APPENDIX A

FIELD SAMPLING PLAN

Remedial Investigation/Feasibility Study
Astoria Area-Wide Petroleum Site
Astoria, Oregon

Prepared by

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1.0 INTRODUCTION

This Field Sampling Plan (FSP) describes procedures for conducting field activities during Phase 1 of the remedial investigation (RI) at the Astoria Area-Wide site in Astoria, Oregon. Specifically, the scope and methodology for soil, sediment, surface-water and ground-water sampling activities are presented. The sampling methods described in the FSP are based on procedures outlined in U.S. Environmental Protection Agency (EPA) guidance documents. Specific sampling locations and analytical requirements are listed in Table 6 of Section 3 of the Work Plan. Analytical requirements are referenced in the Quality Assurance Project Plan (Appendix B).

1.1 QUALITY ASSURANCE OBJECTIVES

The quality assurance (QA) objectives of the FSP are:

(a) That samples obtained are representative of the source
(b) That sufficient sample is collected for all analyses that will be performed
(c) That the samples do not change significantly in chemical or physical makeup between sampling and analysis
(d) That there is adequate documentation of the sampling procedures used to collect the samples
(e) To ensure sampling and analysis methodology is consistent with accepted procedures (maximizing accuracy, reproducibility, and comparability of data between sampling events)

Adherence to the FSP and QA objectives will ensure proper:

- Locations for sampling
- Equipment and procedures for safe sampling
- Methods of sampling to be used
- Number of samples to be collected
- Volume of samples to be collected
- Type and kind of field analyses
- Laboratory analyses to be performed
- Methods of preservation and shipment
- Execution of proper chain-of-custody procedures

1.2 FSP ORGANIZATION

The rest of this FSP is organized into the following sections:

- **Section 2.0 Project Documentation**. Provides information on taking field notes, using field sampling data forms, and how to properly label sample containers and photographs.
- **Section 3.0 Field Equipment.** Provides equipment lists, sampling equipment material specifications, and instructions for calibrating, cleaning and decontaminating equipment.
- **Section 4.0 General Field Procedures.** The procedures that should be used every time a characterization activity is to be performed are described in this section.
- **Section 5.0 Sample Handling and Custody Procedures.** Describes sample collection, handling, storage, transporting, and custody procedures.
- **Section 6.0 Soil Sample Collection.** The protocol to be used under a variety of soil sampling situations is described.
- **Section 7.0 Sediment Sampling.** The procedures for sampling of sediment are described in this section.
- **Section 8.0 Ground-Water Monitoring and Sampling**. Presents ground-water monitoring procedures designed to provide for data of consistent quality across the Astoria Area-Wide site.
- **Section 9.0 Storm Water Monitoring and Sampling**. Storm water observations and sampling procedures are presented in this section.
- **Section 10 References.** References to materials used in the preparation of this plan.

2.0 PROJECT DOCUMENTATION

It is imperative that characterization results are well documented. Daily field documentation needs to provide sufficient data and observations to enable participants to reconstruct events that occurred during the project and to refresh the memory of the field personnel. This information will be used both by people who are and are not familiar with the site so it is important that the written information provides a clear picture of all conditions encountered. Complete and descriptive field notes may later provide the key to interpreting characterization results.

All field documentation and project records will be filed to prevent loss, damage, or alteration. Access to any archived project files or laboratory data will be controlled to maintain integrity of the documentation.

2.1 FIELD NOTEBOOK

Daily field notes pertinent to the individual field tasks will be recorded using non-erasable waterproof ink in a bound, waterproof field notebook containing consecutively numbered pages. Information documented on field sampling forms (Section 2.2) need not be repeated in the field notebook; however, reference must then be made in the field notebook to the field forms.

If an error is made on any field documentation, corrections will be made by drawing a single line through the error and entering the correct information. Whenever possible, errors will be corrected by the person who made the entry. Corrections will be initialed, dated, and, if necessary, a footnote explaining the correction will be included. The erroneous information will not be discarded.

Information that might be recorded includes:

- Site and sample locations with enough detail to be able to relocate the sampled site. Information may include major water body, nearby bridges and roads, GPS or Loran-C readings, compass readings to permanent landmarks (triangulation), distances from shore and relation to permanent landmarks (sediment sampling), or a hand drawn map of the immediate area.
- Weather conditions
- Date and time each sample was taken
- Sample label
- Types of samples being taken and for what purpose

- Observations about the sample including depth collected, texture, coloring, odor, presence of detritus, etc.
- Type and results of field measurements
- Equipment being used
- Name(s) of sampling personnel
- Any other detailed information that is important for understanding or interpreting the data

2.2 FIELD SAMPLING FORMS

To aid in achieving complete data, task-specific field sampling forms (e.g., chain-of-custody record, sample collection form, etc.) will be used to document sampling activities. An example field sampling form to be used for ground-water sampling is included on Figure A-1.

2.3 SAMPLE CONTAINER LABELS AND IDENTIFICATION FORMAT

Each sample container will be labeled, chemically preserved if required, and sealed immediately after collection. Sample container labels will be filled out using waterproof ink and will be firmly affixed to the sample containers. Sample label information also will be recorded on the appropriate field sampling forms. An example sample container label is shown on Figure A-2.

The sample container label will contain the following information:

- Sample Designation, or Identification
- Locator
- Date and time of collection
- Medium
- Project number
- Name of sampler(s)
- Analyses required
- Preservation (if applicable).

Additional information may be added as needed, based on the specific requirements of the sampling activity.

It is important that all sample designations be unique, both internally for each property investigation and for the Astoria Area-Wide investigation as a whole. Sample locations are designated as “locators” for purposes of managing the data. A “locator” is a generic name for use in data management to describe spatial locations of monitoring wells, soil borings, test pits, storm-water outfalls, or any place in horizontal space where an environmental sample is collected. Locators are described in the form of PR-xx(SU), where PR indicates the prefix, xx is the numeric designation of the locator, and (SU) is the suffix.

The prefix assigned to a locator describes the type of sampling location. Prefixes will be assigned as follows:

MW	= Monitoring Well
TW	= Temporary Well
SB	= Soil Boring, including GeoProbe®
TP	= Test Pit
SO	= Storm Water Outfall
CB	= Catch Basin
SW	= Surface Water Sampling Station
SD	= Sediment
AI	= Air Sample
IN	= Influent Sample Port
EF	= Effluent Sample Port
BM	= Blind Duplicate, monitoring well
BT	= Blind Duplicate, temporary well
BS	= Blind Duplicate, storm water outfall
BI	= Blind Duplicate, influent sample
BE	= Blind Duplicate, effluent sample

Each PRP will be assigned a group of numeric designations for samples collected on its behalf, as shown below:

100-199	Chevron @ Texaco
200-299	Chevron @ McCall
300-399	Delphia Oil
400-499	Harris/VanWest
500-599	McCall Oil
600-699	Niemi Oil
700-799	Port of Astoria
800-899	Qwest
900-999	Shell Oil
1000-1100	Astoria Area-Wide

Numeric designations for each prefix will be issued sequentially beginning with 101, 201, 301, 401, etc. for each group of numbers assigned to each PRP.

Suffixes for locators have been assigned to allow for easy correlation of locator and analytical data developed prior to the RI/FS with data developed during the RI/FS. The suffixes are as follows:

(C)	Chevron
(D)	Delphia Oil
(F)	Harris/VanWest/Flying Dutchman
(M)	McCall Oil
(N)	Niemi Oil
(P)	Port of Astoria
(Q)	Qwest
(S)	Shell Oil
(A)	Astoria Area-Wide

Samples collected at each locator will be designated by the locator name and appropriate appended information. For example, a sample collected from monitoring-well MW-1001(A) will simply be called "MW-1001(A)" in the sample designation on the sample label. Samples from monitoring wells are differentiated by date. Samples collected where depth or elevation are important in differentiating samples from the same locator will have the depth or elevation included in the sample designation. A sample collected from soil boring SB-601(N) from a depth of 5 feet for example, will be called "SB-601(N)-5" in the sample designation on the sample label.

Two (or more) locators may be positioned at the same place (same northing and easting). For instance, SB-601(N) may be the locator assigned to a soil boring. A temporary well installed in the soil boring may be designated TW-601(N). Finally, a permanent monitoring well may be installed at the same location and could be called MW-1003(A).

Sample information will be recorded in the field notes and on the appropriate sample collection forms. Field quality control samples will be coded as individual samples and identified in the field notes and on sample collection forms. When a blind duplicate or replicate is prepared, the prefix will be changed, as in BM-1001(A) for a blind duplicate from MW-1001(A). Only the sample designation changes, not the locator.

2.4 PHOTOGRAPHS

Photographs may be taken in the field to document sampling methodologies, locations, or conditions, and may be made from film or taken digitally. When taken, photographs will be recorded in field notebooks. Notations in field notebooks concerning photographs may be made singly or for groups of photographs.

3.0 FIELD EQUIPMENT

Having the right equipment and supplies prepared and available while on-site for a particular sampling event will expedite characterization activities. Field personnel should be trained on the proper use and maintenance of all the equipment they may use.

3.1 EQUIPMENT LISTS

This section presents lists of equipment that may be needed at the Astoria Area-Wide Site. Both general and sediment sampling-specific lists are included. These lists suggest equipment that may be necessary for this project and should not be considered exhaustive.

3.1.1 General Equipment/Materials Checklist

- Protective clothing: hard hats, boots, waders, gloves, rain gear, latex/nitrile sampling gloves, tyvek (if required), etc.
- First aid kit
- Traffic control and security aids (stanchions, caution tape, padlocks, locking monitoring well caps, temporary security fencing, etc.)
- Mobile phone
- Credit card for gas and emergencies
- Maps: road and site maps
- Compass and measuring equipment
- Electronic location device (Loran or GPS)
- Field notebook and field sheets
- Waterproof pens and pencils
- Field measurement equipment (temperature, dissolved oxygen, etc.)
- Extra field equipment batteries
- Sample containers
- Sample-labeling marker (permanent-type) and appropriate label material
- Slide hammer for corer/push-probe, hand sampling equipment (stainless steel auger, push probe with extensions and fittings, stainless steel mixing bowls, spoons and shovel, etc.), or other appropriate samplers
- Pliers, wrenches, etc. for adjusting equipment
- Mixing bowl and spoon
- Cleaning (decontamination) supplies (non-ionic detergent, tub, brushes, etc.)

- Wash bottles, distilled water
- Ice chest and ice/frozen freezer packs for cooling samples
- Extra rope and/or nylon string for bailers
- Equipment suitable for the chemical constituents that may be encountered on the site.

3.1.2 Sediment Sampling Equipment/Materials Checklist

- Boat, anchor, motor, gas tank, tow vehicle
- Depth pole with markings for measuring depth of sediment samples
- Coring device and dredge or grab with adequate rope and extension poles (grab is backup for corer in sandy sediments), including extension poles

3.2 SAMPLING EQUIPMENT MATERIAL SPECIFICATIONS

All equipment or sample containers that will come into contact with a sample for chemical analysis should be constructed of materials that will not affect the concentration of contaminants in the sediment sample.

- For **organic analysis**, equipment and containers should be constructed of: *glass, teflon, polycarbonate, nylon, aluminum, galvanized steel, stainless steel or porcelain*. *Acrylic* core tubes are also acceptable for almost all sampling needs.

- For **inorganic analysis**, equipment and sample containers should be constructed of: *glass, teflon, polyethylene polycarbonate, stainless steel* or *acrylic*.

3.3 EQUIPMENT CALIBRATION

All meters will be calibrated and tested following the manufacturers' instructions prior to departure into the field so faults can be discovered and remedied prior to meter use. Calibration data (dates, results and person testing the equipment) will be recorded in a log maintained for each instrument. Meter calibration will be checked at least twice during a sample day (middle and end of day) or when meter drift is suspected, and data will be recorded in the calibration log.

3.4 EQUIPMENT CLEANING AND DECONTAMINATION PROCEDURES

Rigorous equipment cleaning and decontamination procedures will be followed to prevent the dispersion of any impacted material, as well as support QA objectives. All equipment will be cleaned before going into the field and between sample locations to prevent contaminating samples. Sampling equipment will be decontaminated before collecting each sample to avoid cross contamination between samples. Decontaminated sampling equipment will be handled in a manner that minimizes contact with potentially contaminated surfaces. Between sampling events, all nondedicated pumps and tubing will be stored in a manner (e.g., in a plastic bag) that protects them from inadvertent contamination.

3.4.1 Heavy Equipment

All heavy equipment used for drilling and/or excavation (e.g., hollow-stem auger, GeoProbe®, backhoe, tracked-hoe) will be decontaminated in an established decontamination area using a high-pressure, hot-water washer before and after each use at each exploration location.

3.4.2 Well Casings and Screens

Permanent well casings and screens will also be decontaminated using a high-pressure washer before installation, if factory decontamination procedures cannot be documented.

3.4.3 Soil, Storm Water, and Ground Water Sampling Equipment

Decontamination procedures for soil, surface water and ground-water sampling equipment will be used to minimize the possibility of cross-contaminating samples. Sampling equipment that comes in contact with potentially contaminated material will be decontaminated before and after each use. Equipment should be washed with clean scrub brushes using a non-phosphate detergent that leaves no residue when rinsed such as Alconox® powdered or Liqui-nox liquid detergent (Liqui-nox is the EPA standard detergent for sampling apparatus). To properly clean equipment, wash apparatus thoroughly with detergent, then rinse 5-6 times with tap water and 3 times with deionized/distilled water if it is available. Rinse the apparatus with site water before taking the first sample. Specifically, decontamination of sampling equipment will consist of the following steps and will be documented on the sample collection form:

- Initial tap water rinse to remove large soil particles, if applicable
- Alconox or Liqui-nox and tap water wash
- Tap water rinse
- Deionized or distilled water rinse.

The discharge tubing that is used for ground water sampling will be replaced with new tubing between wells, or dedicated tubing will be assigned to each well.

3.4.4 Sediment Collection and Sampling Equipment

The following steps for cleaning new or used sediment sampling equipment and containers are recommended by EPA:

- Soak 15 min in tap water, and scrub with detergent
- Rinse twice with tap water
- Rinse once with fresh, dilute (10% V:V) hydrochloric or nitric acid
- Rinse three times with deionized water

Rinse field collection equipment with site water immediately before use.

4.0 GENERAL FIELD PROCEDURES

The following routine procedures should be followed each time field work is conducted. Adherence to this routine will further both worker health and safety and the FSP QA objectives.

In the Office (before Characterization Activity)

- Identify specific fieldwork to be conducted. Know the type and locations of samples to be collected, analyses to be run.
- Collect and pack all equipment and materials needed for the characterization activity. Order and pre-label sample containers.
- Test operation of all field equipment. Calibrate and check batteries.

On-Site

- Upon arriving at site, conduct safety tailgate meetings. Inform on-site workers of any project updates.
- Setup work zones
- Perform initial air monitoring, as necessary (described in HASP)
- Turn on any equipment that needs to warm up (like a dissolved oxygen meter)
- Make sure all equipment is clean and ready to use
- Have container ready to accept entire sample quickly upon retrieval
- Label every sample container with a permanent marker on labeling tape on the side of the jar or wherever the label will not come off accidentally
- Place all samples on ice immediately and follow all other chain-of-custody procedures (Section 5.0)
- Record all site information in a field notebook or on field sheets before leaving site. Information usually includes: field measurements, time and date, persons collecting samples, number and types of samples taken including field blanks, etc., labels assigned to each sample, and any general observations. Keep records of all samples, how they were labeled and any blanks or controls that are submitted for analysis.
- Properly store and label any decontamination and/or purge water
- Properly cover and secure any stockpiled soil or sediment
- Secure all monitoring wells and work areas before leaving
- Submit samples to laboratory in accordance with specific analyses' holding times

5.0 SAMPLE HANDLING AND CUSTODY PROCEDURES

Sample handling and custody procedures are summarized in this section. These procedures and protocols for each sampling activity were developed to meet the data quality objectives (Appendix B to the Work Plan, Quality Assurance Project Plan) and are based on proven and acceptable sampling methods as established by EPA guidance documents, Oregon State regulations, and professional judgment. When field conditions require modification of an approved sampling protocol, the modification will be recorded in the field-sampling notebook. If sampling protocol is modified as a procedural basis, this document will be revised to reflect this update in sampling protocol. The laboratory shall notify the responsible party's consultant and/or *EnviroLogic Resources* before any modification of laboratory procedures.

5.1 SAMPLE COLLECTION AND HANDLING

Sample collection procedures and protocols for each sampling activity are described in detail in Sections 7.0 through 9.0 of this FSP. Sample containers, preservatives, and holding times will be selected according to the type of sample collected and the analytical method to be used. Strict precautions will be taken to adhere to maximum sample holding times. Sample containers, preservatives, and holding times for each analysis are presented in Table A-1. Each sample will be documented, labeled, and identified as noted in Section 2.3.

5.2 SAMPLE PACKAGING AND SHIPPING

Samples will be packaged and transported in a manner that protects the integrity of the sample and prevents detrimental effects due to the possible hazardous nature of samples. Regulations for packaging, marking, labeling, and shipping hazardous materials are promulgated by the U.S. Department of Transportation (DOT) in the Code of Federal Regulations (CFR), 49 CFR 171 through 177.

Soil and water samples will be placed on sealed, reusable ice packs or double-bagged ice in coolers immediately after collection. Soil samples will be placed in reclosable bags or otherwise protected from contamination from melting ice if ice is used. At the end of each day or as soon as practical after sample collection, samples will be sent to the analytical laboratory.

Samples will be packaged carefully to avoid breakage or cross-contamination using sufficient packing material. Samples will be shipped to the offsite analytical laboratory at the appropriate temperatures (typically controlled by accompanying ice/frozen freezer packs). The chain-of-custody forms accompanying the samples to the laboratory will be placed inside a separate plastic bag and taped inside the shipping container lid.

The shipping container will be taped shut with strapping tape. Custody seals will be placed on the containers. The shipping containers will either be air-freighted to the laboratory by an over-night carrier or transported by surface carrier.

5.3 SAMPLE CUSTODY

The primary objective of sample custody is to create an accurate record that can be used to trace the possession and handling of samples so that their quality and integrity can be documented and maintained from collection until completion of all required analyses. Adequate sample custody will be achieved by means of the chain-of-custody record initially completed by the sampler, and thereafter signed by each individual who accepts custody of the sample. An example chain-of- custody record is shown on Figure A-3. A sample will be considered to be in custody under the following conditions:

- Someone has the sample in physical possession
- Someone has the sample in view
- The sample is locked or secured in a locked container or otherwise sealed so that tampering will be evident
- The sample is kept in a secured area, restricted to authorized personnel only

Sample control and chain-of-custody in the field and during transport to the laboratory will be conducted in general conformance with the procedures described below and in Section 4 of A Compendium of Superfund Field Operations Methods.

5.3.1 Field Custody Procedures

The following field custody procedures will be followed:

- As few persons as possible will handle samples.
- Sample bottles will be purchased directly from the manufacturer by the responsible party's consultant, or *EnviroLogic Resources*, or obtained new or pre-cleaned from the laboratory performing the analyses.
- The person collecting the sample will be responsible for completing the chain-of-custody record and for the care and custody of collected samples until they are transferred to another person under chain-of-custody rules.

- The responsible party's consultant, or *EnviroLogic Resources* field representative will oversee field custody procedures during the fieldwork and in the event of noncompliance, will determine if corrective action is required.

5.3.2 Sample Shipment Custody Procedures

The coolers in which the samples are shipped will be accompanied by the chain-of-custody record identifying their contents. The original record and laboratory copy will accompany the shipment (sealed inside the shipping container). The other copy will be distributed, as appropriate, to the *EnviroLogic Resources* QA task leader.

Shipping containers will be sealed with custody seals for shipment to the laboratory. The method of shipment, name of courier, and other pertinent information will be entered in the remarks section of the chain-of-custody record.

If sent by mail, the package will be registered with return receipt requested. If sent by common carrier, a bill of lading will be used. Freight bills, postal services receipts, and bills of lading will be retained as part of the permanent documentation.

5.3.3 Transfer of Custody

When samples are transferred, the individuals' relinquishing and receiving the samples will sign the chain-of-custody record and document the date and time of transfer. The person who collected the sample will sign the form in the first signature space. If the samples are shipped via commercial carriers, the chain-of-custody records will be sealed inside the sample container before delivery and the custody signature will be from the person who receives the samples from the carrier at its final destination. Each person taking custody will evaluate the integrity of the shipping container seal and note any observations on the chain-of-custody record. Project documentation of sample custody will be verified during regular review of the data validation package.

5.3.4 Laboratory Custody Procedures

A designated sample custodian at the laboratory will accept custody of the shipped samples, verify the integrity of the custody seals, and certify that the sample identification numbers match those on the chain-of-custody record. The custodian will log the sample identification numbers and requested analyses in accordance with laboratory QA/QC protocols. If containers arrive with broken custody seals, the laboratory will note this on the chain-of-custody record and will immediately notify the *EnviroLogic Resources* QA task leader so the potential for sample tampering can be evaluated. The laboratory will maintain sample security and custody throughout the analytical process.

6.0 SOIL SAMPLE COLLECTION

Soil samples may be collected from surface soils, soil borings, test pits, excavations or monitoring-well boreholes. This section describes the procedures to be used to describe and sample soils for use in the Astoria Area-Wide RI.

6.1 DESCRIBING SOILS

Standards for uniformity in sample description are very important for correlating hydrostratigraphic units across the site. Soil samples will be described using American Society for Testing and Materials (ASTM) Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) D 2488-00, to the extent practical. Color will be described using the Munsell system. Information such as percentage of gravel, sand, and fines; particle size range, shape, and angularity; and plasticity, strength, and dilatancy will be recorded, as appropriate. In addition, moisture, the presence of odors, and interpretation of geologic formation will be documented.

An example boring log form is presented on Figure A-4. The format to be recorded on boring logs is shown below:

> Light brown (5YR 6/4) silty SAND (SM) – 80% fine sand, subrounded, micaceous, 15 to 20% silty fines with low plasticity; firm; wet; some organic debris; petroleum-like odor; (FILL).

A geologic log will be developed for each boring installed, including information on the location of the boring, penetration rate or standard penetration resistance, sampled intervals and percent recovery, stratigraphic and lithologic information, aquifers, water-bearing zones and zones of high permeability or fracture encountered, contamination observed, and any other drilling observations including lost circulation zones or other difficulties encountered during drilling. Unconsolidated deposits will be classified on the log according to Section 6.1. Rock will be described recording lithology, mineralogy, color, grain-size, degree of cementation, degree of weathering, density and orientation of fractures, other primary and secondary features and physical characteristics of the rock, and the rock quality designation.

During the initial drilling activities, the *EnviroLogic Resources* Project Manager will visit each drilling site with representative samples and their standardized descriptions to facilitate consistency of geologic logging.

6.2 PROCEDURES FOR COLLECTING SOIL SAMPLES FOR CHEMICAL ANALYSIS

Soil samples will be screened in the field for the presence of organic vapor and samples may also be collected when elevated levels are detected using a PID.

Soil samples to be analyzed for volatiles will be collected immediately after opening the split-barrel sampler or push sampler probe core. Plastic caps pressed over teflon sheeting will be used to cover brass, stainless steel, or cellulose acetylbulylate (CAB) sample tubes. When the use of a tube is not possible, as in a sample collected from a test pit or excavation, the sample will be collected using a decontaminated stainless-steel spoon or using freshly donned latex (or other appropriate composition) sampling gloves and placed in the appropriate sample container so that little or no headspace remains.

Sample tubes or jars will be labeled as described in Section 2.3. The samples will be placed on in chilled storage immediately after collection and until delivered to the laboratory. Sampling equipment that comes in contact with potentially contaminated soil or water will be decontaminated before and after each use. Section 3.4 describes decontamination procedures.

6.2.1 GeoProbe® Sampling

Surface and subsurface soil samples may be collected from soil borings during drilling using a GeoProbe® rig, Push probe soil cores are obtained in four (4) foot long, two (2) inch diameter, CAB (cellulose acetate butylate) sleeves. A clean sleeve is used for each drive. After each drive, the sleeve is cut length-wise to expose the recovered soil. Samples are collected by transferring recovered soil core to appropriate sampling jars, filled with minimal headspace. Alternatively, if soil core recover allows, the sleeve can be cut cross-wise and the ends of the sleeve then sealed with Teflon tape and vinyl end caps. The sealed sleeve or sample containers are labeled with a distinctive designation (Section 2.3), logged, and placed in cooled storage until delivered to the laboratory.

6.2.2 Auger Borehole Sampling

Surface and subsurface soil samples may be collected using auger drilling techniques. Samples collected during hollow stem auger drilling are collected by driving a 1.5- or 2-foot long, 2-inch I.D., split spoon sampler with a 140-pound hammer. Alternatively, a Shelby tube can be used. The number of blows with the hammer will be recorded for each 6-inch advance, as an indication of the compaction and density of the subsurface materials. Representative samples are transferred with clean latex gloves into appropriate sample containers. The sample containers are labeled with a distinctive designation (Section 2.3), logged, and placed in cooled storage until delivered to the laboratory.

6.2.3 Test Pit/Trench Sampling

Surface and subsurface soil samples may be collected from test pits or trenches installed by excavation. Samples collected during excavation of the test pit of trench are collected from either freshly excavated materials noting sampling location, or from the test pit/trench sidewalls using a stainless steel shovel or hand auger. If the sampler is to enter the test pit or trench, appropriate precautions should be taken, including shoring if required. Representative samples are transferred with clean latex gloves into appropriate sample containers. The sample containers are labeled with a distinctive designation (Section 2.3), logged, and placed in cooled storage until delivered to the laboratory.

6.3 PROCEDURES FOR COLLECTING SOIL SAMPLES FOR GEOENVIRONMENTAL ENGINEERING PURPOSES

To obtain relatively undisturbed soil samples for evaluating site and engineering parameters a Shelby sampler will should be used. Alternatively a GeoProbe® sampler lined with a CAB liner can be used. However, the disruption of the sample along the sampler margins (especially in coarse grained materials) significantly increases the permeability. This effect is greatly increased with decreasing diameter of the sampler, like a GeoProbe® sampler. For samples collected from the GeoProbe® sampler, the sample should be collected where soil is least disturbed, depending on specific objectives of the sample and requirements of the test methods to be used. Following collection, the sample should be capped at both ends and placed in a plastic bag. Soil samples collected for grain size analysis may be placed in reclosable bags.

Geoenvironmental engineering analyses that may be conducted during the course of the RI/FS include:

- Bulk density
- Particle density
- Porosity
- Water content
- Fraction Organic matter
- Atterberg limits
- Shear strength
- Plasticity
- vertical hydraulic conductivity
- grain size tests

7.0 SEDIMENT SAMPLING

This section describes how to conduct sediment sampling for the Astoria Area-Wide RI/FS. The methods presented herein are standardized (i.e., EPA Standard Methods), reliable, effective, repeatable, and deemed most economical. Standardization of sediment assessment procedures is desired to increase the reliability and repeatability of sediment data generated.

7.1 GENERAL PROCEDURES

Adhering to the following general sediment-specific sampling procedures will further both worker health and safety and QA objectives.

- When working from a boat, two or three anchors or spuds driven into the sediment in shallow water will help stabilize the boat in breezy, open water conditions.
- Each grab or core attempt, whether for a composite sample or replicates, should be <u>taken from undisturbed sediment</u> at the site. Avoid disturbing sediments with a boat motor or by walking on the site. Approach sites from downstream to avoid suspending sediment into the water column over the site.
- Sediment samples should be collected from the reference or control sites first whenever possible to reduce the chances of cross-contamination from other sites.
- All samples in a study should be handled identically, including using the same sampling equipment, stirring times, etc.
- When collecting samples for chemical or toxicity tests, take appropriate measures to prevent contamination from other sources such as vehicle and boat motor exhaust or associated contaminants and other contaminated sites. The person operating the boat motor should either not handle sediment samples or make sure to put on clean gloves to prevent contamination from the motor.

7.2 FIELD MEASUREMENTS AND OBSERVATIONS

Physical and chemical factors will be an important part of this investigation. These include sediment type (particle size, organic carbon content); water depth; submerged vegetation, temperature average and fluctuation; sunlight; turbidity, pH; dissolved oxygen; current velocity, metals, total petroleum hydrocarbons, and both semi-volatile and volatile organic constituents.

Field measurements should be taken whenever sediments are being sampled. Since samples for this project will be collected primarily for bulk chemical analysis, sediment depth and site location will be sufficient. However, sampling for a biologically-based test or survey such as invertebrate community, toxicity or bioaccumulation would need to include additional field measurements (water depth, pH, water temperature (at depth and surface; average and fluctuation), dissolved oxygen, light attenuation, turbidity, conductivity and flow). These measurements may need to be taken close to the sediment surface, at the water surface or mid-depth, depending on the study.

Field Observations. Take turbidity or Secchi readings first (if applicable), prior to the disturbance of sediment.

The following observations on the sediment sample should be recorded in the field notebook:

- Depth of sample
- Water depth
- Sediment texture
- Sample odor
- Color
- Presence/absence of invertebrates
- Presence of detritus

The following observations on site conditions should be recorded in the field notebook:

- Tide
- Flow direction
- Shade
- Submerged macrophytes
- Shoreline proximity and characteristics
- Presence of debris such as wood chips, coal pieces, detritus, etc.

7.3 PROCEDURES FOR USING CORE AND GRAB SAMPLING DEVICES

Sediment samples are most commonly collected using a coring device or dredge or grab. The type of collecting equipment chosen will depend on sediment texture, site location (depth and current velocity), analyses to be performed, and study goals.

7.3.1 Collecting Sediment Samplings with a Coring Device

A corer allows excellent quantitative and qualitative sampling to a specified sediment depth with little disturbance of the sediment water interface. Samples can be separated or stratified by depth or color/texture to analyze distinct layers of sediment, although the sediment along the side of the core may smear as the core penetrates, slightly distorting the stratification of the sediment.

A corer may not be able to penetrate and/or retain very sandy substrates. Coring in high clay-content sediments may be difficult with a push corer and may require the use of a slide hammer or vibrating corer.

A large bore corer will provide a larger volume of sediment per attempt. This is important if discreet sample replicates are desired, where enough sediment must be collected for a specific analysis or test. Even with the large bore core tube, samples may need to be composited to obtain enough sediment volume for the required analyses and/or tests.

A hand-operated, 3-inch diameter core sampler with acrylic core tube (with an optional piston) and extensions for deeper water can be effectively used in soft sediments with some silt/clay content in water up to approximately 30 feet deep.

This procedure can be used for a push corer with or without a piston. A piston may not be necessary in high clay sediments. Disregard directions for use of the piston if piston will not be used.

- Assemble the corer. Adjust the piston (if applicable, the nut on the bottom adjusts piston diameter) so that it just fits snugly. If the piston is too loose, it will not stay in place until the corer reaches the sediment. If too tight, the piston will not move sufficiently when the corer is being pushed into the sediment, and compaction of the sediment core may occur.

- Position the piston at the bottom of the core tube (open end), with the rope attached and threaded through the core head.

- With the piston in place, let the core tube fill with water from the top, then lower the corer slowly and vertically to the sediment. If the piston falls out the bottom or moves up the core tube before reaching the sediment, tighten piston slightly and repeat.

- With the bottom edge of the corer and the piston in contact with the sediment in a vertical position, push the core tube into the sediment while maintaining some tension on the piston rope. The piston should remain at the sediment surface while the core tube moves into the sediment. In difficult sediments, it may be necessary to actually pull on the rope as the corer is pushed into the sediment. The object however is to maintain the piston in a fixed position <u>at</u> the sediment-water interface without compacting the sediment.

- In hard or clay sediments where it is difficult to push the corer into the sediment by hand, a slide hammer designed specifically for the core sampler should be used.

- After core is pushed to desired depth, pull up the corer slowly while maintaining the position of the piston by holding the piston rope in place. Even with the piston, some sediment may be lost from the bottom of the corer if the sediment is sandy. To help prevent sample loss, bring the corer into a horizontal position as it reaches the surface. A plug can also be inserted into the bottom of the sampler before removal from the water.

- Place the corer on the work surface over the receiving container. The sediment core can be extruded from the top or bottom of the core tube, depending on the purpose of the sample and study goals. Generally, cores collected for macroinvertebrate work should be extruded out the bottom, and cores collected for chemical analysis should be extruded out the top of the core tube to reduce contamination of the sample segment from other layers if only part of the segment is needed.

  - To extrude through the bottom, remove the sampler head, insert a pole through the top and push down on the piston eyebolt. Extrude the core into a waste container until the desired length of core remains, then extrude the remaining sediment into the sample container.

  - To extrude through the top, remove the sampler head and place an extrusion pole and rubber plug at the bottom of the sampler and push sediment out through the top slowly.

- A premarked acrylic or polycarbonate (clear) core tube is helpful for measuring core lengths.

7.3.2 Collecting Sediment Samplings with a Grab or Dredge Sampler

Grab samplers rely on their own weight and gravity to penetrate the sediment as well as the leverage from the closing of the jaws. For this reason, they are not as efficient in water flowing over one meter per second. They normally take a discreet "bite" of sediment to a fairly consistent and measurable depth. Grabs often cause a shock wave upon descent, which may disturb very fine sediment at the sediment-water interface.

Many grabs and dredges such as the petite Ponar and Ekman dredge are available. These two can be hand operated from a suitably sized boat, preferably flat-bottomed. The Ponar is better suited to sampling hard or sandy sediments because of the greater ability to penetrate. The Ekman is more suited to sampling in soft sediments in low flow waters. Neither grab will effectively sample hard clays where a coring device or shovel such as a sharpshooter spade can be used.

- Set closing mechanism and lower grab slowly to substrate, being careful to avoid a shock wave caused by too rapid of a descent near the sediment.
- Initiate closure mechanism of grab. This is usually a messenger sent down the rope or a sharp pull on the rope.
- When it feels like the grab has closed and contains sediment, raise grab at a steady rate and immediately position over large bucket. If jaws are not completely closed due to obstructions, discard entire grab contents away from sampling area and try again. Make sure to move the sampling site at least several feet away from the previous attempt(s) to avoid sampling a disturbed area.
- If the study dictates sampling for metals analysis, the middle portion of the sample not touching the metal grab can be collected with a teflon spoon, and the rest of the sample discarded.
- Empty entire contents of grab into mixing bowl if sample needs to be mixed.
- Place appropriate volume of sediment into sample container.

7.4 COLLECTING COMPOSITE SAMPLES

Composite samples are generally used to estimate the average concentration of the individual samples that make up the composite. Multiple grabs or cores for a composite sample should be taken from a relatively homogeneous sediment deposit (i.e., all grabs should be of similar sand/silt content). In some cases, composite samples are needed to generate sufficient sample volume for all analyses. It is best to know the rough boundaries of the sediment deposit or "site" before sampling.

- Place each grab or core into a single mixing bowl (made of suitable material), remove any large objects such as sticks, leaves or stones, etc. and stir thoroughly with a spoon to homogenize. A single grab or core should be mixed at least two minutes. Multiple grab or core samples should be mixed five minutes or longer if necessary.

- Fill sample jars with the sediment mixture by placing one spoonful sequentially into each jar until the jars are full. This subsampling system assures that each sample container contains a sample as similar as possible to the other containers.

- Sediment samples to be analyzed for volatiles will be collected immediately after opening the sampler and before any other soil processing for chemical analyses. Samples will not be collected from exposed surfaces that have been in direct contact with the sampler. The sample will be collected using a decontaminated stainless-steel spoon or using freshly donned appropriate sampling gloves and placed in the appropriate sample container so that little or no headspace remains.

7.5 COLLECTING REPLICATE SAMPLES

Replicate samples can be obtained at different stages of the sampling for different purposes depending on the objectives of the study. The RI/FS Work Plan describes where and how much replication is necessary. The procedures described here are for collecting distinct field replicate samples where the object is to determine the variability within a deposit and compare one field site to another.

- When collecting replicate samples to statistically compare sediment deposits, sample sites within each deposit should be randomly located for statistical comparisons to be valid.

- Be sure each sample is taken from an undisturbed area of sediment

- If the replicate samples are fairly similar, the equipment need only be rinsed with site water between samples. But, if the replicates are not similar, and some contain significantly more fines than others, than the core tube or dredge may need to be washed with a non-ionic detergent and rinsed in between samples to prevent cross-contamination and to keep replicate samples independent for valid statistical analysis of the data. Use a tub of water in the boat to wash equipment to prevent getting detergent in the site water while sampling.

8.0 GROUND-WATER MONITORING AND SAMPLING

This section provides the procedures for conducting ground-water monitoring and sampling in monitoring wells and in boreholes during drilling.

8.1 WATER LEVEL AND PRODUCT MONITORING PROCEDURES

Water levels will be measured in each of the new and existing wells and well points during ground-water sampling events, before ground-water samples are collected. Water levels will be measured using an electronic water-level indicator or steel tape and will be recorded to the nearest 0.01 ft. Measurements will be taken from a marked survey point at the top of each well casing, or, if no mark is available, from the northern edge of the casing. To avoid cross contamination between wells, the indicator probe and affected cable will be rinsed with a solution of Alconox or Liqui-nox and tap water followed by a rinse with deionized water before the first measurement of the day, between each well, and at the end of the day. Water-level information will be recorded on a water-level measurement form, an example of which is shown on Figure A-6.

Following measurement of water levels, but before initiating the pre-sampling purge, each well will be checked for the presence of light nonaqueous phase liquids (LNAPL or free product) using oil-finding paste or a water-oil interface probe. If a separate phase is found, apparent thickness will be documented in the field notes/sampling form. A sample of the NAPL phase for characterization by laboratory analysis will be collected on the initial sampling event, but a ground-water sample will not be collected from that location.

To evaluate tidal influence in the upper and lower water-bearing zones, water levels will be monitored in selected wells using a data logger and pressure transducers (or combined unit); water levels in the other selected wells will be obtained manually (or by transducers). Water levels should be correlated with tide levels from a local tide gage if available, before, midway, and at the completion of a sampling event. The midway reading would allow determination of rising or falling trend in cycle. Water-level data from the wells selected to monitor tidal influence will be available for correlation of water levels for sampling events that extend over more than one day. The tidal influence will likely vary with lunar cycle.

This water-level information will be evaluated by transferring the transducer data into a spreadsheet program for manipulation and correction of transducer drift, if necessary, and ultimately stored in the data management system for the Astoria Area-Wide site. Plots of water-level elevation over time (hydrographs) will be generated to evaluate tidal responses at each selected monitoring location.

8.2 GROUND-WATER SAMPLING PROCEDURES

Ground water samples will be collected and analyzed for the constituents as shown on Table 6 of Section 3.0 of the Work Plan in temporary wells. Samples collected from existing and new monitoring wells will be analyzed as determined in the Ground-Water Monitoring Plan to be prepared.. Sample containers, preservatives, and holding times for each analytical method are provided on Table A-1.

8.2.1 Equipment Calibration

Specific conductance and pH meters will be calibrated according to manufacturer's specifications at the beginning of each sample day and every 4 hours afterward. Calibration data will be recorded in a log maintained for each instrument. Meter calibration will be checked at least twice during a sample day (middle and end of day) or when meter drift is suspected, and data will be recorded in the calibration log. The meters will be calibrated with solutions buffered closest to known field parameters; usually this is pH = 7 and specific conductivity = 200 µS, but calibration solutions with a higher specific conductance will likely be needed to mimic the brackish ground water expected at the site.

8.2.2 Water Level Monitoring

Before sampling, depth to water and well depth will be measured to the nearest 0.01-ft and recorded on the sample collection form for ground water sampling (Figure A-1). From this information, the height of water in the well and the pore volume will be calculated.

8.2.3 Purging

Before sampling, the well will be purged using a purge pump with dedicated Teflon tubing or disposable Teflon or PVC bailer. Purging will continue until at least three casing volumes of water have been removed and specific conductance and temperature have stabilized (when the replicate sample measurements vary by no more than 10 percent) or until the well is dry. Purge volume will be calculated based on the following formula:

$$1 \text{ well volume (gallons)} = pr^2h \times 7.48 \text{ gal/ ft}^3,$$

where: p = 3.14, r = radius of well casing in feet, h = height of water column from the bottom of the well, in feet.

The wells will be purged at a rate below the rate that was used for development and below their recovery rate to prevent further development of the well. This is to prevent damage to the well, and to reduce migration of water in the formation above the well screen. The well will not be purged at a rate that allows formation water to vigorously cascade down the sides of the screen.

Purge data will be recorded on the sample collection form, including purge volume, time of beginning and termination of purging, and observations regarding color, turbidity, temperature, specific conductance, pH, or other factors that may be important in evaluation of sample quality.

Purge and decontamination water will be contained in drums or in a storage tank located in a temporary staging area at the facility for proper disposal.

8.2.4 Sampling

Ground-water sampling will begin immediately following well purging or if the well purges dry, as soon as enough water is available in the well for sampling. Sample data will be recorded on the sample collection form, including sample number and time collected, the observed physical characteristics of the sample (e.g., color, turbidity, etc.), field parameters (pH, specific conductance, temperature, dissolved oxygen, and oxidation-reduction potential), and other data that may be important in the evaluation of sample quality.

On low-yielding wells, pH, temperature, and specific conductance will be measured at the beginning and end of sampling.

Ground water samples will be collected for all parameters using a peristaltic pump with dedicated Teflon tubing for each well or a disposable Teflon or PVC bailer; volatile organic analysis (VOA) samples will be collected first, using a disposable bailer or the peristaltic pump with low flow sampling. To prevent degassing during sampling, the pumping rate will be adjusted below 100 mL/min (or a bailer will be lowered gently into the water column). Clean latex gloves will be worn when collecting each sample.

The water sample will be discharged or poured slowly and carefully into appropriate sample containers to minimize aeration. VOA containers will be completely filled so that no headspace remains. VOA sample containers will be checked for air bubbles by turning the bottle upside down, tapping it lightly to make air bubbles move to the bottom of the sample bottle. If air bubbles are observed in any of the VOA containers, the container will be re-topped off with fresh sample (refilled, once only, or a new container used). Samples for dissolved metal analyses will be collected last and immediately field filtered through an in-line 0.45-micron disposable filter determined to be appropriate for the purpose by the manufacturer. A note will be made on the sample label, sample collection form, and chain-of-custody form (Figure A-3) to indicate the sample has been field filtered. Samples will be preserved as specified in Table A-1. Samples will be chilled immediately after sample collection.

Duplicate samples will be collected by the same procedure. Duplicate samples will be labeled with a separate sample number and the number will be noted on the sample collection form. Duplicate samples will receive a designation as described in Section 2.3.

All sampling will be conducted in accordance with the appropriate provisions of the project health and safety plan (Appendix C).

8.3 BOREHOLE SAMPLING PROCEDURES (RECONNAISSANCE GROUND WATER SAMPLES)

Ground-water samples may be collected from boreholes.

8.3.1 GeoProbe® Sampling

Ground water samples will be collected from soil borings during drilling. Using a GeoProbe® rig, a ground-water sampling probe will be used. The ground-water sampling probe will be driven to the bottom of the boring, at which point the sampling probe will be pulled back exposing the 4-foot screen. The boring will first be purged using a vacuum pump. VOA samples will be collected using Teflon tubing fitted with a Teflon foot value. Reciprocating motion will be used to draw water into the tubing, then carefully transferred into 40-ml VOA vials. Other parameters will be sampled using a vacuum pump. Samples for dissolved metals will be field filtered as indicated in Section 8.2.4. The ground water samples will be collected at or near the water table, when elevated levels of organic vapor are detected from the soil samples. Depth to water, pH, specific conductance, temperature, dissolved oxygen, and oxidation-reduction potential will be measured and recorded on a sample collection form (Figure A-1.)

8.3.2 Auger Borehole Sampling

Ground water may be collected by installing a temporary well point ahead of the auger during drilling. Ground-water samples will be collected following purging to lower the turbidity. Alternatively, the ground water may be collected using a decontaminated or new disposable Teflon or PVC bailer. The ground-water samples will be collected at or near the water table, when elevated levels of organic vapor are detected from the soil samples. Depth to water, pH, specific conductance, temperature, dissolved oxygen, and oxidation-reduction potential will be measured and recorded on a sample collection form (Figure A-1.)

9.0 STORM-WATER MONITORING AND SAMPLING

This section provides the procedures for conducting storm-water monitoring and sampling in the three storm water outfalls on the Astoria Area-Wide site (Figure 2).

9.1 VISUAL MONITORING PROCEDURES

Visual monitoring will take place on a monthly basis during the Phase I RI, as storm water is discharging. Observations of storm-water flow for the following parameters: below.

Parameter	Frequency
Floating Solids (associated with industrial processes)	Once a month, when discharging
Oil and Grease Sheen	Once a month, when discharging

All observations will be recorded on the Storm-Water Monitoring Form, shown on Figure A-8.

9.2 STORM-WATER SAMPLING PROCEDURES

Storm water samples will be collected from up to three outfalls and analyzed for the constituents shown below. Sample containers, preservatives, and holding times for each analytical method are provided on Table A-1.

- Total copper, using EPA Method 6010B;
- Total lead, using EPA Method 7421;
- Total zinc, using EPA Method 6010B;
- pH, using EPA Method 150.1;
- Total suspended solids, using EPA Method 160.2; and
- Oil and grease, using EPA Method 1664.

9.2.1 Equipment Calibration

Specific conductance and pH meters will be calibrated according to manufacturer's specifications at the beginning of each sample day and every 4 hours afterward. Calibration data will be recorded in a log maintained for each instrument. Meter calibration will be checked at least twice during a sample day (middle and end of day) or when meter drift is suspected, and data will be recorded in the calibration log. The meters will be calibrated with solutions buffered closest to known field parameters; usually this is pH = 7 and specific conductivity = 200 µS.

9.2.2 Sampling

Samples must be collected from a point prior to the confluence of the storm water with the receiving water body. Sample data will be recorded on the sample collection form, including sample number and time collected, the observed physical characteristics of the sample (e.g., color, turbidity, floating solids, etc.), field parameters (pH, specific conductance, and temperature), and other data that may be important in the evaluation of sample quality.

Storm water samples will be collected for all parameters using a glass beaker. Clean latex gloves will be worn when collecting each sample. The water sample will be poured slowly and carefully into appropriate sample containers to minimize aeration. Samples will be preserved as specified in Table A-1. Samples will be chilled immediately after sample collection.

Duplicate samples, as required, will be collected by the same procedure. Duplicate samples will be labeled with a separate sample number and the number will be noted on the sample collection form. Duplicate samples will receive a designation as described in Section 2.3.

All sampling will be conducted in accordance with the appropriate provisions of the project health and safety plan (Appendix C).

10.0 REFERENCES

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TABLE A-1
SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

Remedial Investigation/Feasibility Study
Astoria Area-Wide Petroleum Site
Astoria, Oregon

MATRIX	ANALYTES	SAMPLE CONTAINER	PRESERVATION	MAXIMUM HOLDING TIMES
Soil/Sediment	Phenols	4 oz wide mouth glass with teflon liner or undisturbed in CAB, stainless steel, or brass tube with end caps	Cool to 4 deg C	10 days until extraction; 40 days after extraction
	Formaldehyde	4 oz wide mouth glass with teflon liner or undisturbed in CAB, stainless steel, or brass tube with end caps	Cool to 4 deg C	7 days until extraction; 40 days after extraction
	Semivolatile Organics	4 oz wide mouth glass with teflon liner or undisturbed in CAB, stainless steel, or brass tube with end caps	Cool to 4 deg C	7 days until extraction; 40 days after extraction
	Total Petroleum Hydrocarbons	4 oz wide mouth glass with teflon liner or undisturbed in CAB, stainless steel, or brass tube with end caps	Cool to 4 deg C	14 days until extraction; 21 days after extraction
	Volatile Organics	1.5 oz wide mouth glass with teflon liner, or wide mouth glass sealed with a septum or undisturbed in CAB, stainless steel, or brass tube with end caps	Cool to 4 deg C; No headspace	14 days
	PCBs	4 oz wide mouth glass with teflon liner or undisturbed in CAB, stainless steel, or brass tube with end caps	Cool to 4 deg C	14 days until extraction; 40 days after extraction
	Metals	4 oz wide mouth glass with teflon liner or undisturbed in CAB, stainless steel, or brass tube with end caps	Cool to 4 deg C	6 months
	Total Organic Carbon	4 oz wide mouth glass with teflon liner or undisturbed in CAB, stainless steel, or brass tube with end caps		28 days

TABLE A-1
SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

Remedial Investigation/Feasibility Study
Astoria Area-Wide Petroleum Site
Astoria, Oregon

MATRIX	ANALYTES	SAMPLE CONTAINER	PRESERVATION	MAXIMUM HOLDING TIMES
Ground Water	Phenols	1 L amber glass; teflon-lined cap	Cool to 4 deg C	7 days until extraction; 40 days after extraction
	Formaldehyde	Unpreserved Vial	Cool to 4 deg C	7 days
	Semivolatile Organics	3 each - 1 L amber glass; teflon lined cap	Cool to 4 deg C	7 days until extraction; 40 days after extraction
	Total Petroleum Hydrocarbons	1 L glass, teflon-lined cap	5 mL HCl, Cool to 4 deg C	7 days until extraction; 14 days after extraction
	Volatile Organics	3 each - 40 mL glass vials; teflon-lined cap	HCl to pH<2, Cool to 4 deg C, No headspace	14 days
	PCBs	4 each - 1 L amber glass; teflon-lined cap	Cool to 4 deg C, pH 5 to 9	7 days until extraction; 40 days after extraction
	Metals	1 L high density polyethylene	HNO3 to pH<2	6 months (Chromium+6 = 24 hrs; Mercury = 14 days)
	Major Ions	1 L high density polyethylene, or glass	HNO3 to pH<2	28 days

WATER SAMPLE LOG

Project Number:

Project Name:

Facility:

Locator ID:

Sampled By:

Date:	Sample ID:
Time Sample Collected:	Well or Boring No.:
COC and RFA No.:	
Static Water Level:	Time:
Well Depth:	Date Drilled:
Filter Pack Thickness:	Casing or “Geoprobe” Diameter:
Amount Purged:	Bailer or Well Point Depth:
Sample Collection Method:	
Pump intake depth:	
Discharge rate during sampling:	DO:
Color:	Temperature:
Turbidity:	ORP:
Conductance:	pH:
Odor:	Other:
Analysis Requested:	
Comments:	

EnviroLogic Resources, Inc.

8948 SW BarburBlvd Portland, Oregon 97219-4047 (503)768-5121

Sample ID ______________Locator_______________

Sampled by__________Date_________Time_______

Client__________________ Project #______________

Media_______________ Preservative______________

Analyses

EnviroLogic Resources, Inc.

8948 SW BarburBlvd Portland, Oregon 97219-4047 (503)768-5121

Sample ID ______________Locator_______________

Sampled by__________Date_________Time_______

Client__________________ Project #______________

Media_______________ Preservative______________

Analyses

EnviroLogic Resources, Inc.

8948 SW BarburBlvd Portland, Oregon 97219-4047 (503)768-5121

Sample ID ______________Locator_______________

Sampled by__________Date_________Time_______

Client__________________ Project #______________

Media_______________ Preservative______________

Analyses

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Sampled by__________Date_________Time_______

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Media_______________ Preservative______________

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Sampled by__________Date_________Time_______

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Media_______________ Preservative______________

Analyses

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Media_______________ Preservative______________

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Sample ID ______________Locator_______________

Sampled by__________Date_________Time_______

Client__________________ Project #______________

Media_______________ Preservative______________

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8948 SW BarburBlvd Portland, Oregon 97219-4047 (503)768-5121

Sample ID ______________Locator_______________

Sampled by__________Date_________Time_______

Client__________________ Project #______________

Media_______________ Preservative______________

Analyses

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Sample ID ______________Locator_______________

Sampled by__________Date_________Time_______

Client__________________ Project #______________

Media_______________ Preservative______________

Analyses

EnviroLogic Resources, Inc.

8948 SW BarburBlvd Portland, Oregon 97219-4047 (503)768-5121

Sample ID ______________Locator_______________

Sampled by__________Date_________Time_______

Client__________________ Project #______________

Media_______________ Preservative______________

Analyses

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11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244 (425) 420-9200 FAX 420-9210
East 11115 Montgomery, Suite B, Spokane, WA 99206-4776 (509) 924-9200 FAX 924-9290
9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 906-9200 FAX 906-9210
20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711 (541) 383-9310 FAX 382-7588

North Creek Analytical, Inc.
Environmental Laboratory Network
www.ncalabs.com

CHAIN OF CUSTODY REPORT

Work Order #:

CLIENT:
REPORT TO:
ADDRESS:
PHONE: FAX:

INVOICE TO:
P.O. NUMBER:

PROJECT NAME:
PROJECT NUMBER:
SAMPLED BY:

TURNAROUND REQUEST in Business Days*

Organic & Inorganic Analyses
10 7 5 4 3 2 1 <1
STD.

Petroleum Hydrocarbon Analyses
5 4 3 2 1 <1
STD.

OTHER Please Specify

*Turnaround Request less than standard may incur Rush Charges.

REQUESTED ANALYSES

CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME														MATRIX (W, S, O)	# OF CONT.	COMMENTS	NCA WO ID
1.																		
2.																		
3.																		
4.																		
5.																		
6.																		
7.																		
8.																		
9.																		
10.																		
11.																		
12.																		
13.																		
14.																		
15.																		

RELINQUISHED BY: DATE:
PRINT NAME: FIRM: TIME:
RECEIVED BY: DATE:
PRINT NAME: FIRM: TIME:
RELINQUISHED BY: DATE:
PRINT NAME: FIRM: TIME:
RECEIVED BY: DATE:
PRINT NAME: FIRM: TIME:

ADDITIONAL REMARKS:
TEMP:
PAGE OF

COC REV 3/99

LOG OF:

LAT: LONG:

Project:

Address:

City, State:

Facility:

Project Number:

Location Sketch

DRILLING METHOD	GROUND SURF ELEV
DRILLING CO	REFERENCE PT DESCRIPTION
SAMPLING METHOD	REFERENCE PT ELEV
DRILLER	DATUM
LOGGED BY	SURFACE CASING
DATE DRILLED	SURFACE SEAL
COMMENTS	CASING MATERIAL
	SCREEN MATERIAL
	SCREEN SLOT SIZE
	FILTER PACK

COMPLETION DETAILS	Depth	Blows	PID	Samples	Graphic	SOIL DESCRIPTION
	5					
	10					
	15					
	20					
	25					

WATER LEVEL MEASUREMENT FORM

Project: Measured by:

LOCATOR ID	DATE	TIME	DTP (feet)	DTW (feet)	COMMENTS

STORM WATER SAMPLE FORM

Instructions: Make visual observations at outfalls. Monitor temperature and pH of storm water. Collect water samples into the appropriate bottles in the order specified. No headspace shall be left in the bottle. Be sure not to spill preservatives or create overflow in bottles with preservatives. Place bottles into cooler with blue ice for laboratory. Label all bottles. Fill out chain of custody form.

Locator ID:	
Date:	
Time Sample Collected:	
Sample Collection Method:	
Weather:	Water Flow: Strong Medium Light
Color:	Odor:
Temperature:	Other:
Analyses Requested:	

Label shall include: sample number, date, time, sampler, and preservatives.

VISUAL STORM WATER MONITORING FORM

Locator ID:	
Date:	
Time Monitoring Performed:	
Weather:	Water Flow: strong medium light
Color:	Odor:
Air Temperature: Water Temperarure:	Other:
Are there floating solids associated with industrial activities?	
Is there an oil and grease sheen?	
Comments:	