

Draft Data Gaps Soil and Groundwater Investigation Sampling and Analysis Plan

Raplee Property
Cleanup Site ID #5275

Prepared for:

City of Stanwood

Stanwood Washington

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Prepared by:

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Raplee Property, Cleanup Site ID #5275

*The material and data in this report were prepared
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Abbreviations

bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
the City	City of Stanwood
COC	Chain of Custody
DQO	data quality objective
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FSDS	field sampling data sheet
IAA	Interagency Agreement No. C2400206
IDW	investigation-derived waste
LCS	laboratory control samples
MFA	Maul Foster & Alongi, Inc.
MS/MSD	matrix spike and matrix spike duplicate
NWTPH	Northwest Total Petroleum Hydrocarbon
Property	9816 271st Street NW in Stanwood, Washington
QA	quality assurance
QC	quality control
RI	remedial investigation
RPD	relative percent difference
SAP	sampling and analysis plan
Site	the “Raplee Property” Site
SOP	standard operating procedure.

1 Introduction

Maul Foster & Alongi, Inc. (MFA) prepared this sampling and analysis plan (SAP) to guide field sampling and laboratory analytical activities to be conducted as part of data gaps soil and groundwater investigation on behalf of the City of Stanwood (the City) at 9816 271st Street NW in Stanwood, Washington (the Property) and the City right-of-way (South ROW; see Figure 1-1). The Property is located on Snohomish County parcel 32032400405900 and is currently owned by Kathleen Raplee. It is MFA's understanding that the City is interested in acquiring the Property, cleaning up the Property and Site (if feasible), and redeveloping the Property as a public park that will enhance the downtown corridor.

The Washington Department of Ecology (Ecology) defines the "Raplee Property" Site (the Site; Cleanup Site ID #5275) as the Property and any adjacent properties may be impacted by contamination originating from the Property. The full extent of the Site is not currently known.

The purpose of this SAP is to guide Site investigation activities to address these data gaps in support of a Site cleanup options evaluation.

1.1 Regulatory Framework

This SAP was prepared in accordance with Interagency Agreement No. C2400206 (the IAA), dated May 8, 2024, between the Ecology and the City. The agreement provides funding from Ecology under Revised Code Washington (RCW) 39.34.130 and RCW 39.26.180(3). This SAP was prepared consistent with the requirements of Washington Administrative Code 173-340-820 for SAPs.

1.2 Scope and Purpose

The purpose of this SAP is to describe the requirements for field sampling and laboratory analytical activities associated with the soil and groundwater sampling at the Site. This SAP supplements the *Draft Site Reconnaissance and Data Review Report* (MFA 2024) which provides Site-specific background information, identifies areas of concern identified through prior investigations and historical document review, and describes the scope of the soil and groundwater sampling.

If an unforeseen change in methodology requires modification to this SAP, an addendum describing the specific revision(s), or the alternative procedures used, will be prepared and documented in the forthcoming Data Gaps Investigation and Cleanup Options report. Procedures are provided that will be used to direct the investigation process so that the following conditions are met:

- Data collected are of high quality, representative, and verifiable.
- Data can be used to support development and evaluation of cleanup options.

This SAP describes methods that will be used for sampling environmental media, decontaminating equipment, and managing investigation-derived waste (IDW). It also includes procedures for collecting, analyzing, evaluating, and reporting useful data. This SAP includes quality assurance (QA) procedures for field activities; quality control (QC) procedures; data validation information.

1.3 Report Organization

This document is organized as follows:

- Section 2 describes access and site preparation for fieldwork.
- Section 3 presents soil sampling procedures to be followed during the environmental investigation.
- Section 4 presents groundwater monitoring procedures to be followed during the environmental investigation.
- Section 5 describes field procedures including archeological monitoring.
- Section 6 describes the chemicals of interest and the laboratory test methods.
- Section 7 describes the sample handling procedures.
- Section 8 presents field and laboratory QC practices.
- Section 9 summarizes the review processes to ensure data usability.
- Section 10 defines data quality objectives (DQO) specific to the environmental investigation.
- Section 11 summarizes the reporting objectives.

Standard operating procedures for conducting field activities included in the SAP are provided in Appendix A. Field sampling data sheets for recording field documentation are provided in Appendix B. A health and safety plan describing health and safety procedures to be used while conducting fieldwork activities is provided in Appendix C. An Inadvertent Discovery Plan describing procedures for the discovery of cultural resources and human skeletal remains is provided in Appendix D.

2 Access and Preparation

2.1 Access

Kathleen Raplee is the owner of the Property, and the City is the owner of the South ROW. The City has an access agreement with Kathleen Raplee to conduct a subsurface investigation on the Property. The City will coordinate with Kathleen Raplee and MFA to provide access to the Property to perform the fieldwork described in this SAP.

2.2 Preparation and Coordination

Before subsurface field sampling programs begin at the Site, public and private utility locates will be conducted to identify underground utilities near the proposed sample locations (see standard operating procedure [SOP] 18, Appendix A). MFA will notify the City and Ecology a minimum of 48 hours before field activities begin. A contact list is provided as Table 2-1.

3 Soil Sampling

This section describes the methods for the collection of subsurface soil samples for observation and chemical analysis. The proposed locations of soil samples are shown on Figure 1-1.

3.1 Sampling Methodology

Subsurface soils will be collected from six borings (SB-24 through SB-27, MW-05 and MW-06) advanced with the direct-push drill rig operated by a Washington State-certified driller using industry-standard sampling techniques (see SOPs 02, 03, 04, and 07 in Appendix A). Borings will be advanced up to a depth of 15 feet bgs in accordance with the IAA. Soil conditions and lithology will be noted on field sampling data sheets (FSDSs; see Appendix B).

When a boring is no longer needed, it will be decommissioned with bentonite chips or with bentonite grout in accordance with the Washington Administrative Code for Minimum Standards for Construction and Maintenance of Wells (Washington Administrative Code 173-160, 1998).

Continuous soil cores will be collected for lithologic description, field screening, and chemical analyses, as described below. The anticipated sampling depths and analytical schedule are specified in Table 3-1. Soil cores will be observed for lithologic description and visual or olfactory indications of contamination as well as screened for volatiles with a photoionization detector.

Up to two soil samples will be collected for chemical analysis from depth intervals where staining, sheen, petroleum odor, or organic vapors are present. Should no indications of contamination be encountered in a boring, one soil sample will be collected from the vadose zone just above the capillary fringe.

Samples will be prepared, handled, and documented as follows:

- Soil-sampling equipment will be decontaminated before it is used at each sampling location (see Section 5.1 and SOP 01 [Appendix A]).
- Soil samples will be transferred directly from the sampling device into laboratory-supplied glass jars by hand, using a new, uncontaminated glove; or with a decontaminated stainless-steel spoon, trowel, or knife; or with a laboratory supplied sampling device if applicable for the analysis.
- Large particles (i.e., larger than 0.25 inch) may be removed before the sample is placed in a laboratory-supplied container.
- Sample containers will be labeled, packed in iced shipping containers with chain-of-custody (COC) documentation, and delivered or shipped to the laboratory (see Section 7).
- Sampling information will be recorded in the field notebook, on the geologic boring log (see Appendix B) and on the COC form.

3.2 Sample Nomenclature

Soil samples will be labeled with a prefix to describe the location identification number, an “S” to indicate a soil sample matrix, and the sample depth in feet below ground surface (bgs). The depth interval should be specified as the middle of the sampling interval. For example, a soil sample collected from location SB25 with a sampling interval from 9 to 10 feet bgs will have the sample nomenclature of SB25-S-9.5.

Duplicate soil samples will replace the location number with “DUP,” and the sample will have the same sample time as the primary sample. A duplicate sample of the abovementioned sample would appear as SBDUP-S-9.5.

Relevant soil sample information will be documented on the boring log (see Appendix B).

4 Groundwater Sampling

4.1 Sampling Methodology

One reconnaissance groundwater sample will be collected from each of the four soil borings, SB-24 through SB-27, if groundwater is encountered during drilling. Reconnaissance groundwater samples will be collected using a temporary polyvinyl chloride well screen and riser in conjunction with a peristaltic pump and dedicated polyethylene tubing (see SOP 09 in Appendix A).

Groundwater samples will also be collected from the four existing monitoring wells at the Site (MW-01 through MW-04) and two new monitoring wells installed at the remaining two soil borings without reconnaissance groundwater sample collection (MW-05 and MW-06). New monitoring wells will be installed following SOP 11 for installation of monitoring wells and the WAC for Minimum Standards for Construction and Maintenance of Wells (WAC 173-160). The two new wells will be installed with 10-foot screens targeting the water table if feasible. All monitoring wells at the Site (MW-01 through MW-06) will have their horizontal locations and vertical elevations surveyed by a surveyor licensed in the State of Washington.

Monitoring wells will be developed or redeveloped at least 24 hours prior to sampling and no sooner than 24 hours following their installation. Field staff will follow the well development procedures described in SOP 12 (Appendix A).

Before collecting groundwater samples from temporary wells or monitoring wells, the water level will be measured (see SOP 13 in Appendix A), and the well will be purged. The well should be purged at a low flow rate (e.g., 0.1 to 0.5 liter per minute). A minimum of one well volume will be purged before sample collection, or purging will continue until selected water quality field parameters (e.g., temperature, specific conductance, pH, turbidity) have stabilized. If the well goes dry during purging, a sample can be collected once the boring recharges enough water.

During purging, the flow rates, water levels, and water quality parameters will be recorded on an appropriate field form or in the field notes. Groundwater will be transferred directly into laboratory-supplied containers specific to the analysis required.

Sample containers will be labeled, packed in iced shipping containers with COC documentation, and delivered or shipped to the laboratory (see Section 7). Sampling information will be recorded in a field notebook, on an FSDS (see Appendix B), and on the COC form.

4.2 Sample Nomenclature

Groundwater samples will be labeled with a prefix to describe the sampling location identification number, a “W” to indicate a groundwater sample matrix, and the midpoint of the screened or open area sample depth in feet. For example, a groundwater sample collected from monitoring well MWO1 with its screen interval from 5 feet to 15 feet bgs will have the sample nomenclature of MWO1-W-10.0.

Duplicate reconnaissance groundwater samples will replace the location number with “DUP,” and the sample will have the same sample time as the primary sample. A duplicate sample of the abovementioned sample would appear as MWDUP-W-10.0.

Relevant sample information will be documented on the exploratory boring log or an FSDS (see Appendix B); documentation may include items such as the screened interval or open space, equipment used, water quality field parameters, and the amount of water purged before sampling. The screened interval of temporary wells and new monitoring wells will be recorded on the boring log.

5 Field Procedures

5.1 Sampling Equipment Decontamination

Non-disposable sampling equipment and reusable materials that contact the soil or water will be decontaminated on Site and before and after each sample collection (see SOP 01 in Appendix A). Decontamination will consist of the following:

- Tap-water rinse. Visible soil to be removed by scrubbing.
- Non-phosphate detergent wash, consisting of a dilute mixture of Liqui-Nox (or equivalent) and tap water.
- Distilled-water rinse.
- Allow equipment to air dry, or dry it with paper towels.

Decontamination fluids will be transferred to drums and managed as described in Section 5.2.

5.2 Management of Investigation-Derived Waste

IDW may include items such as soil cuttings, decontamination fluids, sampling debris, and personal protective equipment. The IDW will be separated into solids, liquids, and sampling debris (e.g., personal protective equipment). IDW will be stored in a designated area on the Site in a secure drum(s).

Drums will be labeled with their contents, the approximate volume of material, the date of collection, and the origin of the material. The drums will be sealed, secured, and transferred to a designated area at the Site, pending characterization. Analytical data from the soil and groundwater sampling activities may be used to characterize the soil cuttings, sampling debris, purge water, and decontamination fluids generated during the investigation.

5.3 Archeological Monitoring

A professional archeologist with Environmental Science Associates will monitoring ground disturbing activities for cultural resources during the investigation and provide training to field personnel pertaining to cultural resource protection during ground disturbing activities. An Inadvertent Discovery Plan describing procedures for the discovery of cultural resources and human skeletal remains is provided in Appendix D. In addition to the Inadvertent Discovery Plan, Environmental Science Associates will prepare an Archeological Monitoring Plan to be submitted to Ecology prior to commencement of drilling.

6 Analytical Methods

In accordance with the QA/QC requirements set forth in this SAP, Friedman & Bruya, a laboratory accredited by the State of Washington and the National Environmental Laboratory Accreditation, will perform the laboratory analyses for the soil and groundwater samples collected at the Site. Soil and groundwater samples collected at the Site will be analyzed for the following:

- Total diesel- and oil-range petroleum hydrocarbons by the Northwest Total Petroleum Hydrocarbon (NWTPH)-Dx method (with and without silica gel cleanup).
- Total gasoline-range petroleum hydrocarbons by the NWTPH-Gx method.
- Benzene, toluene, ethylbenzene, and xylenes (BTEX collectively) by U.S. Environmental Protection Agency (EPA) Method 8021B.

The analytical methods and performance criteria for the analyses are provided in Tables 5-1 and 5-2.

7 Sample Handling

7.1 Preservation

Soil and groundwater samples will be collected in laboratory-supplied containers with appropriate preservation per analytical method requirements, as outlined in Table 6-1. The samples will be stored in iced coolers at approximately 4 degrees Celsius.

7.2 Sample Packing and Shipping

Soil and groundwater samples will be stored in iced coolers, and then transported to the analytical laboratory via courier or shipping service.

7.3 Sample Custody

Sample custody will be tracked from point of origin through analysis and disposal using a COC form filled out with the appropriate sample and analytical information.

The following items will be recorded on the COC form:

- Project name
- Project number
- MFA project manager
- Sampler name(s)
- Sample number, date and time collected, media, number of bottles submitted
- Requested analyses for each sample
- Type of data package required
- Turnaround requirements
- Signature, printed name, and organization name of persons having custody of samples, and date and time of transfer
- Additional instructions or considerations that would affect analysis (nonaqueous layers, archiving, etc.)

Persons in possession of the samples will be required to sign and date the COC form whenever samples are transferred between individuals or organizations. The COC will be included in the shipping containers. The laboratory will implement its in-house custody procedures, which begin when sample custody is transferred to laboratory personnel.

At the analytical laboratory, a designated sample custodian will accept custody of the samples and will verify that the COC form matches the samples received. The shipping container or set of containers is given a laboratory identification number, and each sample is assigned a unique sequential identification number.

8 Quality Control

8.1 Field Quality Control Samples

The occurrence of field contamination will be assessed through the analysis of a variety of sample blanks described below (see Table 7-1).

8.1.1 Field Duplicates

Field duplicate samples are collected to assess reproducibility of field procedures. One duplicate sample will be collected per twenty (or fewer) samples per soil and aqueous matrix. It is anticipated that at least one field duplicate soil and one field duplicate groundwater sample will be collected. It is noted that sample heterogeneity for nonaqueous matrices may affect the measured precision for the duplicate sample.

8.1.2 Equipment Rinsate Blanks

If nondedicated equipment is used, equipment blanks will be used to assess the efficiency of field equipment decontamination procedures in preventing cross-contamination of samples.

Analyses of equipment rinsate blanks will be used to assess the efficiency of field equipment decontamination procedures in preventing cross-contamination of samples. Rinsate blanks used to assess the efficiency of field equipment decontamination procedures will be collected at the end of each day of field sampling. Equipment rinsate blanks will be collected by pouring certified distilled water over or through decontaminated (clean) sampling equipment used in the collection of investigative samples and subsequently collected in prepared sampling containers. Additives or preservatives will be included in the equipment rinsate blanks as required for analysis. The rinsate blank will be shipped with the associated field samples.

For each sample matrix, a rinsate blank will be collected and analyzed at a minimum frequency of one equipment rinsate blank per 20 samples for each day of sample collection. Rinsate blanks will not be required if dedicated equipment is used for sampling. The rinsate blanks will be analyzed for the same parameters as the investigative samples.

8.1.3 Trip Blanks

Trip blanks are collected for volatile organic compound sample analysis to assess the contamination of samples during transport to the Site, sampling collection, and transport to the laboratory. Trip blanks are prepared in the laboratory, using analyte-free water. Trip blanks should be inspected for air bubbles by both the laboratory (before shipping) and the field team. Any vials containing visible air bubbles should be discarded. One trip blank is included for each sample cooler collected for analysis of BTEXs and shipped to the laboratory. The criterion for trip blanks is that target analyte concentrations must be below the method reporting limits. Consistent with EPA data validation guidelines, analytical results for investigative samples will be qualified if the target analyte is detected in the trip blank.

One trip blank will be included per batch of samples submitted to the analytical laboratory.

8.1.4 Temperature Blanks

Temperature blanks are prepared by the laboratory, using analyte-free (reagent) water. Temperature blanks are used by the laboratory to record the temperature of each cooler used to transport samples from the field to the laboratory. Each cooler containing samples that require temperature preservation will contain a temperature blank. The laboratory will verify that the temperature blank measurement is within the acceptable range specific to the analytical method.

8.2 Laboratory Quality Control Samples

In the laboratory, QC samples may include matrix spike and matrix spike duplicate (MS/MSD) samples, laboratory control samples (LCSs), surrogate spike samples, and method blanks, as well as other QC samples and procedures as required by the individual methods.

8.2.1 Calibration Verification

Instruments will initially be calibrated at the start of the project or sample run, as required, and when any ongoing calibration does not meet control criteria. The number of points used in the initial calibration is defined in the analytical method. Calibration will be continued as specified in the analytical method to track instrument performance. If a continuing calibration does not meet control limits, analysis of project samples will be suspended until the source of the control failure is either eliminated or reduced to within control specifications.

8.2.2 Method Blanks

Method blanks are prepared using analyte-free (reagent) water and are processed with the same methodology (e.g., extraction, digestion) as the associated investigative samples. Method blanks are used to document contamination resulting in the laboratory from the analytical process. A method blank shall be prepared and analyzed in every analytical batch. The method blank results are used to verify that reagents and preparation do not impart unacceptable bias to the investigative sample results. The presence of analytes in the method blank sample will be evaluated against method-specific thresholds. If analytes are present in the method blank above the method-specific threshold, corrective action will be taken to eliminate the source of contamination before proceeding with analysis. Investigative samples of an analytical batch associated with method blank results outside acceptance limits will be qualified as appropriate by the data validation contractor.

8.2.3 Laboratory Control Samples

LCSs are prepared by spiking laboratory-certified, reagent-grade water with the analytes of interest or a certified reference material that has been prepared and analyzed. The result for percent recovery of the LCS is a data quality indicator of the accuracy of the analytical method and laboratory performance.

8.2.4 Laboratory Duplicate Samples

Laboratory duplicate samples are prepared by the laboratory by splitting an investigative sample into two separate aliquots and performing separate sample preparation and analysis on each aliquot. The results for relative percent difference (RPD) of the primary investigative sample and the respective laboratory duplicate samples are used to measure precision in the analytical method and laboratory performance. For nonaqueous matrices, sample heterogeneity may affect the measured precision for the laboratory duplicate samples.

8.2.5 Matrix Spike/Matrix Spike Duplicate

MS samples are analyzed to assess the matrix effects on the accuracy of analytical measurements. MS/MSD samples will be prepared by spiking investigative samples with known amounts of analytes before extraction and preparation and analysis. The recoveries for the MS/MSD samples will be used

to assess the accuracy and precision in the analytical method by measuring how well the analytical method recovers the target compounds in the investigative matrices. For each matrix type, at least one set of MS/MSD samples will be analyzed for each batch of samples for every 20 (or fewer) samples received.

8.2.6 Surrogate Spikes

Surrogate spiking consists of adding reference compounds to samples before sample preparation for organic analysis. Surrogate compound spiking is used to assess method accuracy on a sample-specific basis. Surrogate compounds will be added to samples in accordance with the analytical method requirements. Surrogate recoveries will be reported by the laboratory along with method-based or method performance-based surrogate percent recovery acceptance limits. The laboratory will not correct sample results using these recoveries.

8.3 Instrumentation

8.3.1 Field Instrumentation Calibration and Maintenance

Field instruments may be used during the investigations. The following field equipment may require calibration before use and periodically during sampling activities:

- Photoionization detector
- Water quality meter, including pH, conductivity, and temperature
- Turbidity meter
- Electronic water-level probe

Field-instrument calibration and preventive maintenance will follow the manufacturers' guidelines, and deviations from the established guidelines will be documented. Generally, field instruments should be calibrated before work begins. Field personnel may decide to calibrate more than once a day if inconsistent or unusual readings occur, or if conditions warrant more frequent calibration. Calibration activities should be recorded in logbooks or field notebooks. To ensure that field instruments are properly calibrated and remain operable, the following procedures will be used, at a minimum:

- Operation, maintenance, and calibration will be performed in accordance with the instrument manufacturers' specifications.
- Standards used to calibrate field instruments will meet the minimum requirements for source and purity recommended in the equipment operation manual. Standards will be checked for expiration dates that may be printed on the bottle. Standards that have expired should not be used.
- Acceptable criteria for calibration will be based on the limits set in the operations manual.
- Users of the equipment should be trained in the proper calibration and operation of the instrument.
- Operation and maintenance manuals for each field instrument should be available to persons using the equipment.

- Field instruments will be inspected before they are taken to the Site.
- Field instruments will be calibrated at the start of each workday. Meters will be recalibrated, as necessary, during the work period.
- Calibration procedures (including items such as time, standards used, and calibration results) should be recorded in a field notebook. The information should be available if problems are encountered.

Preventive maintenance of field instruments and equipment will follow the operations manuals. A schedule of preventive-maintenance activities should be followed to minimize downtime and ensure the accuracy of measurement systems. Maintenance will be documented in the field notebook.

8.3.2 Laboratory Instrumentation Calibration and Maintenance

Specific laboratory instrument calibration procedures, frequency of calibration, and preparation of calibration standards will be according to the method requirements as developed by the EPA, following procedures presented in EPA Method Solid Waste-846 (EPA 1986).

Preventive maintenance of laboratory equipment will be the responsibility of the laboratory personnel and analysts. This maintenance includes routine care and cleaning of instruments and inspection and monitoring of carrier gases, solvents, and glassware used in analyses. The preventive-maintenance approach for specific equipment should follow the manufacturers' specifications, good laboratory practices, and industry standard techniques.

Precision and accuracy data will be examined for trends and excursions beyond control limits to determine evidence of instrument malfunction. Maintenance should be performed when an instrument begins to change, as indicated by the degradation of peak resolution, shift in calibration curves, decrease in sensitivity, or failure to meet any QC criterion.

9 Data Reduction, Validation, and Reporting

The analytical laboratory will submit analytical data packages that include laboratory QA/QC results to permit independent and conclusive determination of data quality. MFA will determine data quality, using the data evaluation procedures described in this section. The results of the MFA evaluation will be used to determine if the project data quality objectives are met.

9.1 Field Data Reduction

Daily internal QC checks will be performed for field activities. Checks will consist of reviewing field notes and field activity memoranda to confirm that the specified measurements, calibrations, and procedures are being followed. The need for corrective action will be assessed on an ongoing basis, in consultation with the project manager.

9.2 Laboratory Evaluation

Initial data reduction, evaluation, and reporting at the analytical laboratory will be carried out as described in EPA SW-846 manuals for analyses (EPA 1986), as appropriate. Additional laboratory data qualifiers may be defined and reported to further explain the laboratory's QC concerns about a particular sample result. Additional data qualifiers will be defined in the laboratory's case narrative reports.

9.3 Data Deliverables

Laboratory data deliverables are listed below. Electronic deliverables will contain the same data that are presented in the hard-copy report.

- Transmittal cover letter
- Case narrative
- Analytical results
- COC form
- Method blank results
- Laboratory duplicate results
- MS/MSD results
- Surrogate recoveries

9.4 MFA Evaluation

9.4.1 Data QA/QC Review

MFA will evaluate the laboratory data for precision, completeness, accuracy, and compliance with the analytical method. MFA will review data according to applicable sections of EPA inorganics and organics procedures (EPA 2020a, 2020b), as well as appropriate laboratory, method-specific guidelines (EPA 1986).

Data qualifiers, as defined by the EPA, are used to classify sample data according to their conformance to QC requirements. Common qualifiers are listed below:

- J—Estimate, qualitatively correct but quantitatively suspect.
- R—Reject, data not suitable for any purpose. The analyte may or may not be present in the sample.
- U—Not detected at a specified reporting limit.

Poor surrogate recovery, blank contamination, or calibration problems, among other things, can require qualification of the sample data. The reasons for sample qualification should be stated in the data evaluation report.

QC criteria not defined in the guidelines for evaluating analytical data are adopted, where appropriate, from the analytical method.

The following information will be reviewed during data evaluation, as applicable:

- Sampling locations and blind sample numbers
- Sampling dates
- Requested analysis
- COC documentation
- Sample preservation
- Holding times
- Method blanks
- Surrogate recoveries
- LCS results
- Laboratory duplicates (if analyzed)
- MS/MSD results
- Field duplicates
- Field blanks
- Method reporting limits above requested levels
- Additional comments or difficulties reported by the laboratory
- Overall assessment

The results of the data evaluation review will be summarized for each data package. Data qualifiers will be assigned to sample results on the basis of EPA guidelines, as applicable.

9.4.2 Data Management and Reduction

MFA uses a database (e.g., EQUIS) to manage laboratory data. The laboratory will provide the analytical results in electronic, EQUIS-compatible format. Following data evaluation, data qualifiers will be entered into the database.

Data may be reduced to summarize particular data sets and to aid interpretation of the results. Statistical analyses may also be applied to results. Data reduction QC checks will be performed on hand-entered data, calculations, and data graphically displayed. Data may be further reduced and managed using one or more of the following computer software applications:

- Microsoft Excel (spreadsheet)
- EQUIS (database)
- Microsoft Access (database)
- AutoCAD and/or ArcGIS (graphics)
- EPA ProUCL (statistical software)

10 Data Quality Objectives

The DQOs are used to establish performance and acceptance criteria, which serve as the basis for designing a plan for collecting data of sufficient quality and quantity to support the goals of the study (EPA 2006). The seven steps of the DQO process outlined by the EPA are as follows:

- State the problem—Define the problem; identify members of the planning team; define the budget and schedule
- Identify the goal of the study—State how environmental data will be used to meet study objectives and solve the problem; identify study questions; define alternative outcomes
- Identify information inputs—Identify data and information needed to answer study questions
- Define the boundaries of the study—Specify target population and characteristics of interest; define spatial and temporal limits; define scale of inference
- Develop the analytic approach—Define parameters of interest; specify type of inference; develop logic for drawing conclusions from findings
- Specify performance or acceptance criteria—Specify criteria for new data collection (performance metrics) and decision making (probability limits)
- Develop the plan for obtaining data—Develop the SAP

This SAP for environmental data collection was developed using the DQO process and presents performance metrics for collection and analysis for soil and water that will be sampled.

Decision criteria will be identified and based on comparison of analytical laboratory results to applicable screening and action levels.

10.1 Data Precision

Precision is the measure of agreement among repeated measurements of the same property under identical or substantially similar conditions, calculated as either the range or the standard deviation (EPA 2002). Precision is measured by making repeated analyses on the same analytical instrument (laboratory duplicates) or replicate collections of samples in the field (field duplicates). Precision criteria are expressed as the RPD between the primary and duplicate samples. The acceptance limits for RPD are based on the sample matrix and the analytical method used.

10.2 Data Bias

Bias is defined as the systematic or persistent distortion of a measurement process that causes error in one direction (EPA 2002). Data bias is addressed in the field and the laboratory through equipment calibration, collection and analysis of QC blank samples, and analysis of QC standard samples.

10.3 Data Accuracy

Accuracy is defined as the measure of the overall agreement of a measurement to a known value and includes a combination of random error (precision) and systematic error (bias) components of both sampling and analytical operations (EPA 2002). Since the “true” concentration of sampled media is not known, the degree of accuracy in the measurement is inferred from recovery data determined by sample spiking and/or the analyses of reference standards. The criterion for accuracy is expressed as the percent recovery of the sample spiking. The acceptance limits for percent recovery are based on the analytical method used.

Percent recovery is calculated using the equation:

$$\text{Percent Recovery} = \frac{x_{ss} - x_s}{T} \times 100\%$$

Where:

x_{ss} = result for spiked sample

x_s = result for sample

T = true value of added spike

10.4 Data Completeness

Data completeness is defined as a measure of the amount of valid data needed from a measurement system (EPA 2002). It is measured as the total number of samples collected for which the valid analytical data are obtained divided by the total number of samples collected and multiplied by 100.

10.5 Data Representativeness

Data representativeness is a qualitative term that expresses “the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition” (EPA 2002). Data representativeness is evaluated by assessing the accuracy and precision of the sampling program. The criterion for evaluating representativeness will be satisfied by confirming that the sample collection procedures are consistently followed.

10.6 Data Comparability

Data comparability is a qualitative term expressing the measure of confidence with which one data set can be compared to another and can be combined for decision-making purposes (EPA 2002). Data comparability will be achieved by using standard sampling and operating procedures and analytical methods. Data comparability will be assessed using documentation of QA/QC procedures.

10.7 Data Sensitivity

Data sensitivity is defined as the capability of a method or instrument to discriminate between measurement responses representing different levels of the variable of interest (EPA 2002). Results measured between the reporting limits and method detection limits will be reported for all analytes and assigned the appropriate qualifier.

11 Reporting

The data and its preliminary screening to Model Toxics Control Act (MTCA) Method A cleanup levels will be included in the forthcoming Data Gaps Investigation and Cleanup Options Report. Environmental data will be submitted to Ecology using the Environmental Information Management System.

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References

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- EPA. 1986. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. EPA publication SW-846. 3rd ed. U.S. Environmental Protection Agency. Final updates I (1993), II (1995), IIA (1994), IIB (1995), III (1997), IIIA (1999), IIIB (2005), IV (2008), V (2015), VI phase I (2017), VI phase II (2018), VI phase III (2019), VII phase I (2019), and VII phase II (2020).
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- MFA. 2024. *Draft Site Reconnaissance and Data Review Report, Raplee Property, Cleanup Site ID # 5275*. Prepared for City of Stanwood. Maul Foster & Alongi, Inc.: Bellingham, WA. August 5.

Limitations

The services undertaken in completing this report 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 report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report 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 report.

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Figure

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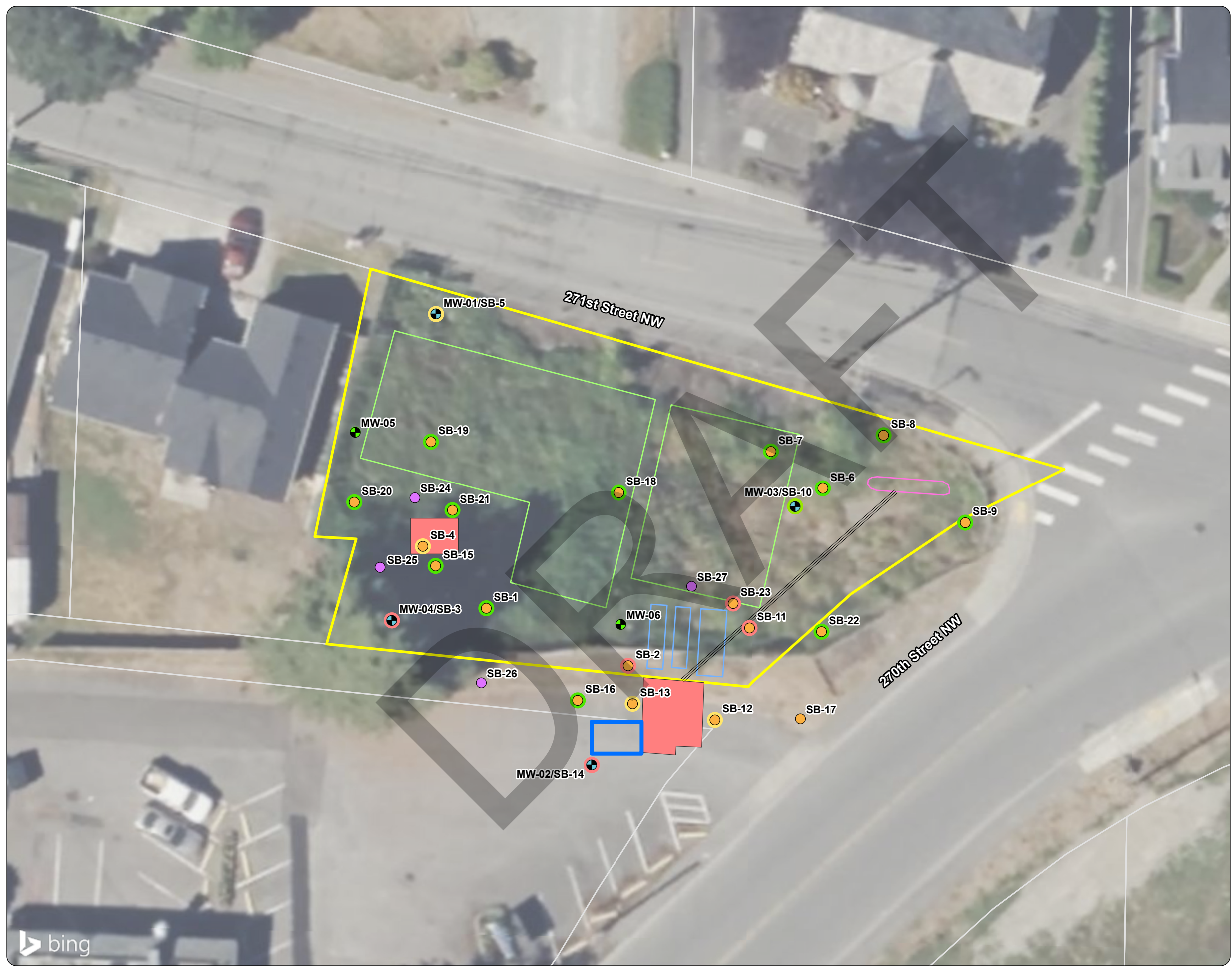
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Project: 1030.08 Produced By: gjaravata Approved By: Print Date: 7/31/2024 Path: X:\10_MFA_Projects\1030\08\003\Pro\M1030_08_003_001.aprx

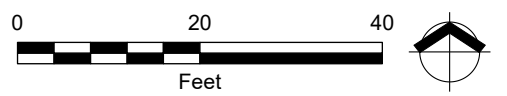
**Figure 1-1
Previous Sample Results
and Proposed Sample
Locations**
Raplee Property
Stanwood, Washington

Legend

- Historical Soil Borings
- Monitoring Well
- Former Product Lines
- Tax Lot
- Existing UST
- Former Building
- Former Service Island
- Former UST
- GPR Anomaly
- Property Parcel
- Proposed Boring
- Proposed Monitoring Well



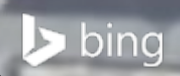
Notes:
 All property feature locations are approximate and were obtained from previous reports (Pinnacle 2005; SAIC 2006).
 Green halo = Petroleum, BTEX, or lead non-detect or detected below 0.1 × the CUL.
 Yellow halo = Petroleum, BTEX, or lead detected between the CUL and 0.1 × the CUL.
 Red halo = Petroleum, BTEX, or lead detected above the CUL.
 BTEX = benzene, toluene, ethylbenzene, and xylenes.
 CUL = MTCA Method A or Method B vapor intrusion cleanup level
 Petroleum = gasoline-range hydrocarbons, diesel-range hydrocarbons, and/or motor oil range hydrocarbons.
 UST = underground storage tank.
 No samples were collected at SB-17.



Source: Aerial imagery obtained from Bing. Property boundary obtained from Snohomish County GIS.



This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.



Tables

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**Table 2-1
Contact List
Raplee Property
City of Stanwood**

Contact Name	Title	Organization	E-mail	Telephone
Alan Lytton	Remedial Action Grant Recipient	City of Stanwood	alan.lytton@ci.stanwood.wa.us	360-502-1326
Olu Akeroro	Ecology Site Manager	Ecology	oake461@ecy.wa.gov	206.594.0116
Phil Wiescher	MFA Program Manager	MFA	pwiescher@maulfoster.com	503-407-1036
Carolyn Wise	MFA Project Manager	MFA	cwise@maulfoster.com	360-690-5982
Nicole Bruneel	MFA Health and Safety Coordinator	MFA	nbruneel@maulfoster.com	208-949-3981
Christian Sifford	MFA Field Team Leader/On-Site Safety Officer	MFA	csifford@maulfoster.com	541-391-3652
Mary Benzinger	MFA Quality Assurance Manager	MFA	mbenzinger@maulfoster.com	503-501-5247
Chris Lockwood	ESA Cultural Resources Director	ESA	clockwood@esassoc.com	206-204-6956
Bryan Hoyt	ESA Archeologist	ESA	bhoyt@esassoc.com	206-204-6955
Notes Ecology = Washington State Department of Ecology. ESA = Environmental Science Associates. MFA = Maul Foster & Alongi, Inc.				

**Table 3-1
Sampling and Analysis Summary
Raplee Property
City of Stanwood**



Location ID	Location Type	Total Depth	Sample Matrix	Number of Samples	Collection Depth/Screen Interval (feet bgs)	Analytical Suite		
						GRO	DRO/ORO	BTEX
SB-24	Boring	15 ft bgs	Soil	Up to 2	Depth of observed impacts ^(a)	X	X	X
			Groundwater	1	5 - 15	X	X	X
SB-25	Boring	15 ft bgs	Soil	Up to 2	Depth of observed impacts ^(a)	X	X	X
			Groundwater	1	5 - 15	X	X	X
SB-26	Boring	15 ft bgs	Soil	Up to 2	Depth of observed impacts ^(a)	X	X	X
			Groundwater	1	5 - 15	X	X	X
SB-27	Boring	15 ft bgs	Soil	Up to 2	Depth of observed impacts ^(a)	X	X	X
			Groundwater	1	5 - 15	X	X	X
MW-05	New Monitoring Well	15 ft bgs	Soil	Up to 2	Depth of observed impacts ^(a)	X	X	X
			Groundwater	1	4 - 14	X	X	X
MW-06	New Monitoring Well	15 ft bgs	Soil	Up to 2	Depth of observed impacts ^(a)	X	X	X
			Groundwater	1	4 - 14	X	X	X
MW-01	Existing Monitoring Well	14.17 ft TOC	Groundwater	1	5 - 15	X	X	X
MW-02	Existing Monitoring Well	14.46 ft TOC	Groundwater	1	4 - 14	X	X	X
MW-03	Existing Monitoring Well	13.56 ft TOC	Groundwater	1	4 - 14	X	X	X
MW-04	Existing Monitoring Well	13.76 ft TOC	Groundwater	1	4 - 14	X	X	X
Field Duplicate	Boring	--	Soil	1	Depth of observed impacts	X	X	X
	Monitoring Well	--	Groundwater	1	4 - 14	X	X	X
MS/MSD	Boring	--	Soil	1	Depth of observed impacts	X	X	X
	Monitoring Well	--	Groundwater	1	4 - 14	X	X	X
Trip Blank	--	--	Water	1	--	--	--	X

Notes

Locations of field duplicates and MS/MSD samples will be determined in the field.

-- = not applicable.

BTEX = benzene, toluene, ethylbenzene, and xylenes.

DRO/ORO = diesel- and oil-range organics.

GRO = gasoline-range organics.

MS/MSD = matrix spike/matrix spike duplicate.

^(a)If no impacts are observed during drilling, one sample will be collected from the vadose zone just above the capillary fringe.

Table 5-1
Soil: Analytical Methods and Performance Criteria
Raplee Property
City of Stanwood

Analyte	MRL (mg/kg) ^(a)	Preferred Analytical Method	MS Accuracy (Percent) ^(b)	Precision (RPD) ^(b)	LCS Accuracy (Percent) ^(b)	Completeness (Percent)
Total Petroleum Hydrocarbons						
Gasoline-range organics	5	NWTPH-Gx	70-130	20	70-130	90
Diesel-range organics	25	NWTPH-Dx	63-146	20	77-123	90
Oil-range organics	125	NWTPH-Dx	NA	NA	NA	90
BTEX						
Benzene	0.02	EPA 8021B	66-121	20	66-121	90
Toluene	0.02	EPA 8021B	72-128	20	72-128	90
Ethylbenzene	0.02	EPA 8021B	69-132	20	69-132	90
Xylenes	0.06	EPA 8021B	69-131	20	69-131	90
<p>Notes</p> <p>BTEX = benzene, toluene, ethylbenzene, and xylenes.</p> <p>EPA = U.S. Environmental Protection Agency.</p> <p>LCS = laboratory control sample.</p> <p>mg/kg = milligrams per kilogram.</p> <p>MRL = method reporting limit.</p> <p>MS = matrix spike.</p> <p>NV = no value.</p> <p>RPD = relative percent difference.</p> <p>^(a)MRL based on values received from Friedman & Bruya, Inc. Actual MRL may differ, based on percent moisture, sample matrix, and/or dilutions.</p> <p>^(b)MS accuracy, precision, and LCS accuracy acceptance criteria are performance-based and may be updated by the laboratory.</p>						

Table 5-2
Groundwater: Analytical Methods and Performance Criteria
Raplee Property
City of Stanwood

Analyte	MRL (ug/L) ^(a)	Preferred Analytical Method	MS Accuracy (Percent) ^(b)	Precision (RPD) ^(b)	LCS Accuracy (Percent) ^(b)	Completeness (Percent)
Total Petroleum Hydrocarbons						
Gasoline-range organics	100	NWTHP-Gx	70-130	20	70-130	90
Diesel-range organics	50	NWTPH-Dx	65-151	20	65-151	90
Oil-range organics	250	NWTPH-Dx	NV	NV	NV	90
BTEX						
Benzene	1	EPA 8021B	70-130	20	70-130	90
Toluene	1	EPA 8021B	70-130	20	70-130	90
Ethylbenzene	1	EPA 8021B	70-130	20	70-130	90
Xylenes	3	EPA 8021B	70-130	20	70-130	90
<p>Notes</p> <p>BTEX = benzene, toluene, ethylbenzene, and xylenes. EPA = U.S. Environmental Protection Agency. LCS = laboratory control sample. mg/kg = milligrams per kilogram. MRL = method reporting limit. MS = matrix spike. NV = no value. RPD = relative percent difference.</p> <p>^(a)MRL based on values received from Friedman & Bruya, Inc. Actual MRL may differ, based on percent moisture, sample matrix, and/or dilutions. ^(b)MS accuracy, precision, and LCS accuracy acceptance criteria are performance-based and may be updated by the laboratory.</p>						

**Table 6-1
Containers, Preservation, and Holding Times
Raplee Property
City of Stanwood**

Matrix	Method	Analysis	Preservative ^(a)	Holding Time (Days)	Sample Container
Soil	NWTPH-Dx	Diesel- and oil-range organics	None	14	4-oz glass jar
	NWTPH-Gx	Gasoline-range organics	MeOH	14	EPA 5035 kit ^(b)
	EPA 8021B	BTEX		14	
Groundwater	NWTPH-Dx	Diesel- and oil-range organics	HCl	14	500-mL amber glass bottle
	NWTPH-Gx	Gasoline-range organics	HCl	14	3 x 40-mL VOA
	EPA 8021B	BTEX		14	

Notes

BTEX = benzene, toluene, ethylbenzene, and xylenes.

EPA = U.S. Environmental Protection Agency.

HCl = hydrochloric acid.

MeOH = methanol.

mL = milliliter.

NWTPH = Northwest Total Petroleum Hydrocarbons.

oz = ounces.

VOA = volatile organic analysis.

^(a)All samples must be stored at 0-6 degrees Celsius.

^(b)5035A sample kit includes one pre-tared 40-mL VOA vial with 5 mL of sodium bisulfate, two pre-tared 40-mL VOA vials with 5 mL of methanol, and one unpreserved 40-mL VOA for moisture content determination

Table 7-1
QC Sample Requirement Summary
Raplee Property
City of Stanwood



QC Check Sample	Sample Matrix		Frequency
	Soil	GW	
Equipment Rinsate Blanks	Yes	Yes	One per every 20 samples (or fewer) each day of sample collection for samples collected with non-dedicated equipment
Field Duplicate Samples	Yes	Yes	One per every 20 samples (or fewer) per sample matrix
Trip Blank	Yes	Yes	One per sample cooler collected for analysis of cVOCs
Temperature Blank	Yes	Yes	One per sample cooler
Matrix Spike/Matrix Spike Duplicate	Yes	Yes	Each analytical batch of samples of every 20 (or fewer) samples received
Surrogate Spiking	Yes	Yes	Added to all project and QC samples (for organic analyses only)
Method Blanks	Yes	Yes	Each analytical batch of samples of every 20 (or fewer) samples received
Laboratory Control Sample	Yes	Yes	Each analytical batch of samples of every 20 (or fewer) samples received
Laboratory Duplicate Sample	Yes	Yes	Each analytical batch of samples of every 20 (or fewer) samples received
Notes GW = groundwater. QC = quality control.			

Appendix A

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)

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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 indicator of contamination. Additionally, PID readings should always be accompanied by observation of the soil samples for other indicators 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 Sampling Using Hand Tools

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 obtaining surface and subsurface soil samples for physical and/or chemical analysis.

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.
- 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). 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:
 - Prewighed 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 $4^{\circ} \pm 2^{\circ} \text{C}$.
- 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.

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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

Low-Flow Groundwater Sampling

SOP Number: 9

Date: 06/29/2023

Revision Number: 0.2

Scope and Application

This standard operating procedure (SOP) describes use of the low-flow sampling method for collection of reconnaissance groundwater samples from borings and groundwater samples from monitoring wells. The method uses low pumping rates during purging and sample collection to minimize water-level drawdown and hydraulic stress at the well-aquifer interface.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Personal protective equipment (as specified in the health and safety plan)
- Water quality meter (e.g., Oakton, YSI Inc. multiparameter meter)
- Turbidity meter
- Water-level meter
- Peristaltic pump and tubing
- Laboratory-supplied sample containers
- Laboratory chain-of-custody form and cooler with ice
- Filter if dissolved analyses will be performed
- Well construction logs documenting the screen depth and interval for all wells to be sampled
- Equipment decontamination supplies if sampling equipment will be reused between sample locations (see SOP 1 for equipment decontamination procedures)
- 5-gallon buckets with lids
- Department of Transportation-approved storage containers (e.g., drums, totes)
- Groundwater field sampling datasheet and notebook

Methodology

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

General Sampling Procedure (Heading 3 No Number Style):

Water Level Measurement

- Water-level measurement procedures are described in detail in SOP 13.

- Open the well cap to allow the water level to equilibrate (approximately ten minutes).
- Measure the water level in the well, using an electronic water-level meter to the nearest 0.01 foot to determine the depth to groundwater below the top of the well casing.
- If light nonaqueous-phase liquid (LNAPL) is present (typically indicated by a dark, oily sheen on the top of the water level meter), discuss with the MFA project manager how to proceed.

Purging

- If the water level is above the top of the well screen, place the end of the sample tubing in the middle of the well screen interval. If the water level is below the top of the screen, place the end of the sample tubing at the midpoint between the water level and the bottom of the well screen.
- Typical low-flow sampling pumping rates range from 0.1 to 0.5 liters per minute, depending on the hydrogeologic characteristics at the site. The objective of the rate selected is to minimize excessive drawdown (<0.3 feet) of the water level.
- Measure water quality parameters (dissolved oxygen, pH, electrical conductivity, turbidity, and temperature) using a flow-through cell connected to the discharge end of the peristaltic pump tubing. Purging will be considered complete when the water quality parameters stabilize per the following for three consecutive readings taken over 3-minute intervals (consistent with EPA guidance)¹:

Dissolved Oxygen (10% for values greater than 0.5 mg/L, if three Dissolved Oxygen values are less than 0.5 mg/L, consider the values as stabilized),

Specific Conductance (3%),

Temperature (3%),

pH (± 0.1 unit),

Oxidation/Reduction Potential (± 10 millivolts).

- Document the purge procedures, including pumping rates, water quality parameter measurements, and the water level during purging, on the groundwater field sampling datasheet.
- Place purge water in Department of Transportation-approved containers (e.g., 55-gallon drum) stored on site. See SOP 1 for drum storage, labeling, and documentation procedures.

Sample Collection

- Following the purging process, collect groundwater samples in laboratory-supplied containers.
- Confirm the laboratory analytical methods and sample container requirement with the MFA project manager or project chemist. If analysis for gasoline-range petroleum hydrocarbons or volatile organic compounds (VOCs) is proposed, fill the sample containers for gasoline and VOC analysis before filling sample containers for other analytical methods. Sample containers for gasoline and VOC analysis shall be filled to capacity without overfilling and capped so that no headspace or air bubbles remain in the container.

¹ EPA. 2017. Low stress (low flow) purging and sampling procedure for the collection of groundwater samples from monitoring wells. September 19.

Low Yield (Alternate Method)

- If drawdown of the water table cannot be avoided by reducing the pumping rate, and the well goes dry during purging, discontinue pumping and water quality parameter measurements.
- Collect the groundwater sample after the water level above the well bottom recovers to 90 percent of the prepurge water level. For example, if the water level was 10 feet above the well bottom before purging, begin sampling when the water level has recovered to 9 feet or more above the well bottom.
- If the water column volume is insufficient to meet the sample volume requirement, allow the water level to again recover to 90 percent before continuing sampling. Repeat this procedure until all sample containers are filled.

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Standard Operating Procedure

Well Installation

SOP Number: 11

Date: 03/09/2021

Revision Number: 0.1

Scope and Application

This standard operating procedure (SOP) describes the use of conventional machine slotted polyvinyl chloride (PVC) or prepacked well screens to install monitoring wells. The screen permits water to enter the well from the saturated aquifer, prevents soil from entering the well, and serves structurally to support the aquifer material. The slot size of the well screen is typically based on selection of the filter pack material. Monitoring wells must be designed and installed to ensure that low-turbidity groundwater samples, groundwater levels, and hydraulic conductivity data that are representative of conditions in the aquifer can be obtained.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Drill rig and operator provided by a subcontractor to MFA. Ensure that the subcontractor is licensed to perform the well installations.
- Personal protective equipment (as specified in the health and safety plan).
- Water-level meter.
- Monitoring well construction log and notebook.

Methodology

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

The drilling contractor will be responsible for conforming to all applicable local and state regulations for well construction.

The proposed well construction should be provided to the driller in advance so that (1) the driller can confirm that the proposed construction is consistent with state regulations, and (2) the driller comes to the project site with sufficient materials for the well construction.

General Procedure:

Drilling and Well Construction. This SOP assumes that a boring has already been drilled and is ready for well installation. See SOPs 7 and 8 for drilling procedures. If the boring was advanced to a depth below the targeted well screen interval, backfill the boring with cement-bentonite slurry or bentonite chips so that the boring bottom is at a depth about 2 feet below the lower screen interval depth. Well construction will include flush-threaded Schedule 40 PVC casing and conventional PVC well screen or stainless steel mesh prepacked well screen, placed at the bottom of the boring.

Filter Pack. Clean silica sand pack will be placed between the boring wall and the PVC screen/riser (i.e., the annulus) from the bottom of the well to approximately 1 to 2 feet above the screened interval. The filter pack should have greater hydraulic conductivity than the surrounding formation so that water can be drawn into the well. Before installation of the seal, the well may be surged using a surge block or similar technique to consolidate the filter pack and eliminate voids. Measure and document the depth to the sand filter pack before setting the seal.

Seal. A bentonite seal 1 to 2 feet thick will be placed above the sand. The bentonite will be hydrated and allowed to sit for a minimum of 30 minutes for proper hydration and sealing. Measure and document the depth to the top of the seal before placing grout.

Grout. Cement-bentonite slurry or bentonite chips (hydrated after installation) will be placed above the bentonite seal following proper hydration of the seal. The cement-bentonite slurry will be placed to within 1 foot of the ground surface.

Surface Seal and Monument. A concrete surface seal will secure a flush-mounted, traffic-rated monument, or a bollard-protected stickup monument. Flush-mounted surface monuments will be completed slightly above grade to prevent ponding of water on the monument lid. A locking cap and lock will secure the top of the well casing in a surface monument. Tamper-resistant bolts (e.g., pentagonal) may be used to secure the lid of a flush-mounted monument. The lid of a stickup monument should be secured with a lock.

The well constructor shall permanently affix a well identification label to the wellhead. In addition, the well number should be marked on the well (e.g., punched into monument ring, written on the well casing/cap with permanent marker). A v-notch is typically cut into the north side of the PVC riser for use as a survey point and for water level measurements.

Documentation. The field representative will produce the following documentation during the well installation:

- Length of well components, including blank casing, well screen, and sump (if included).
- Preinstallation boring depth below ground surface (bgs).
- Depth bgs to top and bottom of screen.
- Depth bgs to top of filter pack and seal.
- Types, brands, and amounts of materials (sand, bentonite, grout) used.
- Decontamination procedures followed, if needed (see SOP 1 for equipment decontamination procedures).
- If potable water was placed into the boring or well during installation, document the total volume of water placed; this information will be needed for well development (see SOP 12).
- Any deviation from standard procedures or any problems encountered during the installation activities.



Standard Operating Procedure

Well Development

SOP Number: 12

Date: 03/09/2021

Revision Number: 0.1

Scope and Application

This standard operating procedure (SOP) describes the methods for developing new monitoring well installations. New wells should be developed no sooner than a period of 24 hours after the grout seal has been placed; longer periods of 48 to 72 hours may be necessary, depending on applicable local or state regulations. The objective of well development is to ensure that low-turbidity groundwater samples, groundwater levels, and hydraulic conductivity data representative of conditions in the aquifer can be obtained from the well. This SOP is also applicable to the redevelopment of existing monitoring wells.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Personal protective equipment (as specified in the health and safety plan)
- Well purge equipment (e.g., Waterra Pump, bailer, and peristaltic pump)
- Water-quality meter (e.g., Oakton and turbidity meter)
- Water-level meter
- Well construction logs for all wells to be developed
- Equipment decontamination supplies if sampling equipment will be reused between sample locations (see SOP 1 for equipment decontamination procedures)
- Five-gallon buckets with lids
- Department of Transportation-approved storage containers (e.g., drums, totes)
- Well development log and notebook

Methodology

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

Owing to the potential for hazardous substances in groundwater, well development requires consideration of the work area and equipment setup, health and safety procedures, use of appropriate personal protective equipment, procedures for equipment decontamination, and disposal of expendable development supplies. Confirm all procedures in advance with the MFA project manager and the MFA health and safety professional.

1. Cut a segment of plastic sheeting to an approximate 10-foot-by-10-foot dimension. Cut a hole in the center of the sheeting and place the sheeting over the well so that the well monument can be accessed through the hole and the sheeting lies flat on the ground. The sheeting defines the

work area for well development. All equipment that may come in contact with groundwater should remain in this work area until it has been decontaminated or containerized for disposal.

2. Measure the depth to water and the total depth of the well before development. Confirm that the entire screen length is below the water level; if it is not, contact the MFA project manager to discuss potential modification of the well-development procedures.
3. Subtract the depth to water from the total well depth to determine the height of the column of groundwater present in the well casing. Multiply the height by the gallon-per-foot value in the table below, corresponding to the diameter of the well being developed, to calculate the volume of water in the well casing. Record the readings and casing volume on the well development log.

Casing Diameter (inches)	Volume (gallons per foot)
1	0.04
2	0.17
3	0.37
4	0.65
5	1.02
6	1.46

4. Surge groundwater through the entire well screen interval with a weighted bailer or Waterra pump with tubing equipped with surge block. Begin surging at the top of the well screen by vigorously moving the bailer or surge block in approximately 1-foot vertical increments. Gradually increase the surge depth until the entire screen interval has been surged. The surge time for each 1-foot increment will depend on type of drilling, lithology, and well completion details. Generally, there should be at least one minute of surging across each increment.
5. After surging the well screen, purge groundwater from the well into buckets at a higher purging rate than the expected purging rate of groundwater sampling. Ideally, purging will be completed using a method that does not continue to surge the well (i.e., peristaltic or submersible pump). If a Waterra pump is used, remove the surge block from the tubing and set the tubing intake above the well screen for purging. Measure the water level during the purging process and adjust the pumping rate to maintain a water level above the top of the screen interval if possible. Document the volume of water removed.
6. When the volume of water purged equals the casing volume, use the water-quality meter to measure the temperature, pH, conductivity, and turbidity of the purge water. Repeat the measurements for each casing volume removed. Note that a YSI water-quality meter or similar meters should not be used in highly turbid water, per the manufacturer's recommendation.
7. After the removal of five casing volumes, review the stability of the water quality meter readings. The well will be considered developed if the water quality readings have stabilized for three consecutive casing volumes for the following:

pH (± 0.1 unit),

Specific Conductance (3%),

Turbidity (10% for values greater than 5 NTU; if three Turbidity values are less than 5 NTU, consider the values as stabilized),

8. If the water-quality readings stabilize before a total of ten casing volumes are removed, development is complete. If the water-quality readings do not stabilize, well development will be consider complete after ten casing volumes have been removed.
9. If the water level cannot be maintained above the well screen or the well pumps dry during purging, contact the MFA project manager for further instructions.
10. If potable water was placed into the boring during drilling or into the well during installation, remove that volume of water and then begin purging as described in step 5.

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Standard Operating Procedure

Monitoring Well—Water Elevation

SOP Number: 13

Date: 03/09/2021

Revision Number: 0.1

Scope and Application

This standard operating procedure (SOP) describes the methods for obtaining groundwater level measurements and light nonaqueous-phase liquid (LNAPL) measurements from monitoring wells. Measurement may be collected as an independent event or in conjunction with groundwater sampling or sampling of removed LNAPL.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Personal protective equipment (as specified in the health and safety plan)
- Equipment decontamination supplies if equipment will be reused between well locations (see SOP 1 for equipment decontamination procedures)
- Field notebook
- Water-level meter or oil/water interface probe if water levels and LNAPL levels will be measured
- Bailers or tape/paste to confirm LNAPL detections if required; see SOP 10 for procedures for managing LNAPL when removing LNAPL from a well

Methodology

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

General Sampling Procedure:

Review well construction details and historical groundwater and LNAPL levels and thicknesses if available.

During groundwater sampling events, measurements should be collected before, during, and after purging and sampling. During purging and low-flow sampling, water-level measurements are conducted to ensure that drawdown is not occurring. Low-flow sampling methods are described in SOP 9. The following procedures should be followed when collecting groundwater-level and LNAPL measurements from wells.

Water Level Measurement

1. Test the water-level meter to ensure proper instrument response. This can be accomplished by immersing the probe tip in a small container of water.
2. Open the well cover and cap and allow the water level to equilibrate with atmospheric pressure for several minutes so that a static water level is attained. Audible air movement into or out of

the well upon loosening of the well cap is an indication that the water level is not in equilibrium with atmospheric pressure.

3. Locate the measurement reference point at the top of the well casing. Typically, this is a small notch in the casing or a point marked with a pen. If no measure point is present, measure the water level from the north side of the casing and note the result in the field notebook.
4. Lower the water-level meter probe into the well casing until the probe signal indicates that water has been contacted.
5. Observe the depth-to-water (DTW) reading from the measurement reference point at the top of the well casing to the nearest 0.01 foot. Over the course of about a minute, raise and re-lower the probe and observe the resulting DTW reading. If the reading remains unchanged to within 0.01 foot, this is an indication that the water level has equilibrated with atmospheric pressure; the reading can then be recorded in the field notebook as the static water level reading. If the reading changes, allow more time for the water level to become static.
6. If the work scope or SAP requires measurement of the depth-to-bottom (DTB), lower the probe to the bottom of the well and record the DTB reading from the reference point to the nearest 0.01 foot.
7. Remove the probe and decontaminate the probe and the portion of the probe tape inserted into the well casing.

Water Level and LNAPL Measurement

1. Repeat above steps 1 through 7.
2. Lower the interface probe into the well casing until the probe signal indicates that LNAPL has been contacted. Typically, the interface probe will signal by a repeating beep when LNAPL is present. A steady signal indicates that LNAPL is absent and that the probe is recording the DTW.
3. Observe the LNAPL reading as described in step 5 above until a static reading to the nearest 0.01 foot is achieved, and record the reading in the field notebook.
4. Lower the probe until a steady signal indicates that water has been contacted. Observe the water-level reading as described in step 5 above to confirm a static water level, and record the reading in the field notebook.
5. If LNAPL is detected in a well with no prior history of LNAPL presence, or the LNAPL thickness is greater than in prior observations, verify the presence and thickness using an alternative technique (e.g., bailer, tape, and water/petroleum colorimetric paste). See SOP 10 for procedures for managing LNAPL when removing LNAPL from a well.
6. Remove the interface probe and decontaminate the probe and the portion of the probe tape inserted into the well casing.



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 locator 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.	

Appendix B

Field Sampling Data Sheets

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MAUL
FOSTER
ALONGI

Maul Foster & Alongi, Inc.

Geologic Borehole Log/Well Construction

Project Number

Well Number

Sheet

Project Name
Project Location
Start/End Date
Driller/Equipment
Geologist/Engineer
Sample Method

TOC Elevation (feet)
Surface Elevation (feet)
Northing
Easting
Hole Depth
Outer Hole Diam

Depth (feet, BGS)	Well Details	Sample Data					Blows/6"	Lithologic Column	Soil Description
		Interval	Percent Recovery	Collection Method	Number	Name (Type)			

1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

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NOTES:

Appendix C

Health and Safety Plan

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MAUL
FOSTER
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Health and Safety Plan

Raplee Property
9816 271st Street NW
Stanwood, Washington

Prepared for:

City of Stanwood

Stanwood, Washington

August 29, 2024

Project No. M1030.08.003

Prepared by:

Maul Foster & Alongi, Inc.

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Health and Safety Plan

Raplee Property

9816 271st Street NW

Stanwood, Washington

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

Maul Foster & Alongi, Inc.

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Abbreviations

AED	automated external defibrillator
CFR	Code of Federal Regulations
COPC	chemical of potential concern
HASP	health and safety plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSC	health and safety coordinator
JHA	job hazard analysis
MFA	Maul Foster & Alongi, Inc.
PIC	principal in charge
PPE	personal protective equipment
the Site	9816 271st Street NW, Stanwood, Washington
SSO	site safety officer

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1 Nearest Hospital/Emergency Medical Center

1.1 Nearest Hospital

Cascade Valley Hospital, 330 S Stillaguamish Ave, Arlington, WA.

Phone: 360-435-2133

Distance: 14.8 miles

Travel Time: 24 minutes

1.2 Route to Hospital from Site

See the map on the first page of this document.

1.2.1 Driving Directions to Hospital from Site

1. Head west on 271st St NW toward 270th St NW for 144 feet.
2. Keep left to get onto 270th St NW for 0.1 miles.
3. Bear left onto Camano St and continue for 453 feet.
4. Turn left onto WA-532 / State Route 532 and continue for 10.2 miles.
5. Bear right onto WA-9 / State Route 9 NE and continue for 3.9 miles.
6. Turn left onto E Highland Dr. Continue for 0.5 miles.
7. Turn left onto S Stillaguamish Ave
8. Turn left in 246 feet.

1.3 Emergency Phone Numbers

Ambulance, Police, Fire	Dial 911
Carolyn Wise Project Manager	Phone: 360-594-6255 Cell: 360-690-5982
Phil Wiescher Principal in Charge (PIC)	Phone: 360-594-6267 Cell: 503-407-1036
Nicole Bruneel Health and Safety Coordinator (HSC)	Phone: 208-784-1090 Cell: 208-949-3981

2 Plan Summary

This health and safety plan (HASP) was developed to describe the procedures and practices necessary for protecting the health and safety of Maul Foster & Alongi, Inc. (MFA), employees conducting activities at the Raplee Property site located at 9816 271st Street NW in Stanwood, Washington (the Site). Other employers, including contractors and subcontractors, are expected to develop and implement their own HASPs to manage the health and safety of their personnel.

MFA personnel conducting activities at the Site are responsible for understanding and adhering to this HASP. Before fieldwork begins, the on-Site personnel will designate a site safety officer (SSO) who is familiar with health and safety procedures and with the Site. Safety deficiencies should be immediately communicated to the SSO and, if necessary, to the project manager, PIC/program manager, or MFA’s HSC.

All contractors and subcontractors have the primary responsibility for the safety of their own personnel on the Site. All personnel on the Site have stop work authority if they observe conditions that they believe create an imminent danger.

If MFA employees work on the Site for more than a year, this HASP will be reviewed at least annually. Additionally, this HASP will be updated as new or changed conditions are encountered to ensure that it reflects the current known hazards and requirements associated with the Site.

MFA personnel who will be working on the Site are required to read and understand this HASP. MFA personnel entering the work area must sign the personnel acknowledgment sheet (Section 17), certifying that they have read and that they understand this HASP and agree to abide by it.

3 Key Project Personnel

Name	Responsibility
Phil Wiescher	PIC or Program Manager
Carolyn Wise	Project Manager
Christian Sifford	Field Personnel
Brenden Murphy	Field Personnel
Nicole Bruneel	HSC

4 Emergency Supplies and Equipment List

Equipment	Location and Notes
First Aid Kit	Inside work vehicle.
Fire Extinguishers	Inside work vehicle.
Mobile Phones	On MFA staff.
Traffic Cones	Inside work vehicle, will be used as needed.
Water and Other Fluid Replenishment	Inside food-only cooler in work vehicle.
Eyewash	In work vehicle.
Spill Kit	In work vehicle.
Health and Safety Plan	On MFA staff, or in work vehicle.

5 Site Description and Background

5.1 Type of Site

The Site is composed of a currently vacant parcel and surrounded by a chain-link fence and a city-owned alley to the south.

5.2 Buildings/Structures

There are currently no buildings or structures at the Site.

5.3 Topography

The site is generally level.

5.4 General Geologic/Hydrologic Setting

The Site is located in the Snohomish River Valley, approximately 0.2 miles northeast of an oxbow of the Stillaguamish River. According to the Geologic Map of the Stanwood Quadrangle, the Site vicinity

is located on Quaternary younger alluvial and estuarine deposits.¹ The upper 4 feet of soil is predominantly fill composed of medium sand and sandy silt with fine gravel. Below the silt is predominantly silt, clay, and/or a silt/clay mixture.² (SAIC 2006).

5.5 General Site History

According to previous environmental reports, the Site had been developed into a filling station by 1941 with a Sanborn Fire Insurance Map depicting at least two underground storage tanks (USTs) in the northeast portion of the Site, a greasing facility in the eastern portion of the station structure, and a store in the western section. The Site was the location of a Standard Oil (now Chevron Corporation) service station from approximately 1958 to when the lease expired in 1970. From 1970 to 1998, the Site's ownership passed through many parties. In 1984, the portion of the Site with the alleyway was sold to the City.³

6 Hazard Evaluation

6.1 Site Tasks and Operations

MFA has completed job hazard analyses (JHAs) for specific tasks that may be conducted on the Site. JHAs are provided in Appendix A. The following list summarizes planned tasks and operations:

- General work near heavy equipment
- Collecting soil samples
- Collecting groundwater samples
- Working in or near a public right-of-way or near vehicle traffic

The control measures that field personnel must implement to eliminate or minimize these hazards, such as personal protective equipment (PPE), engineering controls, and decontamination procedures, are detailed in the JHAs and in subsequent sections of this HASP.

6.2 Chemical Hazard Evaluation

Chemicals of potential concern (COPCs) detected on the Site are summarized in Appendix B. Air monitoring action levels and associated controls are specified in Appendix C.

¹ Minard, J. P. 1985. "Geologic map of the Stanwood Quadrangle, Snohomish County, Washington." *Miscellaneous field studies map MF-1741*. U.S. Geological Survey.

² SAIC. 2006. *Site Assessment Report, Former Standard Oil Service Station No. 30-5192, 9816 271st Street NW, Stanwood, Washington*. Prepared for Chevron Corporation. Science Applications International Corporation: Bothell, WA. May 5.

³ SAIC. *Site Assessment Report*.

6.3 Physical Hazards

The specific physical hazards and associated controls for work on the Site are described in the JHAs provided in Appendix A.

7 Site-Control Measures

Control of access to the Site will be established before the work begins. Control measures may include fencing, gates, and signs limiting access to everyone except authorized personnel.

MFA requires the buddy system if personnel conducting the work may potentially be exposed to chemical or physical hazards that would require immediate medical attention or rescue. The buddy system may involve working with non-MFA personnel.

8 Health and Safety Training

MFA personnel who could be exposed to COPCs while conducting work on the Site will have completed training consistent with the Hazardous Waste Operations and Emergency Response (HAZWOPER) requirements in 29 Code of Federal Regulations (CFR) 1910.120(e) before beginning work on the Site. The training will include the following:

- Identification of an SSO, and other safety and health personnel, if applicable
- Identification of safety and health hazards specific to work being conducted
- Proper use of required PPE
- Safe work practices required (e.g., fall protection, confined-space entry procedures, hot-work permits, general safety rules)
- Safe use of engineering controls and equipment
- Medical surveillance requirements, including the recognition of signs and symptoms that might indicate overexposure to hazards
- The project-specific emergency response plan/spill containment plan

The HSC will oversee training for MFA personnel conducting fieldwork. Training records, including an outline, signoffs, and competency records, will be maintained by the HSC.

While the HSC is responsible for maintaining training records, the project manager is responsible for verifying that the training status of field personnel is current before these personnel deploy to the field.

9 Safety Equipment

9.1 Personal Protective Equipment

Individuals on the Site must wear PPE to protect against physical hazards. PPE required on the Site is typically modified Level D, which consists of the following:

- High-visibility vest
- Work boots
- Safety glasses with side shields
- Nitrile gloves or equivalent if handling media potentially impacted or known to be impacted

Additional PPE may be necessary for specific tasks with additional hazards. The SSO will be responsible for designating additional PPE for specific tasks. Depending on the activity, additional PPE may include the following:

- Hard hat
- Work gloves (if handling materials that might have sharp edges, protrusions, or splinters)
- Hearing protection (to be worn during high-noise tasks)

Additional PPE may be required if workers discover unexpected contamination. Characteristics of unexpected contamination could include unusual odors, discolored media, or a visible sheen. MFA employees should contact the SSO and, if necessary, the project manager and/or the HSC as soon as possible after the discovery of unexpected contamination. The SSO and, if applicable, the project manager and/or HSC will determine any need for additional controls and/or training.

PPE used at the Site must meet the requirements of recognized consensus standards (e.g., American National Standards Institute, National Institute for Occupational Safety and Health), and respiratory protection will comply with the requirements set forth in 29 CFR 1910.134.

Project personnel are not permitted to reduce the specified level of required PPE without approval from the SSO or the project manager and/or HSC.

9.2 Safety Equipment

The SSO will be responsible for ensuring that the following safety equipment is available during fieldwork and is properly inspected and maintained:

- Soap and water for decontamination
- Caution tape, traffic cones, and/or barriers
- First aid kit
- Fire extinguisher
- Fluids for hydration, (e.g., drinking water or sports drink)

9.3 Air Monitoring Equipment

Air monitoring is not anticipated to be necessary; however, the following air monitoring equipment will be available to identify conditions that may require additional controls. See Appendix C for specified action levels and follow-up response actions.

- Photoionization detector

9.4 Communications Equipment

MFA personnel should have a mobile phone or a radio available in case of emergency.

10 Decontamination Procedures

10.1 Partial Decontamination Procedures

MFA employees will implement the following partial decontamination procedures when exiting the work/exclusion zone but remaining on the Site.

- Wash and rinse boots and outer gloves (if wearing two pairs) in containers in the contamination-reduction zone.
- Remove and inspect outer gloves. If they are ripped or otherwise damaged, discard them in a container labeled for disposable items.
- Wash hands and face with soap and water.

10.2 Full Decontamination Procedures

When exiting the exclusion zone and leaving the Site (e.g., at the end of the work shift), MFA employees will follow the full decontamination procedures listed below.

- Wash and rinse boots and outer gloves in containers in the contamination-reduction zone.
- Remove work boots and put on street shoes. Place work boots in a plastic bag or container.
- Remove inner gloves and deposit in a container labeled for disposable items.
- Wash hands and face with soap and water.
- Shower as soon after the work shift as practicable.

11 Medical Surveillance

MFA will ensure that its employees who meet the following criteria are enrolled in a medical surveillance program consistent with 29 CFR 1910.120(f):

- The employees are, or may be, exposed to hazardous substances or health hazards at or above established permissible exposure limits for 30 or more days per year.
- The employees are required to wear a respirator for 30 or more days per year.

MFA employees who exhibit signs or symptoms consistent with overexposure to COPCs will be offered medical surveillance consistent with HAZWOPER requirements.

MFA will ensure that its employees who are authorized to wear respirators are medically evaluated and approved for respirator use, consistent with the respiratory protection standard (29 CFR 1910.134). The HSC or administrative designee (e.g., human resources manager) will maintain medical evaluation records, including respirator clearance documentation.

Personnel medically cleared for respirator use will undergo an annual qualitative fit test. The MFA HSC or administrative designee will conduct the annual qualitative fit tests and will manage the documentation.

If employees are required to wear a respirator on the Site, the project manager will verify that the employee has a current annual respirator fit test.

12 Air Monitoring

Based on Site conditions, it is not anticipated that air monitoring will be necessary; however, air monitoring equipment will be available in case workers encounter conditions, such as unusual odors, discolored media, or a visible sheen, that indicate the presence of unexpected contamination. If such conditions are discovered, workers will exit the area and contact the SSO and, as needed, the project manager or the HSC. If necessary, MFA will use the air monitoring equipment to evaluate the conditions and determine whether additional controls and/or training are required. Action levels and follow-up actions are provided in Appendix C.

If air monitoring is necessary, it must be performed by individuals familiar with the calibration, use, and care of the required instruments. Measurements will be documented, and the records must include the following information:

- The name of the person conducting the measurements
- The identity of workers, if any, who have exposure indicated by the measurement results
- Information about the instrument (e.g., type, make, model, serial number)
- The location where the measurement was taken
- The measurement date and start/stop time

- Conditions represented by the measurement, including applicable activities, work practices, weather conditions, Site conditions, and controls in place
- Measurement results
- Other relevant observations or notes

12.1 Air Monitoring Action Levels

If air monitoring is conducted, the results will be compared to the action levels provided in Appendix C. These levels have been established to comply with Occupational Safety and Health Administration permissible exposure limits, American Conference of Governmental Industrial Hygienists threshold limit values, and National Institute for Occupational Safety and Health recommendations for the chemicals that may be encountered on the Site. The action levels have been adjusted for the relative response of common photoionization detection instruments to motor-fuel vapors.

12.2 Explosion Hazard Action Levels

MFA employees will take measurements when working near known or suspected sources of explosive gases or vapors. The instrument alarm should be set to sound at 10 percent of the lower explosive limit. When measurements exceed this level, MFA employees will:

1. Extinguish ignition sources and shut down powered equipment in the work area.
2. Move personnel at least 100 feet away from the work area.
3. Contact the SSO, the project manager, and/or the HSC as applicable.
4. At the instruction of the project manager and/or the HSC and after waiting 15 minutes for explosive gases to dissipate, the SSO may use the combustible-gas meter to safely approach the work site to measure combustible gases in the work area. The SSO will not enter (or allow any personnel to enter) any area where the combustible-gas meter readings exceed the explosivity action level, nor will the SSO approach if there is a potential for fire or explosion.
5. The SSO may authorize personnel to reenter the work area after the source of the combustible gases has been identified and controlled.

12.3 Instrument Calibrations

Instruments will be calibrated consistent with manufacturers' recommendations. Calibrations will be coordinated by the SSO and the project manager. Calibration and monitoring records will be maintained by the SSO and/or the project manager.

13 Emergency Response, Spill Containment, and Confined Space

MFA employees will follow the emergency response, spill response, and confined-space procedures described in the MFA Policies and Procedures Manual. Incidents will be documented on the incident report form included as Appendix D.

14 Pre-Entry Briefing

MFA employees will conduct pre-entry briefings prior to beginning work on the Site (e.g., tailgate meetings; see the checklist provided as Appendix E). Additional briefings shall be conducted as the scope of work or conditions change throughout the project to ensure that employees are familiar with and are adhering to the appropriate safety and health protocol. Attendance and discussion topics will be documented on sign-in sheets that will be maintained by the SSO.

15 Periodic Evaluation

The project manager or designee will evaluate the effectiveness of this HASP by conducting periodic HASP audits. A HASP audit form is included as Appendix F. In addition, HASP effectiveness will be evaluated by tracking ongoing health and safety feedback from field personnel working on the project. This feedback will be reviewed and incorporated into either immediate or annual updates of this HASP, as appropriate. This HASP will be reviewed and updated at least annually. Updating this HASP as necessary ensures that it reflects the known hazards, conditions, and requirements associated with the project. MFA will maintain HASP audit or other periodic evaluation records and track all revisions to this HASP.

16 Safe Work Practices

The following safe work practices are provided to supplement the other information in this HASP.

1. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of materials is prohibited in areas with potentially contaminated materials.

2. Whenever practicable, field personnel will remain upwind of drilling rigs, open excavations, and other ground-disturbing activities.
3. Subsurface work will not be performed at any location until the area has been confirmed by a utility-locator firm to be free of underground utilities or other obstructions.

17 Acknowledgment

MFA cannot guarantee the health or safety of any person entering the Site. Because of the potentially hazardous nature of active sites, it is not possible to discover, evaluate, and provide protection against all possible hazards that may be encountered at the Site. Strict adherence to the health and safety guidelines set forth herein will reduce, but not eliminate, the potential for injury and illness. The health and safety guidelines in this HASP were prepared specifically for the Site and should not be used on any other site without prior evaluation by trained health and safety personnel.

MFA personnel who will work at the Site are to read, understand, and agree to comply with the specific practices and guidelines described in this HASP regarding field safety and health hazards.

This HASP has been developed for the exclusive use of MFA personnel. MFA may make this HASP available for review by contracted or subcontracted personnel for information only. This HASP does not cover the activities performed by employees of any other employer on the project. All contracted or subcontracted personnel are responsible for implementing their own health and safety program, including generating and using their own HASP.

I have read and I understand this HASP and all attachments, and agree to comply with the requirements described herein:

Name	Title	Date
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Appendix A

Job Hazard Analyses

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Job Hazard Analysis

Task/Operation: Conducting Fieldwork		
Project Number: M1030.08.003		Site Where Task Performed: Raplee Property, 9816 271st Street NW, Stanwood, Washington
Date Prepared: 08/22/2024	Employee Preparing this Job Hazard Analysis (JHA): C. Sifford	
Date Reviewed: 08/26/2024	Employee Reviewing and Certifying this JHA: C. Wise	
Job/Task Description		
This JHA describes hazards and required safe-work practices that are common to most types of fieldwork. See the separate task-specific JHA for hazards and safe-work practices that are unique to certain tasks (e.g., sampling contaminated media, working in remote areas).		
Physical Hazards		
Hazard/Risk	Source of Hazard/Risk	Hazard/Risk Mitigation
Heat/cold/sunburn	Weather.	Be aware of seasonal dangers, including frostbite, hypothermia, snow blindness, trench foot, and heat stress. Drink plenty of fluids, especially when perspiring. Wear sunscreen on exposed skin. Stop work if an employee feels symptoms of dehydration, overheating, or heat stroke. Move to a shaded area and drink water. During cold or wet conditions, wear adequate clothing to reduce the potential for hypothermia. If there is lightning in the area, seek indoor shelter immediately, if possible. If outdoors, get into a hard-topped vehicle and away from trees. Turn off all radios and electronic equipment.
Eye injury	Debris (e.g., soil, water, injection fluids) coming into contact with eyes; working in areas with low, dense vegetation.	Wear eye protection with side shields. If there is a splash hazard, wear tight-fitting chemical goggles. If chemicals come into contact with eyes, immediately wash chemicals out with water. Identify the location of the eyewash station before beginning the work.
Head injury	Heavy equipment, tools, overhead hazards impacting the head.	Wear a hard hat. Do not work near moving or heavy equipment or under overhead hazards.
Foot injury	Sharp objects that could be stepped on; large objects falling on feet.	Wear protective boots (composite or steel-toe).
Hand injury	Pinch points, sharp objects, stress from pulling rope, dermal contact with chemicals and contaminated media.	Wear protective gloves. Appropriate gloves should be identified in the HASP or Safe Work Plan. Avoid placing hands near operating equipment.
Hearing loss	Noise generated by heavy equipment/machinery.	Wear hearing protection such as earplugs or earmuffs.

Task/Operation: Conducting Fieldwork		
Bodily harm, including to bystanders and the public and pedestrians in the locality of work	Heavy equipment, drilling rigs, support vehicles, traffic and public rights-of-way; potential to be struck, crushed, or impacted by moving objects.	Wear a safety vest for enhanced visibility. Use cones and caution tape to cordon off the immediate work area. Watch for and escort pedestrians away from the work area. Pause work if necessary. Ensure traffic control measures (e.g., traffic cones, signage) are in place. Do not work near moving or heavy equipment or under overhead hazards. Maintain eye contact with equipment operators. When working around vehicles or heavy equipment, know the locations of emergency equipment (e.g., fire extinguishers, emergency shutoff features).
Physical stress	Lifting heavy equipment and objects; conducting strenuous activities; kneeling on hard or gravel surfaces.	Use proper lifting techniques, i.e., bending and lifting with the legs and not the back. Do not twist at the waist when turning. Use the buddy system for heavy objects. Use knee pads or a kneeling pad. Take breaks and rest as needed.
Accidents with equipment/tools	Sample-collection equipment/tools.	Verify that you have the appropriate equipment/tools for your tasks. Use equipment/tools as intended by the manufacturer. Only use open blades or sharp-edged tools for their intended purposes. Stow tools in the vehicle properly; use appropriate cases and bags. Secure equipment (including compressed-gas cylinders) in the vehicle with netting and straps; do not leave loose—it can cause property damage or serious injuries to others or yourself.
Slips, trips, and falls	Uneven or unstable ground.	Maintain good housekeeping in work areas to minimize or eliminate slip/trip/fall hazards from equipment and supplies. Walk around rather than over hazards on the ground. Use caution when walking on uneven ground or in snowy and/or icy conditions. Dense vegetation may obscure dangerous features, including biological hazards, riverbanks, cliffs, unstable/steep slopes, excavations, and mine adits. Flagging or marking dangerous areas can help reduce the likelihood of injury.
Biological/Chemical Hazards		
Biological/Chemical Risk	Source of Hazard/Risk	Hazard/Risk Mitigation
Biological—animals	Livestock, deer; biting or stinging insects, spiders, and snakes; animal feces.	Do not turn your back on animals even if they seem docile. Make sure you have an escape plan in case an animal becomes aggressive. Use bug repellent. Insect nests should never be disturbed. Use snake chaps or shin guards when grass is above the ankle. Employees who are allergic to stings should not work in areas where there is a high risk of encountering stinging insects. Use a bar to clear spiders and/or snakes from objects and/or vegetation. Check well vaults and security lids for insects; use caution when opening. Avoid contact with animal feces. When working indoors, remove animal feces from the work area—if possible, without creating dust.

Task/Operation: Conducting Fieldwork		
Biological—plants	Poisonous plants and other irritant vegetation (e.g., blackberry canes).	Do not touch or approach poisonous or irritant vegetation. Wear long pants and a long-sleeved shirt while on the site if poisonous plants and other irritant vegetation is present.
Exposure to chemicals in environmental media	Chemicals or hazardous materials in soil, sediment, surface water, groundwater, NAPL, stormwater, building materials, indoor air, outdoor air, soil vapors, monitoring wells, borings, excavations, and manholes.	See the task-specific JHA.
Additional Control Measures and Guidance		
<p>Engineering Controls: No engineering controls specified. The need for engineering controls should be discussed with the project manager, health and safety coordinator, and subcontractors.</p>		
<p>General Safe-Work Practices and Guidance:</p> <ul style="list-style-type: none"> • Employees should not eat or drink in the immediate area where sampling is being conducted. Employees should wash their hands and faces before eating or drinking. If used, nitrile gloves should be disposed of in a container labeled for disposable items. • Cones, barrier tape, or equivalent methods will be used to establish the work area, if feasible. • Tasks that must be conducted in the work area must be coordinated with equipment operators before work begins. Methods of communication, such as direct eye contact, hand signals, and/or verbal communication, will be established before work begins. • Employees should carry a cellular phone and/or a security radio. 		
<p>PPE: Hard hat (when working around heavy equipment, including drill rigs, or overhead hazards), work boots (protective composite or steel-toe boots when working around heavy equipment), high-visibility vest or outer garment, safety glasses with side shields, nitrile gloves (or other hand protection appropriate for the type of physical or chemical hazards present), hearing protection (earplugs or earmuffs) as needed. Use chemical goggles if there is a chemical splash hazard.</p>		

Job Hazard Analysis

Task/Operation: Task-Specific Hazards		
Project Number: M1030.08.003		Site Where Task Performed: Raplee Property, 9816 271st Street NW, Stanwood, Washington
Date Prepared: 08/22/2024	Employee Preparing this Job Hazard Analysis (JHA): C. Sifford	
Date Reviewed: 08/26/2024	Employee Reviewing and Certifying this JHA: C. Wise	
Job/Task Description		
This JHA is specific to certain elements of fieldwork that have unique hazards and require specific safe-work practices to mitigate those hazards. See the separate General Fieldwork Hazards JHA for hazards and safe-work practices that are common to most types of fieldwork.		
Sampling Contaminated Solid and Liquid Media		
Hazard/Risk	Source of Hazard/Risk	Hazard/Risk Mitigation
Exposure to chemicals or hazardous substances (e.g., petroleum hydrocarbons) via direct contact and inhalation	Chemicals or hazardous materials in soil and groundwater.	See the chemical hazards summary table for applicable chemical hazards.
		Consult the HASP to identify the required PPE for preventing direct contact with contaminated media. Chemical-resistant Tyvek (yellow/coated) is strongly recommended for projects that include potential exposure to NAPL.
		Consult the HASP to identify required air monitoring equipment, respiratory protection, and action for preventing inhalation of contaminated dust and vapors.
		When around monitoring wells, avoid working with your breathing zone directly above the opening of the well casing. When possible, work upwind of the well casing. Keep your face away from the monument when removing the well cap.
		Use plastic garbage bags or plastic sheeting to cover the work area. It is preferable to roll/berm the edges to catch any drips/spills. If it is raining, work under a rain canopy.

Task/Operation: Task-Specific Hazards		
Sampling and/or Monitoring Vapors		
Exposure to chemicals via inhalation	Chemicals in soil vapors, monitoring wells, and borings.	See the chemical hazards summary table for applicable chemical hazards.
		Consult the HASP to identify required PPE for preventing inhalation of contaminated or hazardous vapors.
		The HASP identifies required air monitoring equipment, monitoring locations, respiratory protection, and action levels for preventing inhalation of vapors.
		If action levels are exceeded, cease activities, notify other site workers and subcontractors, move away from or upwind of the point of exceedance, and continue to monitor your breathing zone. Contact the health and safety coordinator and the project manager as soon as possible.
Additional Control Measures and Guidance		
Engineering Controls: No engineering controls specified. The need for engineering controls should be discussed with the project manager, health and safety coordinator, and subcontractors, and identified in the HASP or Safe Work Plan.		
General Safe-Work Practices and Guidance:		
<ul style="list-style-type: none"> • See the General Fieldwork Hazards JHA for safe-work practices and guidance common to most types of fieldwork. • If additional safe-work practices are needed to address unique, task-specific hazards, these should be specified in the HASP or Safe Work Plan. 		

Appendix B

Chemicals of Potential Concern

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**Table
Chemical Hazards**



Analyte	OSHA PEL (TWA)	ACGIH TLV (TWA)	NIOSH IDLH ⁽¹⁾	LEL (%)	IP (eV)	Other Hazard
TPH						
Gasoline-range organics	NA	300 ppm	NA	1.4	NA	C, E, F, P
Diesel-range organics	NA	100 mg/m ³	NA	NA	NA	E, F, P
Residual-range organics	NA	NA	NA	NA	NA	E, F, P
VOCs						
Benzene	1 ppm	5 ppm	500 ppm	1.2	9.24	F, C, P, R
Ethylbenzene	100 ppm	125 ppm	800 ppm	0.8	8.76	F, P
Toluene	100 ppm	150 ppm	500 ppm	1.1	8.82	E, F, P, R
Xylenes	100 ppm	150 ppm	900 ppm	0.9	8.44–8.56	F, P
<p>Notes</p> <p>ACGIH = American Conference of Governmental Industrial Hygienists.</p> <p>C = carcinogen.</p> <p>E = explosive.</p> <p>F = flammable.</p> <p>IDLH = immediately dangerous to life and health.</p> <p>IP (eV) = ionization potential.</p> <p>LEL = lower explosive limit.</p> <p>mg/m³ = milligrams per cubic meter.</p> <p>NA = not available.</p> <p>NIOSH = National Institute for Occupational Safety and Health.</p> <p>OSHA = Occupational Safety and Health Administration.</p> <p>P = poison.</p> <p>PEL = permissible exposure level.</p> <p>ppm = parts per million.</p> <p>R = reactive.</p> <p>TPH = total petroleum hydrocarbons.</p> <p>TWA = time-weighted average.</p> <p>VOC = volatile organic compound.</p> <p>Reference</p> <p>⁽¹⁾CDC. 2019. "Immediately Dangerous to Life or Health (IDLH) Values." Centers for Disease Control and Prevention, The National Institute for Occupational Safety and Health (NIOSH). October 8. Accessed September 13, 2022. http://www.cdc.gov/niosh/idlh/intridl4.html.</p>						

Appendix C

Air Monitoring Action Levels

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Air Monitoring Procedures and Toxicity Action Levels

Instrument	Action Level	Initial Action	Follow-Up Action
PID ^(a)	Detection of 1 ppm (above ambient) or greater in breathing zone sustained for two minutes.	Upgrade to Level C and continue to monitor breathing zone. If 10 ppm, leave exclusion zone. Return only if levels decrease to below 10 ppm.	Ventilate area; always work upwind.
CGI–LEL	At or above 10 percent of LEL.	Cease activities; turn off all potential sources of ignition. Evacuate.	Determine source of flammable vapors.
<p>Notes CGI = combustible-gas indicator. HSC = health and safety coordinator. LEL = lower explosive limit. PID = photoionization detector. ppm = parts per million. ^(a)Some PIDs do not work in high (e.g., greater than 90%) humidity or rainy weather. Under these atmospheric conditions, only PIDs certified for use in high humidity should be used.</p>			

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Appendix D

Incident Report Form

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Appendix E

Tailgate Safety Meeting Checklist

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Tailgate Safety Meeting Checklist



Client Name:	
Project No.:	
Communicated By:	
Date:	

Yes	NA	Information Reviewed
<input type="checkbox"/>	<input type="checkbox"/>	Emergency Response Procedures and Site Evacuation Routes
<input type="checkbox"/>	<input type="checkbox"/>	Route to Hospital
<input type="checkbox"/>	<input type="checkbox"/>	HASP Review and Location
<input type="checkbox"/>	<input type="checkbox"/>	Key Project Personnel
<input type="checkbox"/>	<input type="checkbox"/>	Emergency Phone Numbers
<input type="checkbox"/>	<input type="checkbox"/>	Stop Work Authority
<input type="checkbox"/>	<input type="checkbox"/>	General Site Description/History and Chemical Hazards
<input type="checkbox"/>	<input type="checkbox"/>	For Active Sites—Site Activities and Vehicular/Equipment Traffic
<input type="checkbox"/>	<input type="checkbox"/>	Site-Specific Physical Hazards
<input type="checkbox"/>	<input type="checkbox"/>	Required Personal Protective Equipment
<input type="checkbox"/>	<input type="checkbox"/>	Available Safety Equipment and Location
<input type="checkbox"/>	<input type="checkbox"/>	Daily Scope of Work (reference JHAs as applicable)
<input type="checkbox"/>	<input type="checkbox"/>	Decontamination Procedures
<input type="checkbox"/>	<input type="checkbox"/>	Identify Work Zones, Exclusion Zones, and Decontamination Zones
<input type="checkbox"/>	<input type="checkbox"/>	Hazardous Atmospheres
<input type="checkbox"/>	<input type="checkbox"/>	Air Monitoring Equipment and Procedures
<input type="checkbox"/>	<input type="checkbox"/>	Identify Potential Site-Specific Slip, Trip, and Fall Hazards
<input type="checkbox"/>	<input type="checkbox"/>	Dust and Vapor Control
<input type="checkbox"/>	<input type="checkbox"/>	Confined Space(s)
<input type="checkbox"/>	<input type="checkbox"/>	Open Pits and Excavation
<input type="checkbox"/>	<input type="checkbox"/>	Extreme Temperatures
<input type="checkbox"/>	<input type="checkbox"/>	Incident Reporting
<input type="checkbox"/>	<input type="checkbox"/>	Other: _____

Additional Health and Safety Practices and Considerations		

Attendees		
Name	Signature	Company
1)		
2)		
3)		
4)		
5)		
6)		
7)		
8)		

Appendix F

HASP Audit Checklist

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HASP Audit Checklist



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Project Name:
Project No.:
Project Location:
Audit Date / Time:
Person / Persons Performing Audit:
MFA Personnel Interviewed or Conducting Fieldwork:

	Status			Comment	Recommendation	Assigned to:	Scheduled Completion Date:	Actions Completed:	Person Who Completed Actions:	Date Completed:	Current Status / Notes:
	Yes	No	N/A								

Audit Checklist Item

1. Is there a written HASP for this project? If so, what is the revision date?											
2. Is the HASP available to project personnel?											
3. Does the HASP appear accurate and complete? For example, are the directions to the hospital and the emergency contact numbers accurate? Are the site contaminants listed?											
4. Do the JHAs appear accurate and complete? For example, do there appear to be risks addressed for all of the applicable activities?											
5. Do you observe violations of the HASP requirements?											
6. If applicable, are employees adhering to the respirator program (see SOP 03, Respiratory Protection)?											

Interview Questions

7. Where do you keep the HASP for this project?											
8. Have you reviewed the HASP for this project? If so, what was your review process?											
9. Can you tell me how you conduct your site activities? Note to auditor—pick a JHA activity and identify major discrepancies between the answer and the JHA, if any.											
10. Do you have any health and safety questions or concerns? For example, have you observed things on this project that you thought were unsafe? Note to auditor—make sure we come up with a plan to promptly address any listed concerns.											

Signature of Person / Persons Conducting Audit

Name	Signature	Date

Signature of Project Manager and Principal in Charge Acknowledging Review of Completed HASP Audit Checklist

Name	Signature	Date

Appendix D

Inadvertent Discovery Plan

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INADVERTENT DISCOVERY PLAN PLAN AND PROCEDURES FOR THE DISCOVERY OF CULTURAL RESOURCES AND HUMAN SKELETAL REMAINS

To request ADA accommodation, including materials in a format for the visually impaired, call Ecology at 360-407-6000 or visit <https://ecology.wa.gov/accessibility>. People with impaired hearing may call Washington Relay Service at 711. People with a speech disability may call TTY at 877-833-6341.

Site Name(s):

Location:

Project Lead/Organization:

County:

If this Inadvertent Discovery Plan (IDP) is for multiple (batched) projects, ensure the location information covers all project areas.

1. INTRODUCTION

The IDP outlines procedures to perform in the event of a discovery of archaeological materials or human remains, in accordance with applicable state and federal laws. An IDP is required, as part of Agency Terms and Conditions for all grants and loans, for any project that creates disturbance above or below the ground. An IDP is not a substitute for a formal cultural resource review (Executive 21-02 or Section 106).

Once completed, **the IDP should always be kept at the project site** during all project activities. All staff, contractors, and volunteers should be familiar with its contents and know where to find it.

2. CULTURAL RESOURCE DISCOVERIES

A cultural resource discovery could be prehistoric or historic. Examples include (see images for further examples):

- An accumulation of shell, burned rocks, or other food related materials.
- Bones, intact or in small pieces.
- An area of charcoal or very dark stained soil with artifacts.
- Stone tools or waste flakes (for example, an arrowhead or stone chips).
- Modified or stripped trees, often cedar or aspen, or other modified natural features, such as rock drawings.
- Agricultural or logging materials that appear older than 50 years. These could include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, and many other items.
- Clusters of tin cans or bottles, or other debris that appear older than 50 years.
- Old munitions casings. **Always assume these are live and never touch or move.**
- Buried railroad tracks, decking, foundations, or other industrial materials.
- Remnants of homesteading. These could include bricks, nails, household items, toys, food containers, and other items associated with homes or farming sites.

The above list does not cover every possible cultural resource. When in doubt, assume the material is a cultural resource.

3. ON-SITE RESPONSIBILITIES

If any employee, contractor, or subcontractor believes that they have uncovered cultural resources or human remains at any point in the project, take the following steps to **Stop-Protect-Notify**. **If you suspect that the discovery includes human remains, also follow Sections 5 and 6.**

STEP A: Stop Work.

All work must stop immediately in the vicinity of the discovery.

STEP B: Protect the Discovery.

Leave the discovery and the surrounding area untouched and create a clear, identifiable, and wide boundary (30 feet or larger) with temporary fencing, flagging, stakes, or other clear markings. Provide protection and ensure integrity of the discovery until cleared by the Department of Archaeological and Historical Preservation (DAHP) or a licensed, professional archaeologist.

Do not permit vehicles, equipment, or unauthorized personnel to traverse the discovery site. Do not allow work to resume within the boundary until the requirements of this IDP are met.

STEP C: Notify Project Archaeologist (if applicable).

If the project has an archaeologist, notify that person. If there is a monitoring plan in place, the archaeologist will follow the outlined procedure.

STEP D: Notify Project and Washington Department of Ecology (Ecology) contacts.

Project Lead Contacts

Primary Contact

Name:

Organization:

Phone:

Email:

Alternate Contact

Name:

Organization:

Phone:

Email:

Ecology Contacts (completed by Ecology Project Manager)

Ecology Project Manager

Name:

Program:

Phone:

Email:

Alternate or Cultural Resource Contact

Name:

Program:

Phone:

Email:

STEP E: Ecology will notify DAHP.

Once notified, the Ecology Cultural Resource Contact or the Ecology Project Manager will contact DAHP to report and confirm the discovery. To avoid delay, the Project Lead/Organization will contact DAHP if they are not able to reach Ecology.

DAHP will provide the steps to assist with identification. DAHP, Ecology, and Tribal representatives may coordinate a site visit following any necessary safety protocols. DAHP may also inform the Project Lead/Organization and Ecology of additional steps to further protect the site.

Do not continue work until DAHP has issued an approval for work to proceed in the area of, or near, the discovery.

DAHP Contacts:

Name: Rob Whitlam, PhD
Title: State Archaeologist
Cell: 360-890-2615
Email: Rob.Whitlam@dahp.wa.gov
Main Office: 360-586-3065

Human Remains/Bones:

Name: Guy Tasa, PhD
Title: State Anthropologist
Cell: 360-790-1633 (24/7)
Email: Guy.Tasa@dahp.wa.gov

4. TRIBAL CONTACTS

In the event cultural resources are discovered, the following tribes will be contacted. See Section 10 for Additional Resources.

Tribe:	Tribe:
Name:	Name:
Title:	Title:
Phone:	Phone:
Email:	Email:
Tribe:	Tribe:
Name:	Name:
Title:	Title:
Phone:	Phone:
Email:	Email:

Please provide contact information for additional tribes within your project area, if needed, in Section 11.

5. FURTHER CONTACTS (if applicable)

If the discovery is confirmed by DAHP as a cultural or archaeological resource, or as human remains, and there is a partnering federal or state agency, Ecology or the Project Lead/Organization will ensure the partnering agency is immediately notified.

Federal Agency:

Agency:

Name:

Title:

Phone:

Email:

State Agency:

Agency:

Name:

Title:

Phone:

Email:

6. SPECIAL PROCEDURES FOR THE DISCOVERY OF HUMAN SKELETAL MATERIAL

Any human skeletal remains, regardless of antiquity or ethnic origin, will at all times be treated with dignity and respect. Follow the steps under **Stop-Protect-Notify**. For specific instructions on how to handle a human remains discovery, see: [RCW 68.50.645: Skeletal human remains—Duty to notify—Ground disturbing activities—Coroner determination—Definitions.](#)

Suggestion: If you are unsure whether the discovery is human bone or not, contact Guy Tasa with DAHP, for identification and next steps. Do not pick up the discovery.

Guy Tasa, PhD State Physical Anthropologist

Guy.Tasa@dahp.wa.gov

(360) 790-1633 (Cell/Office)

For discoveries that are confirmed or suspected human remains, follow these steps:

1. Notify law enforcement and the Medical Examiner/Coroner using the contacts below. **Do not call 911** unless it is the only number available to you.

Enter contact information below (required):

- Local Medical Examiner or Coroner name and phone:
 - Local Law Enforcement main name and phone:
 - Local Non-Emergency phone number (911 if without a non-emergency number):
2. The Medical Examiner/Coroner (with assistance of law enforcement personnel) will determine if the remains are human or if the discovery site constitutes a crime scene and will notify DAHP.
 3. **DO NOT speak with the media, allow photography or disturbance of the remains, or release any information about the discovery on social media.**
 4. If the remains are determined to be non-forensic, Cover the remains with a tarp or other materials (not soil or rocks) for temporary protection and to shield them from being photographed by others or disturbed.

Further activities:

- Per [RCW 27.44.055](#), [RCW 68.50](#), and [RCW 68.60](#), DAHP will have jurisdiction over non-forensic human remains. Ecology staff will participate in consultation. Organizations may also participate in consultation.
- Documentation of human skeletal remains and funerary objects will be agreed upon through the consultation process described in [RCW 27.44.055](#), [RCW 68.50](#), and [RCW 68.60](#).
- When consultation and documentation activities are complete, work in the discovery area may resume as described in Section 8.

If the project occurs on federal lands (such as a national forest or park or a military reservation) the provisions of the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) apply and the responsible federal agency will follow its provisions. Note that state highways that cross federal lands are on an easement and are not owned by the state.

If the project occurs on non-federal lands, the Project Lead/Organization will comply with applicable state and federal laws, and the above protocol.

7. DOCUMENTATION OF ARCHAEOLOGICAL MATERIALS

Archaeological resources discovered during construction are protected by state law [RCW 27.53](#) and assumed eligible for inclusion in the National Register of Historic Places under Criterion D until a formal Determination of Eligibility is made.

The Project Lead/Organization must ensure that proper documentation and field assessment are made of all discovered cultural resources in cooperation with all parties: the federal agencies (if any), DAHP, Ecology, affected tribes, and the archaeologist.

The archaeologist will record all prehistoric and historic cultural material discovered during project construction on a standard DAHP archaeological site or isolate inventory form. They will photograph site overviews, features, and artifacts and prepare stratigraphic profiles and soil/sediment descriptions for minimal subsurface exposures. They will document discovery locations on scaled site plans and site location maps.

Cultural features, horizons, and artifacts detected in buried sediments may require the archaeologist to conduct further evaluation using hand-dug test units. They will excavate units in a controlled fashion to expose features, collect samples from undisturbed contexts, or to interpret complex stratigraphy. They may also use a test unit or trench excavation to determine if an intact occupation surface is present. They will only use test units when necessary to gather information on the nature, extent, and integrity of subsurface cultural deposits to evaluate the site's significance. They will conduct excavations using standard archaeological techniques to precisely document the location of cultural deposits, artifacts, and features.

The archaeologist will record spatial information, depth of excavation levels, natural and cultural stratigraphy, presence or absence of cultural material, and depth to sterile soil, regolith, or bedrock for each unit on a standard form. They will complete test excavation unit level forms, which will include plan maps for each excavation level and artifact counts and material types, number, and vertical provenience (depth below

surface and stratum association where applicable) for all recovered artifacts. They will draw a stratigraphic profile for at least one wall of each test excavation unit.

The archaeologist will screen sediments excavated for purposes of cultural resources investigation through 1/8-inch mesh, unless soil conditions warrant 1/4-inch mesh.

The archaeologist will analyze, catalogue, and temporarily curate all prehistoric and historic artifacts collected from the surface and from probes and excavation units. The ultimate disposition of cultural materials will be determined in consultation with the federal agencies (if any), DAHP, Ecology, and the affected tribe(s).

Within 90 days of concluding fieldwork, the archaeologist will provide a technical report describing any and all monitoring and resultant archaeological excavations to the Project Lead/Organization, who will forward the report to Ecology, the federal agencies (if any), DAHP, and the affected tribe(s) for review and comment.

If assessment activities expose human remains (burials, isolated teeth, or bones), the archaeologist and Project Lead/Organization will follow the process described in **Section 6**.

8. PROCEEDING WITH WORK

The Project Lead/Organization shall work with the archaeologist, DAHP, and affected tribe(s) to determine the appropriate discovery boundary and where work can continue.

Work may continue at the discovery location only after the process outlined in this plan is followed and the Project Lead/Organization, DAHP, any affected tribe(s), Ecology, and the federal agencies (if any) determine that compliance with state and federal laws is complete.

9. ORGANIZATION RESPONSIBILITY

The Project Lead/Organization is responsible for ensuring:

- This IDP has complete and accurate information.
- This IDP is immediately available to all field staff at the sites and available by request to any party.
- This IDP is implemented to address any discovery at the site.
- That all field staff, contractors, and volunteers are instructed on how to implement this IDP.

10. ADDITIONAL RESOURCES

Informative Video

Ecology recommends that all project staff, contractors, and volunteers view this informative video explaining the value of IDP protocol and what to do in the event of a discovery. The target audience is anyone working on the project who could unexpectedly find cultural resources or human remains while excavating or digging. The video is also posted on DAHP's inadvertent discovery language website.

[Ecology's IDP Video](https://www.youtube.com/watch?v=ioX-4cXfbDY) (<https://www.youtube.com/watch?v=ioX-4cXfbDY>)

Informational Resources

[DAH P \(https://dahp.wa.gov\)](https://dahp.wa.gov)

[Washington State Archeology \(DAH P 2003\)](https://dahp.wa.gov/sites/default/files/Field%20Guide%20to%20WA%20Arch_0.pdf)

[\(https://dahp.wa.gov/sites/default/files/Field%20Guide%20to%20WA%20Arch_0.pdf\)](https://dahp.wa.gov/sites/default/files/Field%20Guide%20to%20WA%20Arch_0.pdf)

[Association of Washington Archaeologists \(https://www.archaeologyinwashington.com\)](https://www.archaeologyinwashington.com)

Potentially Interested Tribes

[Interactive Map of Tribes by Area](https://dahp.wa.gov/archaeology/tribal-consultation-information)

[\(https://dahp.wa.gov/archaeology/tribal-consultation-information\)](https://dahp.wa.gov/archaeology/tribal-consultation-information)

[WSDOT Tribal Contact Website](https://wsdot.wa.gov/tribal/TribalContacts.htm)

[\(https://wsdot.wa.gov/tribal/TribalContacts.htm\)](https://wsdot.wa.gov/tribal/TribalContacts.htm)

11. ADDITIONAL INFORMATION

Please add any additional contact information or other information needed within this IDP.

Implement the IDP if you see...

Chipped stone artifacts.

Examples are:

- Glass-like material.
- Angular material.
- “Unusual” material or shape for the area.
- Regularity of flaking.
- Variability of size.



Stone artifacts from Oregon.



Stone artifacts from Washington.



Biface-knife, scraper, or pre-form found in NE Washington. Thought to be a well knapped object of great antiquity. Courtesy of Methow Salmon Rec. Foundation.

Implement the IDP if you see...

Ground stone artifacts.

Examples are:

- Unusual or unnatural shapes or unusual stone.
- Striations or scratching.
- Etching, perforations, or pecking.
- Regularity in modifications.
- Variability of size, function, or complexity.



Above: Fishing Weight - credit [CRITFC Treaty Fishing Rights website](#).



Artifacts from unknown locations (left and right images).



Implement the IDP if you see...

Bone or shell artifacts, tools, or beads.

Examples are:

- Smooth or carved materials.
- Unusual shape.
- Pointed as if used as a tool.
- Wedge shaped like a “shoehorn”.
- Variability of size.
- Beads from shell (‘dentalium’) or tusk.



Upper Left: Bone Awls from Oregon.

Upper Center: Bone Wedge from California.

Upper Right: Plateau dentalium choker and bracelet, from Nez Perce National Historical Park, 19th century, made using Antalis pretiosa shells Credit: Nez Perce - Nez Perce National Historical Park, NEPE 8762, [Public Domain](#).

Above: Tooth Pendants. Right: Bone Pendants. Both from Oregon and Washington.

Implement the IDP if you see...

Culturally modified trees, fiber, or wood artifacts.

Examples are:

- Trees with bark stripped or peeled, carvings, axe cuts, de-limbing, wood removal, and other human modifications.
- Fiber or wood artifacts in a wet environment.
- Variability of size, function, and complexity.



Left and Below: *Culturally modified tree and an old carving on an aspen (Courtesy of DAHP).*

Right, Top to Bottom: *Artifacts from Mud Bay, Olympia: Toy war club, two strand cedar rope, wet basketry.*



Implement the IDP if you see...

Strange, different, or interesting looking dirt, rocks, or shells.

Human activities leave traces in the ground that may or may not have artifacts associated with them. Examples are:

- “Unusual” accumulations of rock (especially fire-cracked rock).
- “Unusual” shaped accumulations of rock (such as a shape similar to a fire ring).
- Charcoal or charcoal-stained soils, burnt-looking soils, or soil that has a “layer cake” appearance.
- Accumulations of shell, bones, or artifacts. Shells may be crushed.
- Look for the “unusual” or out of place (for example, rock piles in areas with otherwise few rocks).



Shell Midden pocket in modern fill discovered in sewer trench.



Underground oven. Courtesy of DAHP.

Shell midden with fire cracked rock.



Hearth excavated near Hamilton, WA.

Implement the IDP if you see...

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Agricultural or logging equipment. May include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, etc.
- Domestic items including square or wire nails, amethyst colored glass, or painted stoneware.



Left: Top to Bottom: *Willow pattern serving bowl and slip joint pocket knife discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*



Right: *Collections of historic artifacts discovered during excavations in eastern Washington cities.*



Implement the IDP if you see...

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Railway tokens, coins, and buttons.
- Spectacles, toys, clothing, and personal items.
- Items helping to understand a culture or identity.
- Food containers and dishware.



Main Image: *Dishes, bottles, workboot found at the North Shore Japanese bath house (ofuro) site, Courtesy Bob Muckle, Archaeologist, Capilano University, B.C. This is an example of an above ground resource.*



Right, from Top to Bottom: *Coins, token, spectacles and Montgomery Ward pitchfork toy discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*



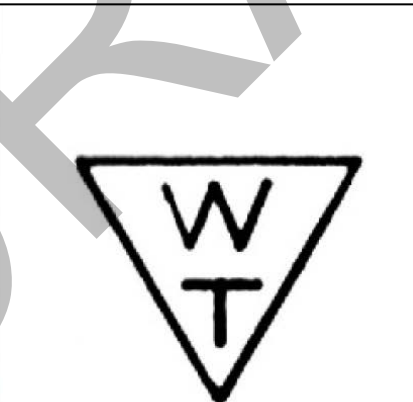
Implement the IDP if you see...

- Old munition casings – if you see ammunition of any type – ***always assume they are live and never touch or move!***
- Tin cans or glass bottles with an older manufacturer's technique – maker's mark, distinct colors such as turquoise, or an older method of opening the container.



Far Left: .303 British cartridge found by a WCC planting crew on Skagit River. Don't ever touch something like this!
Left: Maker's mark on bottom of old bottle.

Right: Old beer can found in Oregon. ACME was owned by Olympia Brewery. Courtesy of Heather Simmons.



Logo employed by Whithall Tatum & Co. between 1924 to 1938 (Lockhart et al. 2016).



Can opening dates, courtesy of W.M. Schroeder.

Implement the IDP if you see...

You see historic foundations or buried structures.

Examples are:

- Foundations.
- Railroad and trolley tracks.
- Remnants of structures.



Counter Clockwise, Left to Right: *Historic structure 45KI924, in WSDOT right of way for SR99 tunnel. Remnants of Smith Cove shantytown (45-KI-1200) discovered during Ecology CSO excavation, City of Spokane historic trolley tracks uncovered during stormwater project, intact foundation of historic home that survived the Great Ellensburg Fire of July 4, 1889, uncovered beneath parking lot in Ellensburg.*

Implement the IDP if you see...

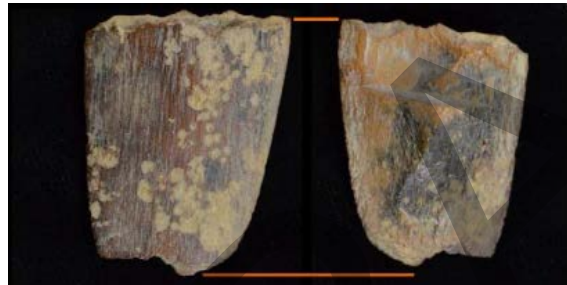
Potential human remains.

Examples are:

- Grave headstones that appear to be older than 50 years.
- Bones or bone tools--intact or in small pieces. It can be difficult to differentiate animal from human so they must be identified by an expert.
- These are all examples of animal bones and are not human.

Center: *Bone wedge tool, courtesy of Smith Cove Shantytown excavation (45KI1200).*

Other images (Top Right, Bottom Left, and Bottom) Center: Courtesy of DAHP.



Directly Above: This is a real discovery at an Ecology sewer project site.

What would you do if you found these items at a site? Who would be the first person you would call?

Hint: Read the plan!