Predesign Investigation Work Plan

Park Laundry Site, Ridgefield Washington

Prepared for:

City of Ridgefield

May 10, 2024
Project No. M0239.33.007

Prepared by:

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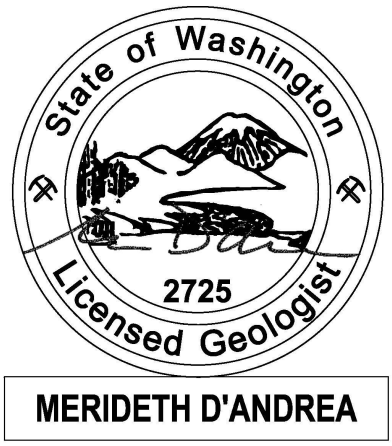
Predesign Investigation Work Plan

Park Laundry Site, Ridgefield Washington

The material and data in this report were prepared under the supervision and direction of the undersigned.

Maul Foster & Alongi, Inc.



05-10-2024

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Abbreviations

bgs	below ground surface
CAP	Cleanup Action Plan
CUL	cleanup level
DCE	dichloroethene
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
MFA	Maul Foster & Alongi, Inc.
MTCA	Model Toxics Control Act
Property	122 N. Main Avenue, Ridgefield, Washington
PCE	tetrachloroethene
Site	the Property and neighboring properties where contamination has come to be
Source Area	the Property and two vacant lots located directly north of the Park Laundry property, collectively
SOP	standard operating procedure
TCE	trichloroethene
VC	vinyl chloride
WBZ	water-bearing zone

1 Introduction

Maul Foster & Alongi, Inc. (MFA) has prepared this predesign data collection work plan on behalf of the City of Ridgefield (City) for a portion of the Former Park Laundry Site, the "Source Area." Park Laundry formerly operated at 122 N. Main Avenue, Ridgefield, Washington (the Property) (see Figure 1). Volatile organic compounds (VOCs) are present in the Source Area (comprised of the Property and certain neighboring properties). Soil, vapor, and groundwater impacts related to tetrachloroethene (PCE) and its degradation products resulting from former dry cleaner operations at the Property have been confirmed. For the purposes of this work plan, the Site is defined by the extent contamination[1] from Park Laundry in all environmental media. The Source Area is defined as the former Park Laundry parcel, the two adjoining parcels to the north (Coombs property), and the property to the south owned by the City and formerly occupied by the police station (see Figures 2 and 3),

1.1 Purpose and Objective

This work plan describes the scope of work for the predesign data collection in the Source Area to support development of the Draft Engineering Design Report and Construction Plans and Specifications per the December 28, 2023 Consent Decree between the City and Washington State Department of Ecology (Ecology), which includes a Cleanup Action Plan (CAP; Ecology 2024). The CAP was developed to address the potential human health and environmental concerns associated with PCE and its degradation products based on Ecology's selected remedy (Alternative 4) from the Remedial Investigation/Feasibility Study (RI/FS) analysis conducted by MFA (MFA 2019).

Ecology's required remedy consists of soil excavation down to 15 feet below ground surface (bgs) in the Source Area, groundwater treatment, institutional controls, and groundwater monitoring. The data used in the FS to select the remedy described in Alternative 4 are from soil and groundwater data collected prior to 2011. Additional temporal and spatial data are needed to confirm and provide the more precise definition of the extent of the contamination in the Source area to support remedial design.

2 Background and Physical Setting

The sections below provide a summary of background and physical setting. Detailed descriptions of site history, topography, geology, hydrogeology, and past data collection are provided in the CAP (Ecology 2024) and RI/FS (MFA 2019).

[1] Defined as having an exceedance of the Model Toxics Control Act Method A cleanup level.

2.1 Source Area and Site Description

The Source Area is zoned as Downtown Mixed Use and is comprised of approximately five parcels. The parcel formerly occupied by Park Laundry was approximately 25 feet wide (north-south) and 100 feet long (east-west). The property occupied by the former Ridgefield Police Department comprises the southern end of the Source Area. The Source Area is bounded on the east by a one-lane paved alleyway, which in turn is bordered by a city skate park and a former fire station. To the west is North Main Avenue and a restaurant. Land use is in the downtown is primarily residential and commercial.

The groundwater plume associated with the Source Area covers an estimated 22 acres. The plume generally follows the topography of the area, extending north and west from the Property, and is bounded on the west by Lake River (MFA 2019).

2.2 Property History

Park Laundry operated at the Property from approximately 1965 to 1977. The laundry service is believed to have included dry cleaning services and self-service, coin-operated washers and dryers. Park Laundry's operations had ceased by 1978 and in 2000 the former laundry service building was removed. The City of Ridgefield acquired the Property on December 28, 2023, at which time the Consent Decree with Ecology became effective (Ecology 2023b).

2.3 Site Topography, Geology and Hydrogeology

Site topography consists of upper and lower terrace areas trending north and south. The upper terrace forms a bluff above the Columbia River and the lower terrace abuts Lake River. The Source Area is located on the upper terrace in downtown Ridgefield.

Borings on and downgradient of the Property have been advanced as deep as 80 and 90 feet bgs, respectively. A generalized geologic cross section was prepared as part of the RI/FS (MFA 2019) and is included in Appendix A. Figure 2 shows the location of the geologic cross section through the Site. Generally, the Site is underlain by Tertiary-age semi-consolidated alluvial deposits Troutdale formation, and Holocene alluvial deposits (lower terrace alluvial deposits). The shallow water-bearing zone (WBZ) on the upper terrace is perched above a massive silt and clay deposit at about 12 to 20 feet bgs. The shallow WBZ in the upper terrace fluctuates seasonally from less than 2-feet bgs to greater than 10-feet bgs. The upper WBZ in the lower terrace is separated by an aquitard (weathered surface of the Troutdale formation), which in turn is underlain by a regional aquifer.

2.4 Past Site Investigations and Contaminants of Concern

The RI/FS report (MFA 2019) provides a detailed summary of the remedial investigation and previous investigation results for the Site including the nature and extent of contaminants and the risk associated with those contaminants. Previous sample locations are shown on Figures 2 and 3. Indicator hazardous substances (IHS) identified for the Site consist of PCE and its degradation products (including trichloroethene [TCE], cis-1,2-dichloroethene [DCE], trans-1,2-DCE, and vinyl chloride [VC]).

2.5 Cleanup and Remediation Levels

The CAP provides CULs for PCE and TCE as well as for their natural degradation products; 1,1-DC, cis-1,2-DCE, trans-1,2-DCE, and VC. A remediation level of 0.05 mg/kg in soil was selected to guide the removal of soil containing PCE in the Source Area at the Site. Removal of this material will aid in and increase site-wide degradation of COCs below proposed CULs (Ecology 2024) via soil excavation and in situ groundwater treatment.

3 Predesign Investigation Scope of Work

This section describes the objectives and scope of work for the predesign investigation in the Source Area. The field investigations will be completed consistent with the methods and protocol described in the attached standard operating procedures (SOPs) included in Appendix B. Soil sample analyses and handling procedures, containers, preservation, and holding times, method requirements and performance criteria, and field quality control procedures for sample analyses are described in Tables 1 through 3.

3.1 Utility Locate

Consistent with the SOP (Appendix B), a public utility locate will be requested. Prior to subsurface exploration, a private utility locate contractor will attempt to locate on-site utilities, including the orientation of any water and sewer mains or laterals. Sampling locations may be adjusted based on information obtained from the utility locates.

3.2 Soil

Approximately 24 shallow soil borings will be advanced using direct-push drilling methods at the locations shown on Figure 3 in a grid pattern. The proposed locations were selected based on a review of existing soil data in the Source Area and are intended to evaluate the current extent of contamination and confirm/refine the extent of excavation in the Source Area.

Consistent with previous investigations, 21 of the borings will be advanced from ground surface though the surficial unit into the massive silt perching layer to approximately 15 ft bgs. Soil samples will be collected the continuous soil cores at 5 feet intervals to allow for effective design of excavation prisms and allow effective soil management. Three of the borings will be advanced to 5 ft bgs to confirm past PCE concentrations in surface soil (see Figure 3).

Soil samples will be analyzed for PCE as it is the only IHS with a remediation level. Samples will be containerized and preserved as specified in Table 1 and analyzed for PCE by EPA Method 8260D as detailed on Table 2. Soil samples will be analyzed by a Washington State accredited environmental laboratory (e.g., Apex Laboratories). The selection of soil samples for analysis will be determined based on past analytical results and field observations. The continuous cores will be logged by an onsite geologist or engineer, overseen by a geologist licensed in the state of Washington. Field quality control procedures are detailed in Table 3. Soil samples will be screened using a

photoionization detector and visual and olfactory observations will be recorded. If there is field evidence of impacts, the sampling depths may be altered. Push probe drilling, geologic logging, soil sample collection will be completed using the methods and protocol outlined in the SOPs included in Appendix B.

3.3 Cultural Resources

The *Final Determination* for the Site (Ecology 2023a) indicates the Site has a high to very high risk for pre-historic artifacts or other archaeological resources and recommends cultural resource monitoring during any subsurface work at the Site. MFA will subcontract an archaeologist to oversee and monitor the drilling activities outlined in this work plan. An Inadvertent Discovery Plan will be used to guide actions, should any cultural resources not previously known be identified during the predesign investigation activities.

3.4 Reporting

The results of the predesign investigation will be validated, compiled, and added to Ecology's environmental data base (EIM). The data will also be provided in the forthcoming Draft Engineering Design Report. The data will be used to evaluate and refine the extent of excavation.

References

Ecology. 2023a. Travis Wise, Washington State Department of Ecology. *Washington State Governor's Executive Order 21-02, Clark County, Park Laundry DAHP Project Number 2023-01-00083 Final Determination.* Memorandum to Cam Penner-Ash, Washington State Department of Ecology. July 3.

Ecology. 2023b. *Consent Decree. Former Park Laundry.* Issued by Washington State Department of Ecology. Lacey, WA.

Ecology. 2024. *Draft Cleanup Action Plan*. *Former Park Laundry*. Issued by Washington State Department of Ecology. Lacey, WA.

MFA. 2010. *Remedial Investigation Work Plan, former Park Laundry*. Prepared for Union Ridge Investment Company. Maul Foster & Alongi, Inc. January 21.

MFA. 2019. *Remedial Investigation and Feasibility Study Report, former Park Laundry,* Washington State Department of Ecology Agreed Order No. DE 6829. Maul Foster & Alongi, Inc., Vancouver, Washington. July 11.

Limitations

The services undertaken in completing this plan were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This plan is solely for the use and information of our client unless otherwise noted. Any reliance on this plan by a third party is at such party's sole risk.

Opinions and recommendations contained in this plan apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this plan.

Figures

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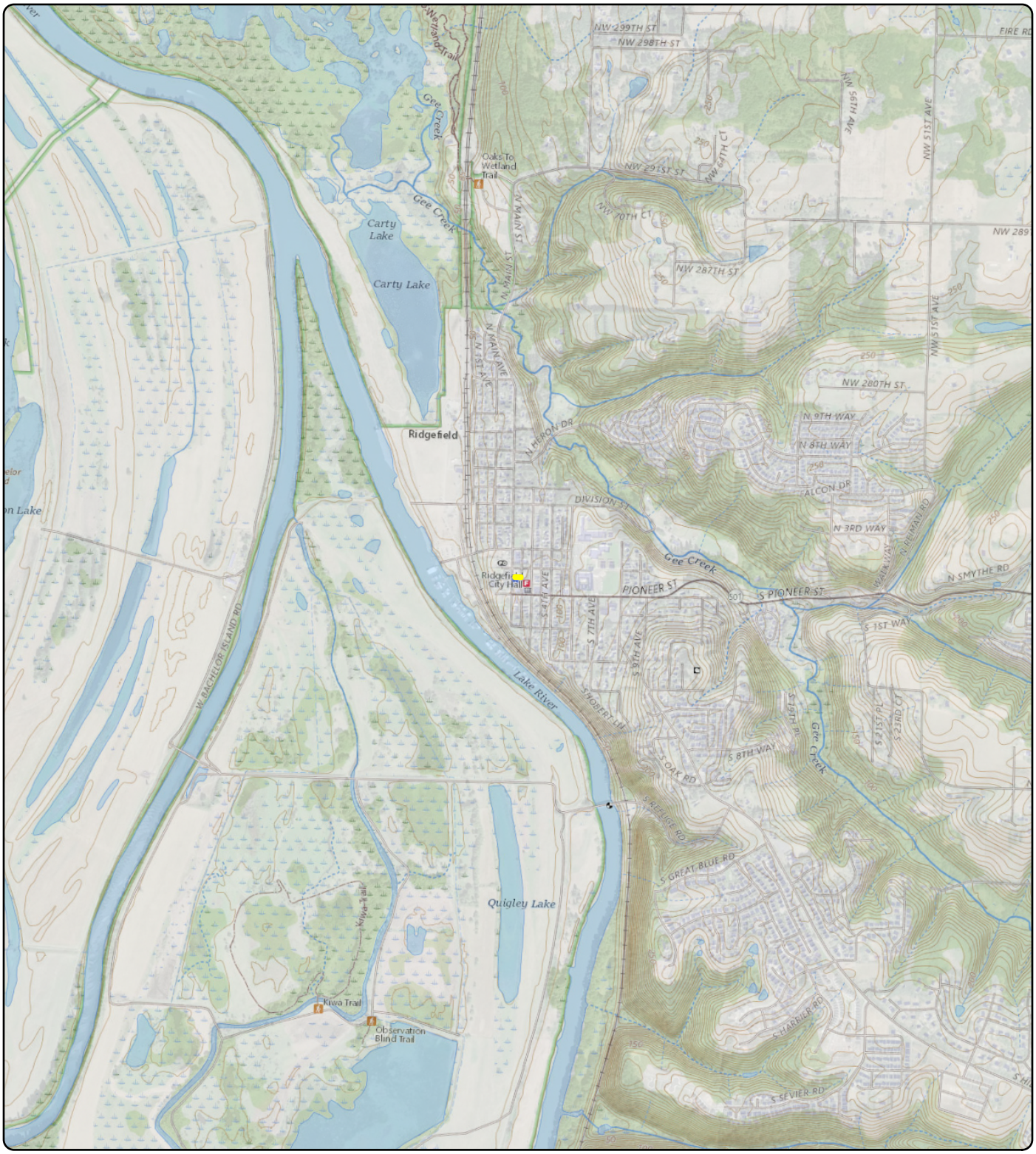

Notes
U.S. Geological Survey 7.5-minute topographic quadrangle (2020): Ridgefield.
Township 4 north, range 1 west, section 24.

Data Source
Property boundary obtained from Clark County.

Legend

Property Boundary

Figure 1
Property Location

Former Park Laundry
City of Ridgefield, WA

0 2,000
Feet

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Path: X:\0239.33\007\Pro\M0239_33_007_004.aprx\Fig 1 Property Location
Print Date: 4/23/2024
Reviewed By: cbusch
Produced By: sturner
Project: M0239.33.007

Figure 2
Site Features

Former Park Laundry
City of Ridgefield, WA

Legend

- Cross Section
- Property Boundary
- Estimated Site Boundary
- Port of Ridgefield Shallow Boring, 2012
- Port of Ridgefield Monitoring Wells
- Shallow Boring, MFA 2001
- Shallow Boring, MFA March 2010
- Deep Boring, MFA March 2010
- Shallow Boring, MFA October 2010
- Shallow Boring, MFA June 2011
- Monitoring Well, MFA June 2011
- Monitoring Well, MFA March 2012
- Monitoring Well, MFA April 2013
- Shallow Boring, MFA September 2014

0 200
Feet

Data Sources
Aerial photograph obtained from Bing and Google Earth.

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Path: X:\0239.33\007\Pro\M0239_33_007_004.aprx\Fig 2 Site Features
Print Date: 4/23/2024
Reviewed By: cbusch
Produced By: sturner
Project: M0239.33.007

Figure 3
Proposed Geoprobe Locations to Support Remedial Design in Source Area

Former Park Laundry
City of Ridgefield, WA

Legend

- Proposed Boring: total depth = 5 ft bgs
- Proposed Boring: total depth = 15 ft bgs

Previous Sample Locations

- Boring
- Monitoring Well
- Surface (0.5 ft bgs) Exceedance
- Mid-Depth (5 ft bgs) Exceedance
- Deep (> 12 ft bgs) Exceedance

Preliminary Excavation Demarcation

- 3' Proposed Excavation
- 6' Proposed Excavation
- 15' Proposed Excavation
- Property Boundary
- Tax Lot
- Sampling Grid

Notes

Exceedance is defined as a PCE concentration in soil within the top 15 feet in excess of the selected REL for PCE in soil. REL for PCE = 0.05 mg/kg.
ft bgs = feet below ground surface.
mg/kg = milligrams per kilogram.
MTCA = Model Toxics Control Act.
PCE = tetrachloroethene.
REL = remediation level.

0 20
Feet

Data Sources

Aerial photograph (2023) obtained from Google Earth; tax lot data obtained from Clark County.

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Path: X:\0239.33\007\Proj\M0239_33_007_004.aprx\Fig 3 Proposed Geoprobe Locations
Print Date: 5/9/2024
Reviewed By: cbusch
Produced By: sturner
Project: M0239.33.007

Tables

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Table 1
Containers, Preservation, and Holding Times
Predesign Investigation Work Plan
Park Laundry Site, Ridgefield, Washington

Sample Matrix	Method	Analyte	Container	Preservation (store all at 4°C)	Holding Time
Soil	EPA 8260D (LL)	Tetrachloroethene (PCE)	EPA 5035 kit[a]	MeOH	14 days

Notes

°C = degrees Celsius.

EPA = U.S. Environmental Protection Agency.

HCl = hydrochloric acid.

LL = low level.

MeOH = methanol.

mL = milliliter.

VOA = volatile organic analysis.

[a]5035 sample kit includes two prepared 40-mL VOA bottles with 5 mL of methanol and one 2-ounce jar for moisture determination.

Table 2
Analytical Methods and Performance Criteria for Soil
Predesign Investigation Work Plan
Park Laundry Site, Ridgefield, Washington

Method	Parameter	Soil REL[(1)]	MDL	MRL	LCS Accuracy (%)	MS Accuracy (%)	Precision (RPD)	Completeness (%)
Volatile Organic Compounds (mg/kg)								
EPA 8260D	Tetrachloroethene (PCE)	0.05	0.00100	0.00200	80-120	73-128	30	90

Notes

Limits provided by Apex Laboratories, LLC. Actual MDLs and MRLs may differ based on sample matrix and/or dilutions.

EPA = U.S. Environmental Protection Agency.

LCS = laboratory control sample.

MDL = method detection limit.

mg/kg = milligrams per kilogram.

MRL = method reporting limit.

MS = matrix spike.

REL = remediation level.

RPD = relative percent difference.

Reference

[(1)]Ecology. 2023. *Former Park Laundry: Public Review Draft Cleanup Action Plan.* Washington State Department of Ecology, Toxics Cleanup Program. Lacey, WA.

Table 3
Field Quality Control Sample Summary
Predesign Investigation Work Plan
Park Laundry Site, Ridgefield, Washington

Type	Frequency	Acceptance Criteria
Equipment Rinsate Blank	One per every 20 samples (or fewer) collected with non-dedicated equipment	Below MRL[(a)]
Trip Blank	One per sample cooler containing field samples analyzed for VOC	Below MRL[(a)]
Temperature Blank	One per sample cooler	4°C (±2°C)
Field Duplicate	One per every twenty samples (or fewer) per sample matrix	50% RPD[(a)]

Notes

°C = degrees Celsius.

MRL = method reporting limit.

RPD = relative percent difference.

VOC = volatile organic compound.

[(a)]Criteria may change based on data validation.

Appendix A

Select Figures

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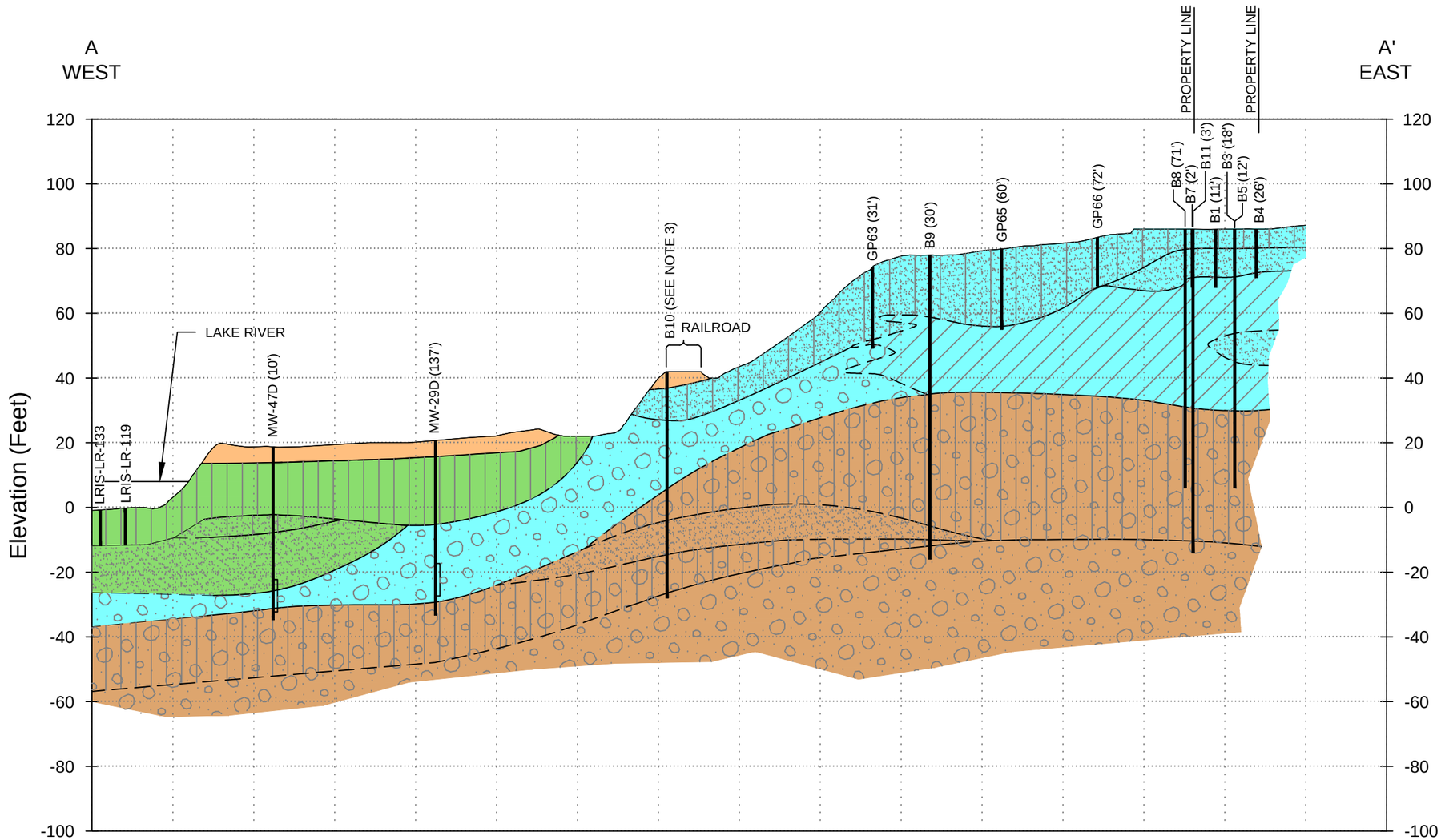
Figure 2-1
Generalized Geologic Cross Section

Former Park Laundry
City of Ridgefield, Washington



PROFILE VIEW OF SECTION
HORIZONTAL SCALE: 1" = 150' VERTICAL SCALE: 1" = 38'
VERTICAL EXAGGERATION: 4

LEGEND:

- FILL

HOLOCENE (ALLUVIUM)

- SILT
- SAND
- SILTY SAND

PLEISTOCENE (ALLUVIUM)

- SAND (UPPER WBZ)
- SILTY SAND
- CLAY (AQUITARD)
- SANDY GRAVEL (UPPER WBZ)

TERTIARY (UPPER TROUTDALE)

- SILTY GRAVEL (AQUITARD)
- SANDY GRAVEL (LOWER WBZ)
- SAND
- LITHOLOGIC CONTACT
- INFERRED LITHOLOGIC CONTACT

NOTES:

1. Borings and Wells are projected perpendicular to the cross section line. Distances in feet are projected from the cross-section line and are shown in parentheses.
2. Actual location of B10 is just east of the railroad although it is shown to the west because of projection.
3. WBZ = Water Bearing Zone.

0 150 300
FEET

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Figure 2-5
Estimated Groundwater Potentiometric Surface Map
September 2016

Former Park Laundry
Union Ridge Investment Company
Ridgefield, Washington

Legend

- Park Laundry Monitoring Well
- Port of Ridgefield Monitoring Well
- Water Level Contour (Feet MSL)
- Groundwater Flow Direction
- Property Boundary

Notes:
1. Park Laundry monitoring well locations were surveyed by Minister-Glaeser on June 23, 2011, March 12, 2012, and April 4, 2013.
2. MSL = mean sea level.
3. Potentiometric surface modeled using ArcGIS 10.4 for Desktop Spatial Analyst Natural Neighbor interpolation tool.

0 100 200
Feet

Source: Aerial photograph (2014) and taxlots (2014) obtained from Clark County GIS; Port monitoring wells obtained from Port of Ridgefield.

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Print Date: 2/23/2017
Approved By: M. D'Andrea
Produced By: rroberts
Project: 8006.31.04

Appendix B

Standard Operating Procedures

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Standard Operating Procedure

Decontamination of Field Equipment

SOP Number: 1
Date: 03/09/2021
Revision Number: 0.1

Scope and Application

This standard operating procedure (SOP) describes the decontamination procedure for field equipment that may come in contact with contaminated media and that Maul Foster & Alongi, Inc. (MFA) staff may reuse at multiple sample locations or sites. Decontamination is performed to reduce the potential for cross-contamination of samples that will be collected with multiuse equipment and that will undergo physical or chemical analyses. Other equipment that is multiuse—not used specifically for sample collection (e.g., water level meter, pump used for well development)—also requires decontamination. Finally, decontamination is necessary to minimize the potential for MFA staff's exposure to chemicals.

Typically, decontamination is not necessary for field equipment that is disposable and intended to be used only once (e.g., disposable bailer). Additionally, this SOP does not apply to equipment used by subcontractors, such as drilling equipment. However, MFA staff should confirm that subcontractors are implementing appropriate decontamination procedures to minimize the potential for cross-contamination of samples or MFA staff's exposure to chemicals.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Nonphosphate detergent solution (e.g., Alconox, Liquinox)
- Distilled and potable water
- Personal protective equipment (as specified in the site-specific health and safety plan)
- Buckets to contain rinsate, brushes, paper towels

Depending on the site conditions and the types of contaminants that may be present, the use of other decontamination materials, such as deionized water, methanol, hexane, or isopropyl alcohol, may be necessary. The need for other materials should be determined prior to fieldwork. The decontamination procedures using other materials should be described in a site-specific sampling and analysis plan (SAP).

Methodology

When the site-specific SAP specifies additional or different requirements for decontamination, it takes precedence over this SOP. In the absence of a SAP, the following procedures shall be used.

General Sampling Procedure:

1. Rinse the equipment with potable water to remove visible soil, petroleum sheen, or contamination.

2. Scrub the equipment with a brush and solution of distilled water and nonphosphate detergent.

3. Rinse the equipment with distilled water.

4. Allow equipment to air dry, or dry it with paper towels.

5. At all times, ensure that the decontaminated equipment is stored so as to prevent it from becoming contaminated while not in use. Depending on the size of the equipment, it can be wrapped with new aluminum foil or placed in a new plastic bag.

Rinsate Storage:

All fluids resulting from equipment decontamination shall initially be contained in a bucket and then transferred to a Department of Transportation-approved container (e.g., 55-gallon drum) stored on site at a location that does not interfere with on-site activities (e.g., vehicle traffic, pedestrian areas). Place a label on each container and include the following information:

- The date on which fluids were placed in the container
- Contents (e.g., “water from equipment decontamination”)
- Contact information, including MFA staff or client phone number

Note that labels on containers exposed to sunlight or precipitation are prone to fading. Use a waterproof, indelible ink pen (e.g., Sharpie®) whenever possible. In the field notebook, keep a detailed inventory of all containers, including the number of containers, the approximate quantity of liquids generated, and a description of the source of the fluids. Provide this information to the MFA project manager. For future reference, take photographs of (1) each drum label, (2) the drum(s), and (3) the drum storage vicinity on site.

Note that some clients and site owners have specific requirements for labeling and storage of containers. The requirements should be determined in advance of the fieldwork.

Standard Operating Procedure

Lithologic Logging

SOP Number: 2
Date: 03/09/2021
Revision Number: 0.1

Scope and Application

This standard operating procedure (SOP) describes the methods for observing and documenting the physical characteristics of unconsolidated geologic materials (soil and sediment) encountered during field investigations. If a Maul Foster & Alongi, Inc. (MFA) project requires hard rock drilling and description of rock core or cuttings, procedures for describing rock should be specified in a project-specific sampling and analysis plan (SAP).

Equipment and Materials Required

The following materials are necessary for this procedure:

- Blank field forms (e.g., boring logs) for documenting observations
- Dry-erase board
- Camera
- Munsell soil color chart (where required)
- MFA field logging checklist

Methodology

When the project-specific SAP specifies additional or different requirements for lithologic logging, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used. MFA uses a combination of the Unified Soil Classification System (USCS) and the ASTM International method D2487 for describing and classifying soil and sediment by visual and manual examination. Before beginning fieldwork, verify with the project manager the logging standard to be used.

Logging Process:

The objective of lithologic logging is to document the physical characteristics of soil and sediment encountered and the changes in characteristics with depth. Typically, changes with depth will define the strata encountered. Therefore, each stratum encountered should be identified and the following characteristics described in the order given:

- Depth interval of each stratum to the nearest tenth of a foot below ground surface
- USCS classification Group Name and Symbol
- Color, using the Munsell color chart
- Grain-size distribution, as percentages of fines (silt and clay combined), sand, and gravel
- Percentages of larger gravels (cobbles and boulders) if present.
- Consistency when the content of fines is 50 percent or greater

- Density when the combined percentage of sand and gravel is 50 percent or greater
- Sand and gravel grain shapes
- Chemical odors, if noticeable
- Structures, if present (e.g., laminae, pores)
- Presence of organic matter (e.g., roots, leaves, twigs, wood fragments)
- Moisture content as “dry,” “moist,” or “wet”
- If possible, a description of the origin of each stratum (e.g., fill, alluvium)

Standard Operating Procedure

Field Screening for VOCs in Soil

SOP Number: 3
Date: 03/09/2021
Revision Number: 0.1

Scope and Application

This standard operating procedure (SOP) describes the use of a photoionization detector (PID) to field screen soil for evidence of organic vapors. The PID measures the organic vapor concentration in parts per million, is not compound-specific.

Never rely on a stand-alone PID reading to identify organic chemical contamination in soil. Always collect multiple PID readings (e.g., at multiple depths along the length of a soil core), since it is the relative difference in concentration between multiple readings (e.g., a sudden increase in concentration at a certain depth interval) that is the typical indictor of contamination. Additionally, PID readings should always be accompanied by observation of the soil samples for other indictors of contamination, such as soil staining or chemical odors, so that these multiple lines of evidence can be used together to identify potential organic chemical contamination in the field.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Personal protective equipment (as specified in the health and safety plan)
- PID with calibration gas
- Ziploc®-type bags
- Field forms or notebook for documenting PID readings

Methodology

When the project-specific sampling and analysis plan (SAP) specifies additional or different requirements for organic vapor field screening, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

The electron volt (eV) rating for the PID lamp (e.g., 9.8, 10.6, 11.7) must be greater than the ionization potential (in eV) of a compound in order for the PID to detect the compound. A lamp of at least 9.8 eV should be used for petroleum hydrocarbons. A lamp of at least 10.6 eV should be used for typical chlorinated alkenes. If the project health and safety plan does not specify the lamp size, verify the compatibility of the lamp size with the anticipated compounds expected to be present in soil prior to the field activities, and confirm with the project manager.

General Sampling Procedure (Heading 3 No Number Style):

Calibration:

- The PID should be calibrated daily (or more frequently, as needed).
- Calibrate the PID according to the manufacturer's instructions.

- Document the calibration activities and results in the field notebook.

Measuring organic vapor content:

- Place a representative volume (generally, a "handful") of freshly exposed soil into a Ziploc-type bag.
- Seal the bag and gently knead the bag to loosen the soil.
- Let the bag set for several minutes to allow organic vapors, if present, to volatilize from the soil into the headspace of the bag.
- Partially open the bag so that the tip of the PID intake tube can be inserted into the bag but is not in contact with the soil, then close the bag seal around the intake tube.
- Record the PID measurement and document results in the field notes or boring log.

Static Sheen Test Procedure and Observations:

Sheen Test Procedure:

- Following the PID screen discussed above, add enough water to cover the soil in the container.
- Observe the water for signs of discoloration/sheen and characterize per the table below.

When static sheen testing is required or when making observations of a water surface the following table presents descriptions to be used (consistent with Department of Ecology Guidance)[1].

No Sheen (NS)	No visible sheen on the water surface
Slight Sheen (SS)	Light, colorless, dull sheen; spread is irregular, not rapid. Natural organic oils or iron bacteria in the soil may produce a slight sheen.
Moderate Sheen (MS)	Pronounced sheen over limited area; probably has some color/iridescence; spread is irregular, may be rapid; sheen does not spread over entire water surface.
Heavy Sheen (HS)	Heavy sheen with pronounced color/iridescence; spread is rapid; the entire water surface is covered with sheen.
Biogenic Film (BF)	False positive results may be generated by the presence of decaying organic matter and iron bacteria, which can produce a rainbow-like sheen similar to an oil sheen. These sheens, unlike oil sheens, can typically be broken up creating platy or blocky fragments when agitated or disturbed. Biogenic films can also be foamy.

[1] Department of Ecology. 2016. Guidance for remediation of petroleum contaminated sites. June.

Standard Operating Procedure

Surface and Subsurface Soil Sample Collection

SOP Number: 4
Date: 09/13/2023
Revision Number: 0.2

Scope and Application

This standard operating procedure (SOP) describes the use of hand tools for collecting surface and subsurface soil samples for physical and/or chemical analysis from drilling cores and samplers (e.g., direct-push macrocores, split spoon samplers) and hand tools (e.g., hand augers, shovels).

Equipment and Materials Required

The following materials are necessary for this procedure:

- Personal protective equipment (as specified in the Health and Safety Plan)
- Tools appropriate for the conditions that may be encountered (e.g., spoon, trowel, shovel, hand auger); tools constructed of stainless steel are preferred.
- Stainless steel bowls
- Tape measure with increments in feet and tenths of a foot.
- Laboratory-supplied sample containers
- Laboratory chain-of-custody form and cooler with ice.
- Equipment decontamination supplies if sampling equipment will be reused between sample locations (see SOP 1 for equipment decontamination procedures).
- Field forms or notebook for documenting the sampling procedures.

Methodology

When the project-specific sampling and analysis plan (SAP) specifies additional or other requirements for soil sampling, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

General Sampling Procedure:

- Don gloves as specified in the Health and Safety Plan; replace gloves with new gloves after each sample is collected.
- Clear the ground surface of brush, root mat, grass, leaves, and other debris, if using hand tools.
- Use the selected hand tool to remove soil to the targeted sample depth. Use a measuring tape to verify that the sample depth is correct and record the depth in the field notebook or boring log.
- Describe and document the soil lithology in accordance with SOP 2.
- Use the selected hand tool to collect soil and homogenize in a decontaminated stainless-steel bowl or a dedicated Ziploc® bag and then transfer the sample to the sample container using hand tools.

- Before sample collection, and to the extent possible, use the selected hand tool to remove organic debris, anthropogenic material (e.g., brick, metal, glass), and gravels larger than 4 millimeters, unless a project-specific SAP directs otherwise.
- When sampling for gasoline-range total petroleum hydrocarbons (gasoline) or volatile organic compounds (VOCs), a subsample will be obtained from a discrete portion of the collected sample. To minimize the potential loss of volatiles during sampling, the subsample shall not be composited or homogenized. The sample container for gasoline and/or VOC analysis will be filled first if additional containers are necessary for other analysis. Specific procedures for collecting samples for gasoline and/or VOC analysis using the U.S. Environmental Protection Agency Method 5035 are specified in SOP 5.
- The sampling device and field equipment will be decontaminated between sample locations in accordance with SOP 1. Alternatively, new, disposable equipment can be used to collect each sample to preclude the need for equipment decontamination.

Backfilling Sample Locations:

Backfill in accordance with federal and state regulations (e.g., Oregon bentonite requirements per OAR 690-240-0035, Washington decommissioning requirements per WAC 173-160-460). Otherwise, manual excavations can be backfilled with excess soil remaining after sample collection, unless the project-specific SAP requires a different backfill procedure.

Standard Operating Procedure

EPA Method 5035 Soil Sampling

SOP Number: 5
Date: 03/09/2021
Revision Number: 0.1

Scope and Application

This standard operating procedure (SOP) describes the methods for obtaining soil samples for chemical analysis for gasoline-range petroleum hydrocarbons (gasoline) and volatile organic compounds (VOCs) by U.S. Environmental Protection Agency Method 5035A.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Sampling equipment (e.g., Terra Core Sampler™ or similar sampler capable of collecting a 5-gram soil sample).
- Laboratory-supplied sample containers:
  - Preweighed and labeled 40-milliliter volatile organic analysis (VOA) vials, including preservative (typically methanol)
  - Two-ounce jar for percent total solids/moisture (if required, confirm with the laboratory)
- Laboratory chain-of-custody form and cooler with ice.
- Equipment decontamination supplies if sampling equipment will be reused between sample locations (see SOP 1 for equipment decontamination procedures).
- Field forms or notebook for documenting the sampling procedures.

Methodology

When the site-specific sampling and analysis plan (SAP) specifies additional or different requirements for soil sampling, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

Laboratory Analytical Considerations:

- VOCs must be analyzed within 14 days of sample collection.
- Samples must be maintained at less than 4°±2°C.
- Discrete VOC samples may be composited at the laboratory.

General Procedure:

- When using the Terra Core Sampler, seat the plunger in the handle.
- Collect the sample by pushing the sampler into the soil until the soil has filled the sampler.
- Remove the sampler and confirm that the soil in it is flush with the mouth of the sampler.

- Wipe all debris from the outside of the sampler. Remove any excess collected soil that extends beyond the mouth of the sampler.
- Rotate the plunger handle 90 degrees until it is aligned with the slots in the body of the sampler. Place the mouth of the sampler into the sample container and extrude the sample into the sample container by pushing the plunger down. Hold the sample at an angle when extruding to minimize splashing of the preservative.
- Immediately remove any soil or debris from the threads of the vial and place the lid on the vial.
- Gently swirl the vial (do not shake) to allow the preservative to uniformly penetrate and wet the soil.
- Repeat process for each additional sample container.
- If required by the laboratory, fill a 2-ounce container to capacity for percent total solids determination.

Standard Operating Procedure

Push-Probe Drilling

SOP Number: 7
Date: 03/09/2021
Revision Number: 0.1

Scope and Application

This standard operating procedure (SOP) describes the use of a push probe (i.e., Geoprobe™) to observe subsurface conditions and collect samples of various environmental media (e.g., soil, sediment, groundwater, soil vapor) for laboratory analysis. Push-probe drilling is generally not suitable for soils with gravel/rock clast larger than about 4 inches in diameter. If gravelly/rocky soils are expected at the project site, consider use of the sonic drilling method described in SOP 8.

Push-probe drilling can be used for a variety of purposes, including:

- Retrieving cores to document subsurface soil or sediment conditions and to obtain samples for physical and/or chemical evaluation
- Sampling soil vapors, using temporary well points
- Collecting reconnaissance groundwater samples from temporary well screens
- Installing permanent monitoring wells

Equipment and Materials Required

The following equipment and materials are necessary for this procedure:

- Push-probe drill rig and operator provided by a subcontractor to MFA. Ensure that the subcontractor is licensed to perform the drilling work.
- Sampling equipment appropriate for the media to be sampled (e.g., water level meter, pumps, hand tools, and pump tubing).
- Laboratory-supplied sample containers.
- Traffic cones, measuring tape, buckets.
- Department of Transportation (DOT)-approved containers (e.g., 55-gallon drum) for storing excess soil and decontamination water; the drums are typically provided by the drilling subcontractor.
- Boring log form and notebook.
- Equipment decontamination supplies if sampling equipment will be reused between sample locations (see SOP 1 for equipment decontamination procedures).
- Personal protective equipment (as required by the project health and safety plan).

Methodology

When the project-specific sampling and analysis plan (SAP) provides additional or different requirements for push-probe drilling, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

Utility Locate:

- Before beginning the fieldwork, assess the proposed drilling location(s) for the presence of overhead and underground utilities, and adjust the locations, as needed, to avoid identified utilities.
- See SOP 18 for the utility locating procedures.

Push-Probe Drilling Process:

- The push-probe drilling rig is equipped with a soil sampling device that retrieves a continuous soil core. A combination of static force and percussion is used to drive the soil sampler into unconsolidated geologic material. A plastic liner placed inside the sampler contains the soil core and permits its removal from the sampler for examination. The sampler is driven into the subsurface, typically in 4- or 5-foot intervals, depending on the length of the sampling device. When each interval depth is reached, the soil sampler is removed from the ground, and the liner is removed to facilitate soil observation and sampling.
- This process is repeated for each soil sample interval until the targeted boring depth is reached.
- Ensure that the drilling subcontractor decontaminates all subsurface equipment before and after each boring. Document the decontamination procedures in the field notebook. Store decontamination water in DOT-approved containers for later off-site disposal.

Logging and Soil Sampling Process:

- Remove the soil core from the sampler for field screening, description, and sampling.
- Describe the lithology in accordance with SOP 2.
- Confirm the required depth interval(s) for soil sample collection and field screening with the MFA project manager, or conduct the work in accordance with the SAP. The sample interval may require adjustment based on core recovery, soil stratigraphy and characteristics, and evidence of contamination. Confirm any adjustments to the sample intervals with the project manager.
- If the project requires field screening for organic vapor, conduct it in accordance with SOP 3.
- If the project requires laboratory analyses for gasoline-range petroleum hydrocarbons or volatile organic compounds, conduct the sampling in accordance with SOP 5.
- Contain all soil core remaining after sample collection in DOT-approved containers for later off-site disposal. See SOP 1 for drum storage, labeling, and documentation procedures.

Reconnaissance Groundwater Sampling Process:

- Typically, reconnaissance groundwater samples are collected at the first occurrence of groundwater in a boring. Confirm the required depth and procedures for groundwater sample collection with the MFA project manager, or conduct the work in accordance with the SAP. If the project requires use of the low-flow sampling method, refer to SOP 9 for the low-flow sampling procedures.
- Reconnaissance groundwater samples are collected using a decontaminated stainless steel or disposable, temporary polyvinyl chloride well screen placed in the boring. If the soils in the boring are fine-grained and may cause excessive turbidity in groundwater, consider using a filter pack

around the screen to reduce turbidity. Alternatively, purging the well screen of groundwater prior to sample collection may also reduce the turbidity. See SOP 9 for purging procedures.

- Purging and sampling will be conducted using a peristaltic pump unless otherwise specified in the SAP. New tubing will be used for each boring. Field parameters (e.g., temperature, conductivity, and pH) will be recorded in accordance with SOP 9 during purging and sampling.

Monitoring Well Installation:

- If the project requires installation of a monitoring well in the boring, refer to SOP 11 for the well installation procedures. Confirm the procedures with the MFA project manager.

Borehole Abandonment Process:

- Abandon each borehole in accordance with local and state regulations/procedures. The abandonment will be performed by the drilling subcontractor.
- The abandonment procedure typically consists of backfilling the boring with granular bentonite and hydrating the bentonite with potable water.
- If the boring was advanced through concrete or asphalt, backfill the boring to about 6 inches below grade to allow for placement of asphalt or concrete in the remaining 6 inches to match the surface conditions.

Standard Operating Procedure

Underground Utility Locates

SOP Number: 18
Date: 03/09/2021
Revision Number: 0.1

Scope and Application

This standard operating procedure (SOP) describes the practices for locating underground utilities. Refer to the MFA health and safety plan (HASP) for additional information regarding communication procedures to be followed when an inadvertent utility strike occurs, as well as regarding methods for mitigating hazards during a utility strike.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Personal protective equipment (as specified in the HASP)
- Marking materials (e.g., marking paint, stakes, flags)
- Field documentation materials

Methodology

When the project-specific sampling and analysis plan (SAP) specifies additional or different requirements for underground utility locates, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

Before Conducting Utility Locates:

- Ensure that the locate will be conducted reasonably soon before the excavation work begins, e.g., within 48 hours. There may be project-specific conditions, e.g., weather and/or ground features that could cause markings to fade, which would require scheduling of the excavation work sooner than 48 hours after the locate.
- Clearly define the boundary of the work and the locations of all proposed excavations. Prepare a map of the project area showing the excavation locations.
- Interview site managers/property owners and obtain plans or drawings, if available, showing on-site utilities.
- For project work that will not take place in the public right-of-way, ensure that the public rights-of-way nearest to the project are identified and communicated during the one-call notification.
- Identify the township and range of the project area. This information can be easily attained by a quick email to MFA's GIS Exchange.
- If feasible, conduct a site visit to identify site conditions that could cause fading or disruption of marking paint. Such conditions could include gravel or ground sensitive to erosion and high traffic.
- Check the weather forecast to assess the potential for snow or rain to make marking utilities difficult or cause the markings to fade.

One-Call Utility Notification:

- If possible, initiate the one-call utility notification at least one week before the proposed work begins.
- Include a map or GPS coordinates when submitting the notification.
- Before conducting any excavation activities, confirm with each public utility that the utility locate has been completed.
- On remote or complicated sites, consider meeting public locators on site.
- Document the one-call ticket number and results in the project files.
- Provide the one-call ticket number to subcontractors who will be doing the excavations.

Private Utility Locate:

- Conduct the private utility locate only after confirmation that the public utility locate has been completed and all public utilities have been marked and the results reviewed by MFA staff who will be overseeing the excavations.
- Meet the private locator on site and participate in the entire private utility locate. Be engaged in the process, ask questions, and take time to walk the site thoroughly with the locator.
- Bring a copy of the one-call utility ticket and results of the one-call utility locater to check against the utility markings on the ground.
- If possible, have a site/property representative knowledgeable of on-site utilities participate in the private utility locate.
- If paint alone may not suffice to ensure clear marking of utilities, add vertical markers such as stakes or flags.
- Visually assess the area of the proposed excavation(s) to identify features potentially indicative of buried utilities. Have the private utility locator examine each feature identified below to assess the presence of buried utilities.
  - Examine adjacent public rights-of-way where public utilities have been marked for evidence of utilities that may extend onto the project site.
  - Identify nearby light poles, telephone poles, electrical utility poles, or other overhead utility poles with wires or conductors that run from the overhead utility, down the pole, and into the ground.
  - Identify the location of gas meters, water meters, or other aboveground junction boxes for evidence of utilities extending from these features into the ground.
  - Examine asphalt and concrete ground surfaces for discontinuities in the surface indicative of utility installations. Discontinuities may include recent patches of asphalt or concrete inlaid within older concrete or asphalt surfaces.
  - Identify manholes and catch basins indicative of buried storm or sanitary sewer pipes. Open manholes to examine the orientation of associated pipes to assess whether the utilities may be present near proposed excavations.
  - Identify tank ports and vent pipes.

- Identify irrigation systems and associated features such as valve boxes and controllers.
- Identify any other signs indicating the presence of buried utilities.
- Be wary of utility marks that suddenly begin or dead end.

Preparing to Perform Subsurface Activities after a Locate:

- Ensure that the markings are still visible when the work begins.
- Adjust locations, as needed, to avoid identified utilities, or use alternative methods such as nonmechanical excavation means (i.e., manual excavation or air-knifing) to a minimum depth of 5 feet.

Table
APWA UNIFORM COLOR CODE

	WHITE—Proposed Excavation
	PINK—Temporary Survey Markings
	RED—Electric Power Lines, Cables, Conduit and Lighting Cables
	YELLOW—Gas, Oil, Steam, Petroleum or Gaseous Materials
	ORANGE—Communication, Alarm or Signal Lines, Cables or Conduit
	BLUE—Potable Water
	PURPLE—Reclaimed Water, Irrigation and Slurry Lines
	GREEN—Sewers and Drain Lines

Source: Uniform Color Codes, ANSI Standard Z535.1. American Public Works Association. Revised 1999.