamp. The PID will be zeroed, using ambient air, and then calibrated with 100 parts per million (ppm) isobutylene gas to benzene equivalent in accordance with the manufacturer's specifications prior to use in the field. The PID calibration data will be recorded in a calibration notebook designated for each PID unit.

At the discretion of Sigma's project manager, an FID may be used instead of the PID. If selected, the unit will be calibrated to the manufacturer's specifications prior to use in the field.

The volatile vapor scan technique with either a PID or FID is a screening method used to assess the presence of certain volatile compounds. Field screening will be performed within 15 minutes of sample collection by filling an eight-ounce jar or Ziploc bag approximately half full, sealing the jar/Ziploc bag, and allowing the sample to equilibrate. The probe of the PID/FID will be then inserted into the jar/Ziploc bag, and the highest stable PID/FID reading will be recorded. The appearance of the soil samples and any incidental odors will also be noted during field screening. The sample will be appropriately disposed of with the balance of the investigation derived waste.

Upon completion of visual soil classification, final borehole logs will be prepared on WDNR Form 4400-122 *Soil Boring Log Information* form. The logs will include information on soil type, gradation, color and moisture content, and field PID/FID readings.

SOP 5: Soil / Sediment Sample Collection and Analyses

Field screening of the soil/sediment samples combined with visual and olfactory observations will aid in selecting samples for laboratory analysis. The selected soil/sediment samples will be submitted to the project laboratory for analyses as specified in a site-specific Sampling and Analysis Plan (SAP). These analyses may include diesel range organics (DRO), gasoline range organics (GRO), volatile organic compounds (VOCs), petroleum volatile organic compounds (PVOCs), polycyclic aromatic hydrocarbons (PAHs), semi-volatile organic compounds (SVOCs), total organic carbon (TOC), per- and polyfluoroalkyl substances (PFAS), Resource Conservation and Recovery Act (RCRA) metals, polychlorinated biphenyls (PCBs), cyanide, herbicides, pesticides, and/or waste characterization analyses depending on the specific site.

Upon opening of the soil/sediment sampling device (e.g. split spoon, Geoprobe sample tube, sediment sampling device), soil/sediment will be removed from the sampling device and divided up into two samples (of equal composition). One sample will be placed in a Ziploc® bag for volatile vapor screening within 15 minutes of sample collection, and the other sample will be placed directly into appropriate containers for the analytical parameters to be analyzed. Specific requirements for sample container type, preservation, and holding times are presented in ***Table 4*** of the QAPP.

Generally, soil/sediment to be submitted for DRO, GRO, VOC, and/or PVOC analysis will be immediately collected (via the methods described below). Following the DRO/GRO/VOC/PVOC sample collection, the remainder of the soil/sediment will be divided among the appropriate jars for additional analytes (if applicable). A new pair of Nitrile gloves will be worn for each sampling interval. Sticks, rocks, and large debris will be removed from the soil/sediment samples submitted for laboratory analysis.

The soil/sediment sample collection, storage, and transportation will be performed in general accordance with ASTM and WDNR specifications and follow standard chain of custody requirements. Upon collection and preservation (if applicable), the samples will be placed on ice in a cooler. The sample collection time, sample location, sample interval depth, and sample number will be recorded on the chain of custody and on each container.

Diesel Range Organics/ Gasoline Range Organics/ Volatile Organic Compounds/ Petroleum Volatile Organic Compounds

In order to properly preserve the undisturbed sample, soil/sediment samples selected for VOC/GRO/PVOC analysis will be taken immediately following sample collection. DRO samples will be collected at the same time (if applicable).

Easy Draw Syringe

Sigma will fill the Easy Draw Syringe by placing it in a Power Stop handle, which has been calibrated, by the laboratory, to receive 13 grams of soil/sediment, and plunging it into an undisturbed part of the soil/sediment sample immediately following the sample collection. The soil/sediment contained in the syringe will then be expelled in a 40-ml vial containing 10-ml of methanol for VOC/GRO/PVOC samples, or no preservative for DRO, which has

been supplied by the laboratory. The threads of the vial will be cleaned prior to the placement of the cap. Then the vial will be gently swirled to immerse the sample in the methanol (if applicable).

The quantity of 13 grams of soil/sediment has been requested by the project laboratory to ensure that the minimum soil/sediment quantity necessary for laboratory analysis (10 grams to meet for 1 to 1 ratio) is provided. For VOC/GRO/PVOC samples, the laboratory will evaluate the methanol/sample ratio upon receipt of the sample and will adjust the methanol to meet the 1 to 1 ratio in the laboratory as needed.

Polycyclic Aromatic Hydrocarbons/ Semi-Volatile Organic Compounds/ Total Organic Carbon/ RCRA Metals/ Polychlorinated Biphenyls/ Cyanide/ Herbicides/ Pesticides

Soil/sediment will be packed into a non-preserved labeled container per the sample requirements listed on ***Table 4*** and sealed with an appropriate lid.

Per- and Polyfluoroalkyl Substances

For PFAS analysis, Sigma will follow cross-contamination minimization and decontamination procedures as described in ***SOP 6: PFAS Field Sampling***. Soil/sediment will be packed into a non-preserved laboratory-supplied 250-ml or 4-ounce HDPE container.

SOP 8: Groundwater Monitoring Well / Piezometer Installation

Groundwater monitoring wells and the piezometers will be constructed in general accordance with Wisconsin Administrative Code NR 141. Generally, groundwater monitoring wells will be screened to intersect the water table as estimated during drilling and soil sample collection activities. Piezometers will be screened below the water table. Groundwater monitoring wells will be constructed using 10- to 15-foot screens consisting of 2-inch inside-diameter factory cut 0.010-inch slotted schedule 40 PVC pipe. Piezometers will be constructed using 5-foot screens consisting of the same type of pipe. For either groundwater monitoring wells or piezometers, the screens will be attached to a schedule 40 PVC riser pipe with flush threaded joints (no solvents or glues allowed), which will be solid (non-perforated) 2-inch inside-diameter PVC pipe. The length of the riser pipe will vary depending upon the total depth of the monitoring well/piezometer relative to the ground surface.

The borehole annulus surrounding the monitoring well/piezometer screen will consist of filter sand #30 Red Flint (or equivalent) filter pack. The filter pack will extend a minimum of 1 foot (and up to 2 feet) above the top of the screen. Above the filter pack, a minimum of 6 inches (and up to 2 feet) of washed silica fine sand #45-55 will be placed as part of the filter pack seal. Above the fine sand, a bentonite chip seal will be placed as an annular space seal to a depth of no less than 1.5 foot from the surface. The bentonite seal will be hydrated prior to completion of the monitoring well/piezometer installation.

All monitoring wells and piezometers will be finished with steel bolt-down flush mount protective covers or stick-up pipes concreted above the annular space seal to ground surface to restrict access to the groundwater monitoring well and minimize surface water infiltration. The depths of the borehole bottom, bottom of screen, top of screen, top of filter pack, top of fine sand, top of bentonite annular seal, and top of PVC riser will be measured. The volumes of both sand and bentonite required and used will be calculated and measured. Field data will be recorded on a *Monitoring Well Construction Form (WDNR Form 4400-113A)* for each groundwater monitoring well and piezometer.

All groundwater monitoring well/piezometer data for the site will be summarized on the *Groundwater Monitoring Well Information Form (WDNR Form 4400-89)*.

Upon completion of groundwater monitoring well/piezometer installation and in accordance with WDNR requirements, Sigma will assign Wisconsin Unique Well Numbers (WUWN) to all the monitoring wells/piezometers at the site. A self-adhesive label with the pre-printed WUWN will be placed on the well/piezometer casing for easy identification in the field. The WUWN will be recorded on the *Monitoring Well Construction Form (WDNR Form 4400-113A)*.

SOP 9: Groundwater Monitoring Well Development

Groundwater monitoring wells constructed in accordance with Chapter NR 141 of the Wisconsin Administrative Code or approved with a Chapter NR 141 variance will be developed with plastic disposable bailers using single use Nitrile gloves and new single-use rope or using a peristaltic pump with single use tubing set to a low flow rate of less than 300 milliliters per minute (ml/min) or 0.1 gallons per minute (gal/min). The well development will be completed in accordance with Wisconsin Administrative Code Chapter NR 141.21. If a well cannot be purged dry, the wells will be surged and purged alternatively for a minimum of 30 minutes, and well development will consist of removing ten well volumes or until the water is free of sediment. If the well can be purged dry, the well will not be surged and well development will be considered complete when the well is purged dry three times. The well development procedures will be documented on the *Monitoring Well Development Form (WDNR Form 4400-113B)*.

Groundwater generated as a part of monitoring well development will be contained in drums, which will be properly labeled with the Bureau for Remediation and Redevelopment Tracking System activity number for the site, the site name, well number, initial date of collection, the contents, and Sigma's company name and phone number. The drums will be temporarily staged on-site pending receipt of groundwater analytical results. Free phase product generated during monitoring well development will be contained within separate, properly labeled drums on-site. Based on the laboratory analytical results, the drummed groundwater will be disposed of at an approved wastewater treatment plant or removed and disposed of off site by a licensed waste hauler. If groundwater does not contain any detectable contaminants, it will be dispersed on site. Drummed free product will be properly characterized, removed, and disposed of off-site by a licensed waste hauler.

SOP 10: Groundwater Level Measurements at Monitoring Wells

To the extent practicable, static water level measurements will be conducted on all wells at the site as quickly as possible before any purging or sampling, and in the order of least-to-most contaminated wells. Prior to groundwater purging and sample collection at a monitoring well, the static water level measurements will be made using a Solinst Model 101 electronic water level indicator or equivalent. If the presence of light non-aqueous phase liquid (LNAPL) or dense non-aqueous phase liquid (DNAPLs) layers are known or suspected, the depth to the immiscible layer and the static water level will be measured with a Solinst 122 Interface Meter or equivalent. Groundwater measurements will be recorded to the nearest 0.01-foot from a surveyed point on the top of the well casing. The water level indicators will be cleaned before and after each measurement with a solution of Alconox and water. (A solution of Simple Green and water will be used instead if Alconox is not available). The depth to water within each well will be recorded at the time the measurement is completed. The data will be recorded on Sigma's *Groundwater Services Summary Form*. The completed form will contain the following information: monitoring well number; date of the static water level measurement; depth to groundwater; type of measuring device used; initials of individuals collecting the data; project number; location of the site; weather conditions; and any additional observations noted.

The groundwater elevations at each well/piezometer will be calculated based on surveyed elevations for the measurement point at the top of the casing of each well/piezometer. If the top of casing is level, the measurement point will be the northern side of well casing. If the top of casing is not level, the measurement point shall be identified (e.g. notched or permanently marked) on the well itself. The survey will be completed using a Trimble GPS receiver (or total station if applicable) and referenced in feet above mean sea level to the USGS's North American Vertical Datum of 1988 (NAVD 1988). The survey data will be recorded on a *Monitoring Well Information Form (WDNR Form 4400-89)*.

If present, the thickness of measured LNAPL or DNAPL layers will be calculated based on the difference from the depth to the immiscible layer and the depth to static water level (or depth to the well bottom).

Groundwater water level measurements for drinking water supply wells are covered under a separate standard operating procedure.

SOP 11: Groundwater Quality Measurements

After the collection of groundwater level measurements and prior to collecting groundwater samples, groundwater quality readings will be collected using a YSI Professional Plus multiparameter water quality instrument or equivalent. The following data will be recorded onto Sigma's Groundwater Services Summary Form: project name, project number, date, field personnel, sampling location, depth to water, depth to bottom, dissolved oxygen (D.O.), redox potential, pH, specific conductivity, water temperature, and any additional observations noted. Ferrous iron concentrations will be measured in the field using a Ferrous Iron Test Kit/Hach Kit. A copy of the YSI Professional Plus User Manual as well as Sigma's *Groundwater Services Summary Form* are attached.

YSI PROFESSIONAL PLUS
Maintenance
Always be very careful with the sensors as they are delicate.

Batteries
The instrument requires 2 alkaline C-cell batteries. To replace batteries:

- Unscrew the four screws to remove the battery cover on the back of the instrument
- Replace batteries, ensuring correct polarity alignment
- Replace battery cover and tighten screws carefully – do **not** over-tighten

O-Rings
The o-rings and sealing surfaces must be maintained to prevent water from entering the battery compartment and/or sensor ports of the instrument.

- When the battery compartment lid is removed, inspect the o-ring for damage and debris and clean/replace with identical o-ring if necessary
- When the sensor connectors are removed, inspect the o-rings for damage and debris and clean/replace with identical o-rings if necessary. If no damage or debris is evident, lightly grease the o-rings without removing them from the groove
- See manual for instruction on removing and reinstalling o-rings

Sensor Ports

- Ensure that entire sensor connector ends and sensor ports are completely dry before connecting
- If sensor connectors are corroded, send them in for repair/replacement

DO Sensor (Polarographic)

- The KCl solution and membrane cap should be changed:
  - once a month during regular use
  - if bubbles are visible under the membrane
  - if significant deposits of dried electrolyte are visible on the membrane
  - If the sensor shows unstable readings/issues
- To change the membrane cap:
  - Remove sensor guard to access sensor tip
  - Unscrew and remove old membrane cap

  - Thoroughly rinse sensor tip with distilled or DI water
  - Fill new membrane cap with O2 sensor electrolyte solution prepared according to directions on the bottle. **BE VERY CAREFUL NOT TO TOUCH THE MEMBRANE SURFACE.** Lightly tap the side of the membrane cap to release trapped bubbles
  - Thread the membrane cap onto the sensor – it is ok if some electrolyte solution overflows
- When changing the membrane, examine the gold cathode and silver anode. If the silver anode is black or if the gold cathode is dull, the sensor may need resurfacing using fine sanding disks included in the membrane kit. **DO NOT** resurface the electrode during every membrane change. See manual for detailed instructions on resurfacing and deep cleaning the cathode and anode.

Conductivity Sensor

- Regularly clean the openings on the sensor with a small cleaning brush with clean water
- If deposits have formed on the electrodes, clean them with a mild detergent and brush and rinse thoroughly with clean water, then check the response and accuracy of the sensor with a calibration standard

Temperature Sensor

- Keep the temperature sensor free of buildup. Clean with the conductivity cleaning brush or a toothbrush if needed

pH and ORP Sensors

Cleaning is required whenever deposits or contaminants appear on the glass and/or platinum surfaces or when the sensor's response slows.

- Use clean water and soft cloth/lens tissue/cotton swab to gently remove material from glass and/or platinum surfaces
- Use moistened cotton swab to carefully remove any material blocking the reference electrode junction of the sensor
- If pH and/or ORP response is not restored, consult the manual for additional cleaning steps

Short-term Storage (less than 30 days)

- Keep a small amount of tap water in the sensor storage container during storage to create a humid environment
- Ensure sensors are **not** submersed in water

Long-term Storage (greater than 30 days)

- See manual for long-term storage conditions for each individual sensor

For sensor and/or cable replacement and/or repair instructions, see manual.

Calibration
Sensors should be calibrated at least once every month during regular use or when an issue is detected with one or more sensors. See manual for sensor-specific calibration instructions.

Taking Measurements
Always be very careful with the sensors as they are delicate. If taking measurements down a well, first ensure the well is unobstructed as to not damage the sensors. If the well or sample source does not allow readings to be collected in place with the instrument, use a flow cell. Use a peristaltic pump to pump the sample into the inlet port (bottom) of the flow cell and allow the sample to overflow through the outlet port (top) of the flow cell. Make sure the overflow is collected and added to the purge water. Where the well or sample source does not allow for in-situ measurements or the use of a flow cell (i.e. the well is too deep for the instrument or pumping, or the well is small diameter and has poor recharge therefore not conducive to using a flow cell), it may be necessary to collect a sample and place it in a secondary container that allows for use of the instrument. If taking measurements from a secondary container, please note the instrument readings may differ from true in-situ conditions.

- Remove sensor storage container and place sensor guard for field measurements
- Turn on the instrument with the power button and let it warm up for several minutes
- Submerge the sensors in the sample (either in the water column of the well, in the flow cell with the pump running, or in the secondary container) then give the cable a shake to release any air bubbles from the sensors. Continue stirring to ensure accurate DO reading (DO reading will drop over time if sensor is stationary/stirred too slowly). If using the flow cell, ensure that the sample is continuously flowing past the sensors
- Allow readings to stabilize (could take a few minutes) and record the data on the *Groundwater Services Summary Form*
- Remove sensor from the sample and **gently** rinse cable and sensors with clean water and/or a mild detergent between samples
- At end of day, power off instrument, ensure cable and sensors are clean, remove sensor guard and replace sensor storage container with small amount of tap water, and store instrument in its case

FERROUS IRON TEST KIT
Maintenance
Wash vials/tubes with clean water between samples and dry with a soft cloth. At the end of the day, deep clean the vials/tubes with mild detergent or solvent and wipe dry with a soft cloth.

Calibration
NA

Taking Measurements

- Fill a viewing tube to 5-mL with sample water. This is the blank.
- Place this tube in the top left opening of the color comparator.
- Fill the measuring vial to 25-mL with sample water.
- Add the contents of one Ferrous Iron Reagent Powder Pillow to the measuring vial.
- Swirl/shake to mix. An orange color will develop if ferrous iron is present. Allow three minutes for full color development.
- Fill another viewing tube to 5-mL with the prepared sample.
- Place the second tube in the top right opening of the color comparator.
- Hold comparator up to a light source such as the sky, a window or a lamp. Look through the openings in front.
- Rotate the color disc until the color matches in the two openings
- Read the mg/L ferrous iron in the scale window and record on *Groundwater Services Summary Form*.

SOP 12: Groundwater Sample Collection and Analyses

The groundwater samples will be submitted to the project laboratory for analyses as specified in the SAP. These analyses will initially include volatile organic compounds (VOCs). Additional analyses such as per- and polyfluoroalkyl substances (PFAS), polycyclic aromatic hydrocarbons (PAHs), Resource Conservation and Recovery Act (RCRA) metals, and polychlorinated biphenyls (PCBs) may also be required depending on the specific site.

The groundwater samples may also be analyzed for natural attenuation parameters including ferrous iron during the quarterly groundwater monitoring, if conducted at the site. The ferrous iron will be tested in the field using a field kit. Standard field measurements including temperature, conductivity, pH, dissolved oxygen, and redox potential will also be collected during each quarterly sampling event using a calibrated handheld meter.

Groundwater samples will either be collected from a small-diameter well set in the Geoprobe borehole or from a permanent ch. NR 141 compliant groundwater monitoring well/piezometer. The dates and times of sample collection will be recorded on the sample containers and on the sampling log. The groundwater sample collection, storage, and transportation will be performed in general accordance with ASTM and WDNR specifications and followed standard chain of custody requirements. The specific requirements for sample container type, preservative, and holding times are presented in ***Table 4*** attached with this QAPP.

Purging Activities

In general, prior to groundwater sample collection, approximately four well volumes of groundwater will be removed from the small-diameter monitoring well or ch. NR 141 compliant monitoring well/piezometer using a disposable bailer or peristaltic pump set to less than 300 milliliters per minute (ml/min) or 0.1 gallons per minute (GPM). Other equipment, such as a Whale submersible electric pump, may be utilized depending on site conditions and the depth of the installed well.

For wells which do not purge dry, Sigma will monitor indicator parameters during the purging activities to ensure groundwater stability when sampling. Specifically, purging activities should continue until three consecutive readings, spaced approximately two minutes or 0.5 well volumes or more apart are within the following ranges for the following indicators parameters (as specified by the WDNR publication PUBL-DG-03896):

- Dissolved oxygen, +/- 0.2 mg/l
- Specific Conductance, +/- 5.0 μmhos/cm for values $<$1000 μmhos/cm or +/- 10.0 μmhos/cm for values $>$1000 μmhos/cm
- pH, 0.1 pH units
- Temperature, +/- 0.1°C
- Turbidity $<$5 NTUs (required if metal samples will not be filtered)

For wells which do purge dry, purge the monitoring well until the pump runs dry and the piezometer until the until the water well is below the top of the well screen.

Groundwater Sample Collection Methods

Groundwater samples from small-diameter monitoring wells will be collected by using ½-inch or ¾-inch diameter disposable bailers or peristaltic pump. If possible, groundwater samples for VOC analysis will be collected using a disposable bailer of appropriate diameter to fit the small diameter well. If sampling by bailer is not possible, or other analytes are requested, new ¼-inch. I.D. plastic tubing with peristaltic pump will be used.

Groundwater samples from the ch. NR 141 compliant groundwater monitoring wells/piezometers will be collected in accordance with the WDNR, Bureau of Drinking Water and Groundwater, *Groundwater Sampling Field Manual*, dated September 1996 (PUBL-DG-03896). Within the Field Manual, a copy of the entitled *Sampling Procedures for Monitoring Wells* is included in this QAPP.

Groundwater will be collected from the ch. NR 141 compliant groundwater monitoring wells/piezometers using a 1½-inch diameter disposable bailer for all samples, except, if PAH or dissolved RCRA metals analysis are requested, low flow purging and sampling techniques will be implemented.

Laboratory Analysis

Depending on the type of analyses requested, groundwater collected from the small-diameter monitoring well or ch. NR 141 compliant monitoring well/piezometer will be containerized as described below:

Volatile Organic Compounds

Groundwater collected for VOCs will be placed in three 40-milliliter (ml) glass vials with Teflon® lined lids preserved with hydrochloric acid. The water should form a positive meniscus at the brim of the sample containers and no air bubbles should be present once the sample container is sealed. Trip and field water blank samples will also be analyzed for VOCs to serve as QA checks.

Polycyclic Aromatic Hydrocarbons

Groundwater collected for PAHs will be placed in unpreserved 250-ml amber glass bottles sealed with Teflon® lined lids. Leave approximately ½ inch of air space when filling the sample bottles to allow for expansion. For laboratory QA/QC purposes, one out of every ten samples should be collected and submitted in triplicate.

Per- and Polyfluoroalkyl Substances

For PFAS analysis, Sigma will follow specific sample collection, cross-contamination minimization, and decontamination procedures as described in ***SOP 6: PFAS Field Sampling***. Groundwater collected for PFAS will be placed in two unpreserved 250-ml HDPE bottles and sealed. Leave approximately ½ inch of air space when filling. For laboratory QA/QC purposes, one out of every ten samples should be collected and submitted in triplicate and a field reagent blank should be submitted per each sampling event.

Dissolved RCRA Metals
Groundwater collected for metals will be field-filtered using a 0.45-micron pore size filter (allow 150 milliliters to pass through filter before sampling) and placed in 500-ml HDPE bottles, preserved with nitric acid and sealed.

Polychlorinated Biphenyls
Groundwater collected for PCBs will be placed in unpreserved 250-ml amber glass bottles sealed with Teflon® lined lids. Leave approximately ½ inch of air space when filling the sample bottles to allow for expansion.

Ferrous Iron
Ferrous iron will be measured in the field using a Hach kit (previously described).

All groundwater samples will be placed on ice in a cooler immediately following collection. Samples will be delivered to the laboratory at the end of the day when they have been collected or will be picked up from Sigma by the laboratory courier the next day.

Groundwater generated, as a part of permanent monitoring well/piezometer purging will be contained in labeled drums and temporarily staged pending receipt of groundwater analytical results. If based on the analytical results, the drummed water contains detectable concentrations of contaminants, the drummed groundwater will likely be disposed of at the Port Washington Waste Treatment Plant or off-site by a licensed waste hauler. If groundwater does not contain any detectable contaminants, it will be dispersed on-site. Due to small quantity, the groundwater evacuated from temporary wells set in Geoprobe boreholes will be dispersed on-site.

Attachment
WDNR PUBL-DG-038 96, Groundwater Sampling Field Manual

SOP 15: Borehole / Groundwater Monitoring Well Abandonment

Upon completion of drilling activities, all soil borings that have not been converted to groundwater monitoring wells will be properly abandoned in accordance with Chapters NR 112 and NR 141 of the Wisconsin Administrative Code.

The protective covers and ground surface seals of any groundwater monitoring wells will be removed, and the well casings will be removed or cut off at least 30 inches below the ground surface. Boreholes will be abandoned with bentonite chips no greater than 3/8 inch in diameter or bentonite pellets. Granular bentonite may be used for abandonment of boreholes less than 25 feet deep. If borings were drilled through the existing pavement and repairs to the pavement are necessary, the boreholes will be capped with concrete or asphalt as appropriate to match the existing pavement. Any settling of the sealant material shall be topped off. Abandonment will be documented on *Well/Drillhole/Borehole Abandonment Form (WDNR Form 3300-5B)*.

SOP 26: Chain of Custody

Custody procedures will be used to document the authenticity of data collected during the project. The data requiring custody procedures includes soil, sediment, groundwater, and vapor samples. The samples are considered in custody, if they are:

- In person's possession
- In view of the person after being in their possession
- Sealed in a manner that it cannot be tampered with after having been in physical possession
- In a secure area restricted to authorized personnel

A Chain of Custody form per project laboratory will be used to ensure proper custody of all samples collected and submitted for laboratory analysis.

Upon collection, soil, sediment, groundwater, and vapor samples will be cataloged on the appropriate Chain of Custody form using the unique sample identification codes. In addition, the date and time of collection, the number of containers for each type of sample, the type of sample preservation, and the type of analyses requested will be recorded on the Chain of Custody form.

Upon relinquishing the sample cooler to the project laboratory, Sigma field personnel will turn custody of the samples over to laboratory personnel by signing and dating the bottom of the Chain of Custody form. Sigma's data manager will retain one copy of the Chain of Custody form and the original will accompany the samples. The Chain of Custody forms will be sealed in a plastic bag and placed inside the sample cooler for transportation to the laboratory. A copy of the completed Chain of Custody form will be included with the laboratory report.

SOP 27: Investigative Derived Waste

Investigation-derived waste will be generated as a part of site investigation activities. Groundwater generated as a part of monitoring well development and purging will be drummed and temporarily staged pending receipt of groundwater analytical results. If based on the analytical results, the drummed water contains detectable concentrations of contaminants, the drummed groundwater will likely be disposed of at a licensed waste water treatment facility by a licensed waste hauler. If groundwater does not contain any detectable contaminants, it will be dispersed on site.

Soil cuttings generated during drilling will be drummed and staged on site pending receipt of laboratory results and subsequent approval for disposal at a licensed facility.

General sampling supplies including disposable bailers, tubing, Geoprobe sample liners, and plastic bags will be disposed of as general solid waste at a licensed disposal facility.