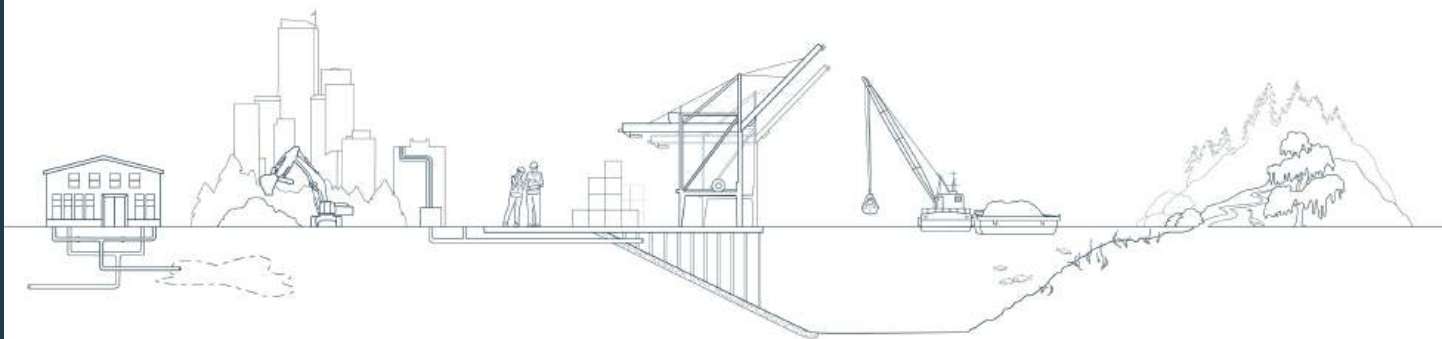


Phase 1 Remedial Investigation Work Plan

Cosmo Specialty Fibers Site

Prepared for
Weyerhaeuser NR Company

May 2026 DRAFT



LIMITATIONS

This report has been prepared for the exclusive use of Weyerhaeuser NR Company, their authorized agents, and regulatory agencies. It has been prepared following the described methods and information available at the time of the work. No other party should use this report for any purpose other than that originally intended, unless Floyd|Snider agrees in advance to such reliance in writing. The information contained herein should not be utilized for any purpose or project except the one originally intended. Under no circumstances shall this document be altered, updated, or revised without written authorization of Floyd|Snider.

The interpretations and conclusions contained in this report are based in part on information presented in the Level 1 Environmental Site Assessment prepared by PES Environmental, Inc. (2007), as well as other historical documents reviewed. Floyd|Snider has relied on these materials and cannot assure the accuracy or completeness of the information contained therein.

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List of Abbreviations

Abbreviation	Definition
AO	Agreed Order
AOP	Air Operating Permit
AOPC	Area of potential concern
AOX	Absorbable organic halides
ARAR	Applicable or Relevant and Appropriate Requirement
AST	Aboveground storage tank

Abbreviation	Definition
bgs	Below ground surface
biopond	Biological pond
BOD	Biological oxygen demand
BTEX	Benzene, toluene, ethylbenzene, and xylenes
CAP	Cleanup Action Plan
COI	Contaminant of interest
COPC	Contaminant of potential concern
cPAH	Carcinogenic polycyclic aromatic hydrocarbon
CSL	Cleanup Screening Level
CSM	Conceptual site model
CUL	Cleanup level
CWA	Clean Water Act
CY	Cubic yards
D/F	Dioxin/furan
DAHP	Washington State Department of Archaeology and Historic Preservation
DQO	Data quality objective
DRO	Diesel-range organics
EBD	Ethylene dibromide
Ecology	Washington State Department of Ecology
EDC	1,2-Dichloroethane
EIM	Environmental Information Management
EPH	Extractable petroleum hydrocarbons
ERT	Emergency response team
ESA	Environmental Site Assessment
FS	Feasibility Study
gal	Gallons
Golder	Golder Associates, Inc.
GRO	Gasoline-range organics
HASP	Health and Safety Plan
HDPE	High-density polyethylene

Abbreviation	Definition
IDP	Inadvertent Discovery Plan
MCL	Maximum contaminant level
MTBE	Methyl <i>tert</i> -butyl ether
MTCA	Model Toxics Control Act
NFA	No Further Action
NPDES	National Pollutant Discharge Elimination System
ORO	Oil-range organics
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
pg/g	Picograms per gram
Phase 1 RIWP	Phase 1 Remedial Investigation Work Plan
PID	Photoionization detector
PLP	Potentially liable person
PQL	Practical quantitation limit
PSL	Preliminary screening level
QAPP	Quality Assurance Project Plan
RI	Remedial Investigation
SAP	Sampling and Analysis Plan
SCO	Sediment Cleanup Objective
SCUM	Sediment Cleanup User's Manual
SEPA	State Environmental Policy Act
Site	Cosmo Specialty Fibers, Inc., Site
SMS	Sediment Management Standards
SPCC	Spill Prevention, Control, and Countermeasure
SQS	Sediment quality standards
SVOC	Semivolatile organic compound
TCDD	Tetrachlorodibenzo- <i>p</i> -dioxin
TCDF	Tetrachlorodibenzofuran
TDS	Total dissolved solids
TEE	Terrestrial ecological evaluation

Abbreviation	Definition
TI/RE	Toxicity Identification and Reduction Evaluation
TOC	Total organic carbon
TPH	Total petroleum hydrocarbons
TSCA	Toxic Substances Control Act
USEPA	U.S. Environmental Protection Agency
UST	Underground storage tank
VI	Vapor intrusion
VOC	Volatile organic compound
VPH	Volatile petroleum hydrocarbons
WAS	Waste activated solids
Weyerhaeuser	Weyerhaeuser NR Company

1.0 Introduction

This Phase 1 Remedial Investigation Work Plan (Phase 1 RIWP) describes the approach for conducting the Phase 1 field investigation at the Cosmo Specialty Fibers, Inc., Site (Site) in Cosmopolis, Washington (Figure 1.1). This Phase 1 RIWP is prepared on behalf of Weyerhaeuser NR Company (Weyerhaeuser). The work described in this Phase 1 RIWP is being conducted pursuant to Agreed Order (AO) No. 23839 between Weyerhaeuser and the Washington State Department of Ecology (Ecology), which was executed on October 29, 2025.

The Site includes three primary operational areas: the Main Mill Complex, the Wood Stave Pipe Corridor, and the Westport Ponds Area. The purpose of the Phase 1 field investigation is to conduct a screening-level evaluation across the Site to establish preliminary information on the nature and extent of contamination, identify potential contaminants of interest (COIs), and improve understanding of potential contaminant migration pathways outside the core mill operations area including the areas associated with the Wood Stave Pipe Corridor and Westport Ponds Area. The investigation emphasizes characterization of perimeter and downgradient groundwater conditions, targeted evaluation of areas of potential concern (AOPCs), and soil sampling along the Wood Stave Pipe Corridor to evaluate potential releases. Limited surface water and sediment sampling within facility surface water features (i.e., drains and sloughs) will also be conducted to evaluate potential contaminant migration from upland areas to on-site aquatic environments.

This Phase 1 RIWP is prepared in accordance with the Model Toxics Control Act (MTCA) and, where applicable, the Washington State Sediment Management Standards (SMS), including relevant provisions of Washington Administrative Code (WAC 173-340 and WAC 173-204).

The objective of the subsequent Remedial Investigation (RI)/Feasibility Study (FS) for this Site is to complete a comprehensive Site-wide evaluation that will support the evaluation of remedial alternatives and recommendation of a cleanup alternative that will meet MTCA criteria and is consistent with reasonably anticipated future Site use. The facility is currently inactive and has not been mothballed, and the current owner has indicated that future resumption of Site operations is under consideration. The current owner, Cosmo Specialty Fiber, Inc., is also subject to an AO (No. 23840) with Ecology, which was executed on July 18, 2025, that includes the same RI/FS-based scope of work for the Site as the Weyerhaeuser AO. In addition, Ecology has also identified The Gores Group, LLC as a potentially liable person (PLP) at the Site (Ecology 2025a).

1.1 OBJECTIVES

The RI will be conducted using a phased investigation approach, beginning with the Phase 1 investigation described in this Phase 1 RIWP. The Phase 1 investigation is intended to collect environmental data needed to evaluate site conditions and potential contaminants and

migration pathways and to inform subsequent phases of the RI. Specific objectives of the RI include the following:

- Characterize site stratigraphy, hydrostratigraphy, and groundwater conditions, including tidal influences, to support development of the hydrogeologic conceptual site model (CSM).
- Identify potential source areas and evaluate the presence or absence of contamination and potential COIs in Site soil, groundwater, surface water, and sediment.
- Evaluate the vertical and lateral distribution of contamination within fill areas and at fill–native soil interfaces.
- Assess contaminant migration pathways, including soil-to-groundwater transport, groundwater flow and downgradient migration, and groundwater–surface water interactions.
- Evaluate whether contaminants from upland areas may be migrating to on-site surface water and sediment.
- Identify and prioritize areas requiring additional investigation and inform development of a focused Phase 2 investigation approach.

1.2 REGULATORY FRAMEWORK

The RI will be conducted under the MTCA and, where applicable, SMS consistent with the requirements of AO No. 23839. This section summarizes the AO and MTCA requirements and regulatory standards that will be followed during this investigation and future cleanup at the Site.

1.2.1 Agreed Order and MTCA Requirements

Under the AO, Weyerhaeuser, as a PLP, is required to perform remedial activities at the Site in accordance with MTCA and applicable state regulations, including WAC 173-340-350(5) and 173-204-560. The primary purpose of the AO is to initiate the cleanup process for the Site by requiring investigation of contamination and evaluation of cleanup alternatives. Key requirements of the AO relevant to this Phase 1 RIWP include the following:

- Conduct an RI/FS in accordance with the Scope of Work and Schedule included in Exhibits B and D of the AO.
- Prepare and submit a Phase 1 RIWP, including a CSM, data gap evaluation, and Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP).
- Implement field investigations to characterize the nature and extent of contamination in soil, groundwater, surface water, sediment, and other environmental media in accordance with WAC 173-204-560.
- Evaluate remedial alternatives in an FS and support development of a preliminary draft Cleanup Action Plan (CAP).

- Submit monthly progress reports documenting activities performed under the AO and planned work.
- Notify Ecology of significant changes in Site conditions or any emergency releases of hazardous substances.
- Conduct work in compliance with Applicable or Relevant and Appropriate Requirements (ARARs) and other applicable federal, state, and local environmental laws.

As required by the AO, all new sampling data generated under this Phase 1 RIWP and any other recently collected data will be submitted to Ecology for entry into the Environmental Information Management (EIM) system in accordance with WAC 173-340-840(5) and Ecology's Toxics Cleanup Program Policy 840: Data Submittal Requirements.

The AO also requires coordination with Ecology throughout the RI/FS; public participation; and development of the CAP after completion of the RI/FS. The AO was subject to public notice and comment prior to becoming effective in accordance with RCW 70A.305.030(2)(a).

MTCA, Chapter 70A.305 RCW and WAC 173-340, establishes the requirements for investigating and cleanup of releases of hazardous substances in Washington. In accordance with WAC 173-340-350(5), cleanup levels (CULs) for upland media will be developed and evaluated in accordance with MTCA, including applicable Method A, B, or C CULs, as appropriate to Site-specific exposure scenarios and land use during the RI/FS. Points of compliance for groundwater, surface water, and soil will be established per MTCA requirements during the RI/FS.

1.2.2 Applicable or Relevant and Appropriate Requirements

Remedial actions conducted under MTCA must comply with ARARs, consistent with the requirements of WAC 173-340. Identification of ARARs is an important component of the RI/FS process because ARARs establish cleanup standards, inform the design and implementation of remedial actions, and are considered during evaluation of remedial alternatives. ARARs are categorized into three groups:

- **Chemical-specific ARARs:** Health or risk-based numerical limits or methods that establish acceptable concentrations of hazardous substances in environmental media such as soil, groundwater, surface water, or sediment
- **Location-specific ARARs:** Restrictions or requirements related to the geographic or ecological setting of the site, such as wetlands, floodplains, critical habitat areas, or other environmentally sensitive areas
- **Action-specific ARARs:** Technology- or activity-based requirements that govern the design, implementation, or operation of remedial actions

Identification of ARARs will be conducted as part of the RI/FS process. Potential ARARs applicable to the Site will be compiled and evaluated to support development and screening of remedial

alternatives. A summary of ARARs will be provided in an appendix to the RI/FS and will be updated as necessary as Site conditions and remedial alternatives are further defined.

1.2.3 Sediment Management Standards

The Site is hydraulically connected to tidally influenced waters of the Chehalis River. Because evaluation of surface and subsurface sediment is required under the AO, the RI will incorporate requirements of the SMS under WAC 173-204 as applicable for sediment areas that are not part of the facility treatment system where operations may resume by the owner. The investigation will evaluate the following:

- Sediment concentrations relative to SMS sediment chemical criteria, including Sediment Cleanup Objectives (SCOs) and Cleanup Screening Levels (CSLs), consistent with Ecology guidance
- Potential upland-to-sediment transport pathways (e.g., groundwater discharge, stormwater runoff, seeps, and bank erosion)
- Whether ongoing upland sources may contribute to sediment contamination or result in recontamination of sediment

Evaluation of upland sources and transport pathways will inform identification of potential source control measures under MTCA.

1.2.4 State Environmental Policy Act

The Washington State Environmental Policy Act (SEPA), Chapter 43.21C RCW, may apply to future cleanup actions. Although the RI itself is investigative in nature, subsequent remedial activities may require SEPA review to evaluate potential environmental impacts associated with construction, sediment disturbance, shoreline work, dewatering, or habitat impacts. SEPA compliance, if required, will be addressed at the appropriate stage during future remedial action planning in coordination with Ecology and other relevant agencies.

1.3 SITE BACKGROUND

As stated in Section 1.0, the Site consists of three primary areas: (1) the Main Mill Complex, (2) the Wood Stave Pipe Corridor, and (3) the Westport Ponds Area (Figure 1.1). The Main Mill Complex is located at 1701 1st Street in Cosmopolis, Washington, along the Chehalis River. The Wood Stave Pipe Corridor extends approximately 3 miles from the Main Mill Complex and during mill operations conveyed spent sulfite liquor (red liquor) to the Westport Ponds Area. Additional details on red liquor are provided in Section 2.2.1.1. The Westport Ponds Area, located at the terminus of the Wood Stave Pipe Corridor, was historically used for wastewater storage, treatment, and discharge to Chehalis River via Outfall 001 under the National Pollutant Discharge Elimination System (NPDES) Permit No. WA0000809. The pipe corridor passes through portions of Cosmopolis and Aberdeen, including residential neighborhoods and utility corridors (PES 2007).

Weyerhaeuser constructed the pulp mill in 1957. The facility was designed to produce high-purity cellulose, commonly referred to as dissolving wood pulp, for industrial applications using a sulfite pulping process. In 1962, Weyerhaeuser converted operations to produce dissolving-grade and specialty pulp to meet market demand. Historically, bleaching operations included the use of chlorine-based processes; however, these processes were modified beginning in approximately 1990 to reduce or eliminate elemental chlorine use. In October 2005, Weyerhaeuser announced the mill's closure, and production ceased in September 2006. The facility was subsequently mothballed in 2007 (PES 2007).

After closure in 2006, the mill remained inactive until September 2010, when Weyerhaeuser sold the facility to Cosmo Specialty Fibers. Cosmo Specialty Fibers was a closely held affiliate created, owned, and managed by The Gores Group, LLC, a Los Angeles-based private equity firm, which acquired the facility with the intent to refurbish and restart mill operations (Ecology 2025b).

Site-wide environmental investigations have not been conducted under the MTCA to date, and limited environmental data are available to characterize the potential nature and extent of contamination at the Site. Mill operations involved the use, storage, and handling of materials that may represent potential sources of environmental contamination, including bleaching-related chemicals and associated byproducts generated during pre-1990 elemental chlorine bleaching operations, petroleum products and solvents used for equipment operation and maintenance, electrical equipment historically containing polychlorinated biphenyls (PCBs), and pulping byproducts such as red liquor (PES 2007).

Ecology inspection records and operational documentation identified multiple historical releases associated with facility infrastructure, including on-site storage tanks and the Wood Stave Pipe, as described in Section 3.2.

1.4 WORK PLAN ORGANIZATION

The Phase 1 RIWP is organized as follows:

- **Section 2.0—Site Setting and Operational Background.** Describes the Site, Site history, and physical and environmental setting.
- **Section 3.0—Previous Investigations and Remedial Actions.** Summarizes prior upland and in-water investigations, cleanup actions, and relevant findings.
- **Section 4.0—Preliminary Conceptual Site Model.** Presents the preliminary CSM, including potential sources, release mechanisms, transport pathways, and receptors.
- **Section 5.0—Contaminants of Interest and Preliminary Screening Level Development.** Presents the preliminary COIs for groundwater and soil at the Site and selected preliminary screening levels (PSLs) for each medium based on ARARs and the preliminary exposure pathways identified in the CSM.
- **Section 6.0—Remedial Investigation Approach.** Identifies data needs and presents an overview of the proposed sampling and analysis approach.

- **Section 7.0—Field Implementation and Supporting Plans.** Describes the procedures and supporting plans relevant for field activities, including the SAP/QAPP, cultural resources review and Inadvertent Discovery Plan (IDP), and Health and Safety Plan (HASP).
- **Section 8.0—Reporting and Schedule.** Describes the project and reporting schedules.
- **Section 9.0—References.** List of the documents and sources relied upon
- **Appendix A—Historical Boring Logs.**
- **Appendix B—Sampling and Analysis Plan.**
- **Appendix C—Quality Assurance Project Plan.**
- **Appendix D—Health and Safety Plan.**
- **Appendix E—Inadvertent Discovery Plan.**

2.0 Site Setting and Operational Background

This section describes the Site setting, facility layout, historical ownership and operations, physical setting, and operational and environmental compliance history relevant to the RI. This information provides context for the previous investigations and remedial actions summarized in Section 3.0 and the potential contaminant sources, release mechanisms, and migration pathways summarized in Section 4.0.

2.1 OWNERSHIP AND OPERATIONAL TIMELINE

The property has been used for industrial wood products manufacturing for over a century, beginning with lumber milling in the late 1800s and later transitioning to sulfite pulp production under Weyerhaeuser. Early operations included the following:

- **1877 to 1879:** Charles Stevens purchased the property in 1877 and constructed a water-powered grist mill, a mill that grinds cereal grain into flour and meal, by 1879 (Caldbeck 2025; Aberdeen Daily World 1961).
- **1881 to 1888:** In 1881, Jason and John Fry purchased the grist mill and converted it into a sawmill, marking the area's initial significant lumber milling activity (Aberdeen Daily World 1961).
- **1888 to 1892:** Pope & Talbot developed a larger mill at the site, operating under the name Grays Harbor Mill Company (PES 2007).
- **1892 to 1931:** The mill was rebranded as the Grays Harbor Commercial Company in 1892. It served as a significant producer of lumber products until its closure in 1929. The company was formally dissolved in 1931 (PES 2007).
- **1948 to 1955:** A smaller sawmill, operated by the United Mill & Logging Co., was present prior to the larger mill operations. This facility included a sawmill, a log intake area on a slough, and additional structures for sorting and processing lumber. The site continued to function as a lumber processing area until preparations for pulp mill construction began under Weyerhaeuser ownership (PES 2007).

Weyerhaeuser Timber Company purchased the underlying property from the Ultican family in 1955 and constructed the pulp mill in 1957. The facility initially produced paper-grade sulfite pulp and transitioned in 1962 to dissolving- and specialty-grade sulfite pulp. In October 2005, Weyerhaeuser announced the mill's closure, citing economic challenges and shifting market demands. Weyerhaeuser then ceased operations in September 2006, and the facility was subsequently shuttered in 2007 (PES 2007).

Following cessation of Weyerhaeuser operations in 2005 and formal shutdown of production in 2006, Weyerhaeuser retained ownership of the Cosmopolis mill until 2010, when the mill was sold to an investment group led by The Gores Group, LLC. The mill resumed operations in May 2011 under the name Cosmo Specialty Fibers and continued producing dissolving wood pulp and specialty cellulose products including viscose, acetate, ether, and lyocell-grade pulps through late 2022.

During this operational period, the mill reportedly produced 140,000 to 170,000 metric tons of specialty pulp products annually and employed approximately 200 workers in Grays Harbor County. Operations were suspended during the COVID-19 economic slowdown in 2020 but resumed in early 2021. In December 2022, production activities were curtailed and mill operations ceased (PaperAge 2020). Ownership of the property was subsequently transferred to Charlestown Investments, an entity associated with Richard Bassett, through acquisition of Cosmo Specialty Fibers and related holding interests (Ecology 2024a).

2.2 FACILITY OVERVIEW AND OPERATIONAL HISTORY

The following sections provide an overview and operational history of the three primary operational areas of the Site: the Main Mill Complex, the Wood Stave Pipe Corridor, and the Westport Ponds Area. The key Site features described in the following sections are shown on Figures 2.1 through 2.3. The summary is based on information compiled from prior investigations and records reviewed to date, including the Level I Environmental Site Assessment (ESA) completed by PES Environmental Inc. in 2007 and additional documents obtained through records review at Washington State Archives and Ecology. This information provides the historical context used to support the development of the preliminary CSM and the proposed investigation approach described in the Phase 1 RIWP.

2.2.1 Main Mill Complex

The Main Mill Complex is located at 1701 1st Street, Cosmopolis, Washington, and occupies approximately 500 acres on the north side of Highway 101 (1st Street) and the south side of the Chehalis River (Figure 2.1). This area of the Site is located near the confluence where the Chehalis River enters Grays Harbor, within the estuary that is subject to tidal influences. The property is located within Sections 13, 14, 23, and 24 of Township 17 North, Range 9 West (Willamette Base Meridian) in the City of Cosmopolis. Numerous tax parcels are associated with the Main Mill Complex (shown on Figure 2.1 and summarized in Table 2.1; Grays Harbor County 2026a). The property is zoned for industrial/manufacturing use, with industrial waterfront-related land use designations along the Chehalis River (Grays Harbor County 2026b).

The primary mill operations area within the Main Mill Complex is approximately 100 acres and consists of pulp mill production facilities and associated support infrastructure, such as process buildings; material handling areas; and on-site storage tanks used for fuels, chemicals, and pulping byproducts. Additional pulp mill property extends east of the mill operations area and encompasses approximately 400 acres, including the secondary wastewater treatment system (biological ponds [bioponds], storage pond, and clarifiers) and fill areas and stockpiles associated with mill construction, maintenance, and waste management activities (PES 2007). The Main Mill Complex also contains surface water and drainage features, including Sweet Sewer Slough and the Woodyard Riverside Drain that primarily convey stormwater and Site runoff to the Chehalis River, as well as the Mill Slough, a natural tributary to the Chehalis River (PES 2007).

Until approximately 2016, Weyerhaeuser maintained a timberlands operations office, log truck maintenance shop, and related support facilities in the area east of the Main Mill Complex and

west of the bioponds area. These timberlands-related operations shared certain common areas, utilities, and regulatory permits with the mill facility (PES 2007). Available Site records do not identify the startup or shutdown dates for Weyerhaeuser Timberlands operations. However, these operations were documented as active at least as late as 2007, based on inspection and reporting records from that period.

Union Pacific railroad tracks run along the south side of the Main Mill Complex roughly parallel to Highway 101. A railroad spur serves the south portion of the Main Mill Complex. However, rail service from the mill to South Aberdeen, Cosmopolis, and Markham was abandoned after the railroad bridge over the Chehalis River at Aberdeen was deemed unsafe in 1994 (PES 2007).

2.2.1.1 Mill Operations Area

The main mill began operating as a pulp manufacturing facility under Weyerhaeuser in 1957 and transitioned in 1962 to production of dissolving-grade and specialty pulp. The mill operations area includes the pulp mill and digester system, bleach plant, power house, hog fuel storage area, acid plant, chip receiving and storage areas, pulp machine, product storage and shipping warehouses, raw water filter plant, and secondary wastewater treatment system (bioponds, storage pond, and clarifiers; PES 2007; Weyerhaeuser 1986a). This area also includes storage tanks, including former and current fuel storage tanks, a Caustic Storage Aboveground Storage Tank (AST), and Dump Tanks historically associated with pulp handling operations. The Dump Tanks are currently used to store red liquor, a caustic, reddish-brown byproduct of the wood pulping process containing dissolved lignin and processing chemicals, typically characterized by high pH and elevated organic content.

Major pulp mill components include digesters and accumulators; the bleach plant; a chlorine dioxide generator and absorption tower; storage tanks for acid, spent sulfite liquor, and other process chemicals; and associated piping, pumps, and ancillary equipment. Wood chips were processed into pulp using a magnesium bisulfite cooking acid process that uses magnesium bisulfite with sulfur dioxide (PES 2007; Weyerhaeuser 1986a, 1991).

Bleaching historically involved chlorine dioxide and, over time, additional reagents such as oxygen, caustic soda, and hydrogen peroxide. Lead mortar is present in brick linings of the digesters and accumulators. Pulp processing, along with supporting utilities and maintenance activities generated process wastewater and required management of hazardous substances and byproducts, including red liquor, magnesium bisulfite, and bleaching-related chemicals (e.g., sodium hypochlorite and chlorine dioxide). During periods when elemental chlorine was used, absorbable organic halides (AOX) could be formed. Records indicate that AOX generation was greatest prior to process changes and was significantly reduced after adoption of oxygen delignification in 1990 (PES 2007; Weyerhaeuser 1986a, 1991).

The power house produced steam and generated electricity for mill operations and included recovery boilers/furnaces (Nos. 1, 2, and 3) with a common recovery stack. Spent sulfite liquor and wastewater treatment solids were burned in the recovery system during at least the late 1980s to early 1990s (Weyerhaeuser 1986a, 1991). Hog-fuel-fired boilers were supplied by hog fuel

historically stored in the hog fuel pile east of the power house, with fuel oil (Bunker C/No. 6) and diesel #2 fuel being stored in ASTs south of the power house. The acid plant, located northeast of the power house, contained several ASTs with associated piping, pumps, and equipment. Fuel storage in this area included a 200,000-gallon (gal) AST for Bunker C/No. 6 fuel oil and two diesel #2 ASTs (21,000 gal and 1,900 gal) within a contained bermed structure and a reported containment capacity of 288,000 gal (PES 2007; Weyerhaeuser 2000).

Chip handling and storage occupied the northern portion of the Main Mill Complex and included chip dumps, outdoor storage areas, a chip merchandiser, six concrete chip silos, and conveyance equipment. From 1957 to 1991, a former chip plant operated to process raw logs into chips (including barker and chippers). The former chip truck dump area included hydraulic lift units and a 1,000-gal diesel AST (PES 2007; Weyerhaeuser 2000).

The pulp machine, located west of the pulp mill, pressed and formed pulp into continuous sheets that are dried and rolled or cut to size. Floor drains and sumps for hydraulic equipment were present in the machine room. Finished products were stored and prepared for shipment in adjoining warehouses (older warehouse south of the machine room and a newer warehouse west of the machine room/older warehouse). The raw water filter plant, located southeast of the pulp mill, treated raw water supplied via pipeline from Aberdeen Lake and included filtering equipment and settling basins. Backwash solids were routed via surface drainage to the Outfall 002 discharge (PES 2007; Weyerhaeuser 1986a).

Support facilities included the main office and laboratory buildings southwest of the pulp mill (laboratory functions included process quality assurance/quality control and environmental compliance testing, with associated chemicals and laboratory wastes), a medical/fitness center, and multiple parking areas. Maintenance and repair shops were distributed across the complex, including a general maintenance building north of the pulp mill (metal fabrication/welding and related material storage), education and safety buildings for training, a paint shop, and a vehicle maintenance shop (Hyster shop) that historically stored and used petroleum products and wastes, antifreeze, solvents, and other chemicals. The Hyster shop included a service pit, used oil and drum storage with containment, and a steam cleaning area with runoff directed through an oil/water separator before discharge to the sour sewer system (wastewater treatment system). Additional features included a drum storage building with a concrete slab and containment sump, a water tower, sandblast and boneyard areas, and an emergency response team (ERT) building for response equipment. A truck scale, scale house, and helipad were also present; a former aviation fueling AST (Jet A) was removed in 2005. The west entrance gate, guard house, and contractor gate and parking were located at the western end of the Site, where two 205,000-gal ASTs store 50% sodium hydroxide within a lined containment structure and berm with a sump pump to the sour sewer system (PES 2007; Weyerhaeuser 2000).

The area between the Main Mill Complex and the Mill Slough contains the secondary wastewater treatment system (bioponds, storage pond, and clarifiers), former log storage areas (log decks), various fill areas, a permitted and closed Woodwaste (Knots) Landfill, and a wood debris storage and disposal area, known as the Rejects Area. Additional details regarding fill, disposal, and

drainage areas are presented in Section 2.2.1.2. The Sweet Sewer Slough is also located in this area and received raw water treatment backwash solids and site stormwater runoff, discharging to the Mill Slough, and provided primary treatment for filter plant backwash solids and stormwater. Drainage infrastructure associated with the Sweet Sewer Slough was actively used during mill operations and was modified during the 1970s. By 1973, the Sweet Sewer Slough had been modified to discharge to the Mill Slough, and dredged solids from the slough were placed on the banks (although the specific locations are unknown) under an agreement with the U.S. Army Corps of Engineers. Except for the Northwest Fill Area, portions of the Site east of the Mill Slough are generally undisturbed and consist of marshland and vegetation (PES 2007).

Electrical equipment historically present at the mill included PCB-containing transformers and capacitors. As early as 1987 and by 1994, PCB-containing equipment (including 33 transformers and 386 capacitors) had been removed and disposed of off-site and replaced with non-PCB containing equipment. A release of PCB-containing transformer oil that reportedly occurred on May 11, 1993, was contained within a designated containment structure and was managed under a U.S. Environmental Protection Agency (USEPA)-approved remediation plan (PES 2007). Additional information related to the PCB release is summarized in Section 4.1.3. Chemical inventories and storage locations are summarized in the Level I ESA (PES 2007), including information excerpted from the facility Spill Prevention, Control, and Countermeasure (SPCC) Plan.

2.2.1.2 *Fill, Disposal, and Drainage Areas*

Multiple on-site areas were historically used for disposal, fill placement, and/or management of solid waste and dredged materials, including the following, and are presented on Figure 2.1 (PES 2007):

- **Northwest Fill Area:** A general fill/disposal area in the north-northeastern portion of the Site, northeast of the Sweet Sewer Slough and Mill Slough, was used from 1957 to approximately 1964. Although formal documentation is limited, materials reportedly placed in this area included ash, pulp rejects, stainless steel piping, and demolition/construction debris. The area is vegetated and overgrown, although scattered debris remains visible at the ground surface.
- **North and South Fill Areas:** The North Fill Area (approximately 2.2 acres) and South Fill Area (approximately 1.6 acres) received fill and disposal materials associated with wastewater treatment operations from the 1960s through the early 1990s. Materials disposed included waste activated solids (WAS), fiber rejects, digester bricks, sulfur, and tower packing material (Tellerette). The South Fill Area also received bricks and lead containing mortar from digester and accumulator linings, which were removed in the early 1990s and disposed of off-site at a hazardous waste landfill. These lead-based materials were removed in the early 1990s and disposed of at a hazardous waste landfill in Oregon. This area is vegetated and overgrown.
- **Diked Area:** An approximately 17-acre diked area that includes the North and South Fill Areas was constructed in the early 1970s during expansion of the secondary

wastewater treatment system, including construction of the bioponds, storage pond, and secondary clarifiers. WAS was disposed of broadly across the diked area as part of routine wastewater treatment operations during the 1970s and 1980s. WAS generated by the secondary clarifiers was pumped from the wastewater treatment system into the diked area via a pipeline that discharged near the north corner of the bioponds. The asbestos-cement (transite) pipeline was later abandoned in place.

- **Woodwaste (Knots) Landfill:** A closed, limited-purpose landfill located east of the bioponds was used as a fill area for pulping residuals (knots and tailings) and boiler ash. The primary fill material was pulping knots; ash placement reportedly occurred at the western end of the landfill in 1996 and 1997. The landfill was closed in 1997 with construction of a soil cap and is managed under a Grays Harbor County solid waste closure permit with inspection and annual reporting requirements, currently managed by Cosmo Specialty Fibers. Leachate is directed to the storage pond and bioponds as part of the secondary wastewater treatment system. This area is vegetated and overgrown.
- **Rejects Area:** This area, located east of the closed Woodwaste (Knots) Landfill was used for storage and disposal of wood debris and pulping rejects from the mid-1970s to the mid- to late 1980s. This area is now largely vegetated and overgrown.

2.2.1.3 Timberlands Operations

The Timberlands operations area included offices and several support facilities: a truck shop, an equipment/drum storage building, a fueling station, a truck wash, a boneyard for surplus materials, a forestry storage building (herbicide), and associated parking/outdoor storage. The Sweet Sewer Slough headworks bordered the truck shop area, and the Forestry Storage Building sat across the Sweet Sewer Slough to the east (PES 2007).

The truck shop maintained logging trucks and other vehicles and included service bays (some with pits), a tire shop, machine shop, offices, and parts storage. The equipment and drum storage building had covered side bays; one side stored petroleum products/wastes (including a small AST) with coated concrete containment, and the other side included hazardous waste collection with bermed concrete secondary containment. A small trailer nearby supported radio and communications service (PES 2007).

The fueling station had multiple ASTs (diesel, gasoline, and chainsaw mix ASTs, with additional smaller tanks for hydraulic and motor oil) within contained structures and included dispensers and canopy. Truck wash runoff was captured in a sump to settle solids then pumped to the western most biopond for treatment, and solids were removed and disposed of off-site. The forestry storage building stored and mixed herbicides and related supplies and equipment, with climate-controlled storage areas and a contained chemical mixing and storage area (PES 2007).

2.2.2 Wood Stave Pipe Corridor

The Wood Stave Pipe was installed in 1957 as part of an upgrade to the mill's wastewater conveyance system and during mill operations conveyed treated mill effluent, including combined primary and secondary wastewater from the sour sewer system, to the Westport Ponds for discharge at Outfall 001 (PES 2007; Ecology 2015).

The pipeline consists of an approximately 3-mile-long, 42-inch-diameter underground pipe extending beneath residential and commercial areas in Cosmopolis and Aberdeen, generally with the public right-of-way (ROW) or private utility corridors between the Main Mill Complex and the Westport Ponds Area (Figure 2.2). Based on available records, the pipe was constructed during development of the pulp mill wastewater infrastructure in the mid-20th century, although the exact construction date is not documented. It is constructed primarily of wood staves bound by closely spaced steel bands, with portions of the alignment including vertical vent and riser structures, segments installed within steel casings (e.g., at roadway or rail crossings), and localized repairs or replacements using alternative materials such as high-density polyethylene (HDPE; Mill Creek 2023).

2.2.3 Westport Ponds Area

The Westport Ponds Area is located on the north side of Washington State Route 105, also known as Westport Road, within Sections 17 and 20 of Township 17 North, Range 9 West along Chehalis River in south Aberdeen (Figure 2.3). The Westport Ponds Area includes four settling ponds (also referred to as aeration ponds) designated Ponds A, B, C, and D and two solids ponds commonly referred to as the East Pond and West Pond (also referred to in historical documents as East and West Solids Ponds, Sludge Ponds, or Spoils Ponds).¹ Ponds A through D were constructed in the mid-1950s, and the East and West Ponds were constructed in the mid-1970s. Collectively, the six ponds (Ponds A through D and the East and West Ponds) occupy approximately 50 acres (PES 2007).

During active mill operations, the four settling ponds were part of treatment operations and were used for wastewater surge storage and final neutralization of pulp mill wastewater. Based on as-built drawings, Ponds A, B, C, and D were constructed with an unlined native soils bottom, clay-blanketed sides, and riprap slopes for protection (Weyerhaeuser 1956). Ponds A, B, and C were interconnected; the intertie between Ponds C and D was filled with concrete in the 1990s (PES 2007). Wastewater was neutralized at Pond A and pumped to Pond D, which acted as a surge pond. If the pH was outside the acceptable range, the gate at Pond D would close to contain treated wastewater until conditions normalized.

Since at least the 1970s, the East and West Ponds have been used for disposal and management of solids removed from the adjacent Westport Ponds, including biological material, ash, and pulp fiber generated during treatment processes. Solids that accumulated in Ponds A through D were

¹ For purposes of this Phase 1 RIWP, the ponds are referred to as the East and West Ponds, except in Section 3.0 where terminology is kept consistent with the original author's reports.

dredged and deposited in the East and West Ponds. The East Pond closed in 2005 after dewatering and establishment of vegetative cover for surface stabilization (Grays Harbor County 2005), and the West Pond remaining operational for waste management purposes until at least 2009. The West Pond is considered operational under applicable solid waste permits administered by Grays Harbor County (Grays Harbor County 2009).

Infrastructure associated with pond operations is present within the Westport Ponds Area. Near Pond A, a fenced equipment area and associated building housed water treatment chemicals, a pump station, a generator, and ASTs for sodium hydroxide and diesel fuel. A pump station and pH meter are located at Pond A, and an additional pH meter is located downstream of Pond D (PES 2007). Small sheds containing electrical equipment used to operate pond aerators and related systems are located near each of the ponds. A small building and associated equipment are also present at the western end of Pond D in connection with discharge to Outfall 001 in Grays Harbor (PES 2007). Vandalism in the Westport Ponds Area, particularly within the fenced equipment area and small electrical sheds, has resulted in removal of equipment and chemicals and loss of functionality of electrical systems, including the generator and aerators. In 2005, Grays Harbor County approved Weyerhaeuser's closure plans for both ponds.

2.2.4 Wastewater Treatment System

The mill wastewater treatment system, located in the Main Mill Complex, received combined effluent from multiple mill operations, including pulping, bleaching, chemical recovery, and power generation, as well as leachate from the Woodwaste (Knots) Landfill. The system incorporated both primary and secondary treatment processes, with subsequent conveyance to the Westport Ponds for final treatment, neutralization, and discharge.

The primary wastewater treatment system, constructed in 1956, consisted of several units designed to remove solids and manage process-specific waste streams. The ash clarifier treated wastewater from the power and recovery boilers, removing ash and magnesium oxide, which were dewatered and shipped off-site for use as construction fill. Disco strainers treated wastewater from pulping operations, bleach plant reject lines, and roadway runoff, removing knots and fibers that were either sold or burned in the hog fuel boiler. A Brinkley rotating screen handled overflow from the pulping area, capturing additional fibers and rejects that were stored in the hog fuel pile for combustion.

Flows from the primary treatment units, as well as other process wastewater from the pulping operations, were conveyed through the sour sewer system to the secondary treatment system. Following secondary treatment, effluent was discharged back to the sour sewer system and conveyed through the Wood Stave Pipe to the Westport Ponds prior to discharge through Outfall 001.

The secondary wastewater treatment system at the Main Mill Complex consisted of four bioponds (aeration basins), a nonaerated storage pond, and two secondary clarifiers. The storage pond was used to hold wastewater with elevated biological oxygen demand (BOD) prior to introduction into the bioponds, whereas sludge from the secondary clarifiers was recycled back into the bioponds as

activated sludge. Nutrients such as aqueous ammonia and phosphoric acid were added to enhance microbial activity. The bottoms and side slopes of the bioponds and storage pond consisted of native “blue clay,” and the berms were constructed of engineered fill. In addition to flows from the primary treatment units and process wastewater from the pulping operations, the bioponds and storage pond also received leachate from the closed Woodwaste (Knots) Landfill located east of the ponds. Effluent from the bioponds was discharged to the secondary clarifiers where solids settled, after which the treated wastewater was disinfected, returned to the sour sewer system, and conveyed to the Westport Ponds prior to discharge to the Chehalis River through Outfall 001 (PES 2007).

Stormwater and minor process water were managed through the Sweet Sewer Slough, with flow routed through a settling basin prior to discharge to the Chehalis River through Outfall 002 (PES 2007). In parallel, the sweet sewer system collected stormwater and non-process water, which passed through a settling basin before discharge to the Chehalis River via Outfall 002.

Modernization and environmental performance upgrades to the wastewater treatment system were implemented in the 1980s and 1990s, including oxygen delignification and substitution of elemental chlorine with oxygen and chlorine dioxide in bleaching, intended to reduce dioxin and AOX production. Additional upgrades continued into the 1990s and early 2000s (PES 2007; Weyerhaeuser 1995a).

2.3 PHYSICAL SETTING

This section summarizes the physical and environmental setting of the Site, including geologic and hydrogeologic conditions, surface water and drainage features, climate, and known cultural resources.

2.3.1 Geology and Hydrogeology

The Site is located in the valley of the Chehalis River just east of Grays Harbor, within the alluvial valley floor of the river on the northwestern margins of the Willapa Hills physiographic region of southwestern Washington.

The Willapa Hills are generally characterized by gentle rolling hills with moderate slopes descending to broad valley floors, such as the Chehalis River valley in the vicinity of the Site. The valleys are underlain by variable thicknesses of recent alluvium consisting of river-deposited gravels, sands, and silts. Near the coast, alluvial deposits may exceed 100 feet in thickness due to valley infilling associated with rising sea levels, which reduced the river’s capacity to transport sediment downstream (PES 2007).

Due to its close proximity to Grays Harbor, groundwater at the Site is brackish in nature, with elevated conductivity and chloride levels, and evidence of saltwater intrusion into both the shallow and deep water-bearing zones at the Westport Ponds. The alluvial water-bearing zone underlying the Site is unlikely to be potable for this reason. The City of Cosmopolis receives its

domestic water supply from the City of Aberdeen via the Wishkah River (City of Cosmopolis 2026) and there are no drinking water wells within 5 miles of the Site (Ecology 2026).

Historical boring logs at the Main Mill Complex indicated that the area is underlain by a gravelly sand fill from the surface to approximately 3 to 12 feet below ground surface (bgs), followed by a clayey silt to a depth of approximately 25 to 60 feet bgs. These units are underlain by a firmer silty sand and silty clay units, which in turn overlie very dense siltstone bedrock or sand and gravel at a depth of about 73 to 95 feet bgs (Hart Crowser 1992). Historical borings encountered groundwater between approximately 1 to 7 feet bgs. The historical boring logs and a figure showing the historical boring locations at the Main Mill Complex are provided in Appendix A.

Historical boring logs near the Westport Ponds indicate that the area is underlain primarily by alluvium, consisting of highly organic silts from the surface to approximately 2 feet to 6 feet bgs, underlain by a thick silty clay layer that is between 7 and 15 feet thick and present up to depths of approximately 22 feet bgs (Figure 2.4). This thick, less permeable clay layer is underlain by fine to medium sand and gravel that is encountered between 12 and 22 feet bgs. The historical boring logs and well completion information can be found in Appendix A, and a cross-section developed from the boring logs is presented on Figure 2.4.

Previous investigations have identified two water-bearing zones at the Westport Ponds Area, a shallow water-bearing zone within the near surface clay unit, within the top 6 feet, and a deeper alluvial water-bearing zone within sand and gravel layers that are encountered below the thick clay unit at depths between 12 and 22 feet bgs. Groundwater flow in the shallow, low-permeability clay unit is interpreted to occur primarily through more permeable organic zones rather than the clay matrix. Depth to groundwater in wells screened across the shallow water-bearing zone at depths between 5 and 14 feet bgs has been measured at approximately 2.5 to 6.5 feet bgs. Depth to groundwater measured in the wells screened across the deeper water-bearing zone at depths between 24 and 30 feet bgs has been measured at approximately 4.5 to 10 feet bgs, which indicates that the deeper water-bearing zone may be confined or partially confined by the thick clay layer that is present between the shallow and deep water-bearing zones. Groundwater in both the shallow and deep water-bearing zones is believed to flow primarily to the north toward the Chehalis River, although both water-bearing zones are likely influenced by tidal cycles within Grays Harbor (Antea 2023). The shallow water-bearing zone has historically shown to have a greater response to rainfall events, whereas the deep water-bearing zone appears to be more strongly influenced by tidal cycles.

2.3.2 Surface Water and Drainage

The Site is located adjacent to the Chehalis River near its confluence with Grays Harbor. The Chehalis River is tidally influenced in the vicinity of the Site, and surface water levels are affected by both river discharge and tidal fluctuations associated with Grays Harbor. Site surface water features also include adjacent shoreline areas, sloughs, ditches, and flooded low-lying areas associated with mill infrastructure. These surface water features represent potential hydraulic connections between upland areas and the river, particularly during the wet season or high-tide conditions.

Surface water drainage at the Site is influenced by a combination of natural water features and engineered drainage conveyances associated with mill operations. Mill Slough is a natural surface water feature that likely receives surface water runoff from the eastern portion of the Site, including the North and South Fill Areas, the Woodwaste (Knots) Landfill, and the Rejects Area. Runoff from these areas may be conveyed to Mill Slough through a combination of overland flow and localized drainage features before discharging to the Chehalis River.

The Sweet Sewer Slough consists of an engineered drainage feature and associated ditches that were actively used during mill operations to receive surface water runoff (including stormwater and wash water), fresh water overflow, and minor filter backwash water from water treatment processes. The Sweet Sewer Slough was historically modified to connect to Mill Slough, and maintenance activities included periodic removal of accumulated sediment from the slough. This drainage system relies on gravity flow and unobstructed channels. Shutdown of power to the Site and a debris blockage at a Sweet Sewer Slough culvert beneath the roadway northwest of the Ash Pad near the bioponds (Figure 2.1) have reduced drainage capacity, resulting in backwater conditions and localized flooding within the Main Mill Complex.

The Woodyard Riverside Drain is an engineered drainage conveyance associated with the woodyard and adjacent operational areas that conveys surface water runoff toward the Chehalis River.

2.3.3 Climate

The Site is located in a coastally influenced climatic zone in western Washington characterized by mild temperatures and relatively high annual precipitation. The area receives 35 to 50 inches of precipitation annually (NOAA 2026), primarily during the fall and winter months (November through February), with comparatively drier conditions during the late summer and early fall (September and October). Seasonal rainfall patterns may influence surface runoff, shallow groundwater recharge, and groundwater elevations, particularly within the shallow water-bearing zone. These wetter months are especially relevant for sampling due to elevated groundwater levels and increased potential for runoff.

2.3.4 Cultural Resources

The Site is located in an area with a long history of human use associated with riverine and coastal environments of Grays Harbor, and previous industrial development has resulted in substantial ground disturbance across much of the property. Cultural resources will be considered and addressed as appropriate, in accordance with WAC 173-340-815 Cultural Resource Protection, which is part of the MTCA cleanup regulations administered by Ecology.

WAC 173-340-815 requires that remedial actions conducted under MTCA avoid, minimize, or mitigate adverse effects to cultural resources and includes provisions for coordination with Washington State Department of Archaeology and Historic Preservation (DAHP) and affected tribes. The rule also requires development and implementation of an IDP that outlines steps to follow if archaeological materials or human remains are encountered during field activities.

Although WAC 173-340-815 formally applies only to remedial actions, Ecology recommends considering cultural resources early in any cleanup involving planned ground disturbance, even during initial investigations. Accordingly, for activities conducted under the Phase 1 RIWP, cultural resources will be evaluated as appropriate, including coordination with DAHP and preparation of an IDP (presented as Appendix E) to support field investigations and ensure compliance with applicable state requirements.

Previous cultural resources surveys within the Main Mill Complex documented remnants of historical lumber and pulp processing operations, including foundations, equipment pads, and rail alignments (DAHP 2026). There is a moderate to high likelihood of encountering additional subsurface features during ground-disturbing activities that could impact historic cultural resources.

Adjacent to the Westport Ponds Area, particularly near Pond D, is the historically significant Newskah Creek Fish Trap Complex. This archaeological site consists of wood stake alignments and structural remnants interpreted as tribal fishing weirs and has been dated to show multiple construction phases over the past 1,000 years. It is eligible for listing for the National Register of Historic Places. Pond D is in an area identified by the DAHP as having a high probability of both precontact and historic cultural resources, suggesting that intact archaeological deposits may extend beyond the boundaries of the fish trap complex (DAHP 2026).

2.4 OPERATIONAL AND ENVIRONMENTAL COMPLIANCE HISTORY

This section summarizes the regulatory permitting history for the mill, including permits for wastewater discharges, solid waste management, and air emissions. It also describes permit requirements and operational changes over time and establishes the regulatory framework relevant to evaluating historical and current environmental conditions.

2.4.1 National Pollutant Discharge and Elimination System Permit

The facility has been covered by NPDES permits since at least the 1970s, with the earliest located permit (WA-000080-9) issued March 1979 for the sulfite pulp mill (Ecology 1974, 1979). Permit renewals through the 1980s added increasingly stringent effluent limits and monitoring for BOD, total suspended solids, fecal coliforms, pH, temperature, toxicity, salmonid bioassays, and shellfish protection. A major permit reissuance in May 1991 (with early amendments) further expanded requirements to include sediment monitoring, dilution-zone studies, acute and chronic toxicity testing, and a dioxin (2,3,7,8-tetrachlorodibenzo-*p*-dioxin [TCDD]) control and monitoring and bioaccumulation program (Ecology 1991).

Under Weyerhaeuser operations, the mill implemented comprehensive wastewater treatment and environmental management and, aside from a few resolved incidents, was reported in compliance with effluent limits (Ecology 2009). After sale to The Gores Group, LLC and Cosmo Specialty Fibers, permit records from the 2000s through the 2015 reissuance show recurring noncompliance (Ecology 2015).

From 2020 onward, the permit status shifted administratively. Cosmo requested a modification in April 2020 tied to market-related curtailment, which was accepted by Ecology in November 2020 to reduce monitoring during periods with no process wastewater while retaining substantive permit obligations (Ecology 2020a).

Consistent with the administrative extension of the permit, Cosmo Specialty Fibers' 2025 Annual Report confirms that the facility continued to operate under the terms of the permit during calendar year 2025, despite remaining shut down due to market-related curtailment (Cosmo Specialty Fibers 2026). The report stated that mill operations ceased in December 2022 and that no wastewater-generating activities occurred during the 2025 reporting year. Accordingly, Cosmo Specialty Fibers reported under the permit's reduced monitoring provisions applicable during curtailment, with no required effluent samples collected and no sludge generated. Continued submittal of annual reporting to Ecology demonstrates that the permit remains administratively active and enforceable, notwithstanding the absence of active operations or discharges during the reporting period.

2.4.2 Solid Waste Disposal Permits

Wastewater treatment solids and wood residuals generated by mill operations were historically managed under state waste discharge permits and later transitioned to solid waste regulatory oversight as requirements evolved. Beginning in the late 1980s and early 1990s, land-based waste management areas, including the East and West Ponds and the Woodwaste (Knots) Landfill, became subject to solid waste permitting, groundwater monitoring, inspection, and closure requirements administered by Grays Harbor County.

Sludge disposal at the East Pond ceased in 1991, and the East Pond was closed by Weyerhaeuser using vegetative enhancement methods. The West Pond remains present on the Site and has been managed by Cosmo Specialty Fibers under successive county-issued solid waste permits, with requirements for monitoring and long-term management (Antea 2019).

The Woodwaste (Knots) Landfill was closed by Weyerhaeuser during the late 1990s under a closure plan approved by Grays Harbor County that included grading, soil cover placement, stormwater management, and long-term vegetative stabilization (Weyerhaeuser 1995b). The landfill remains subject to post-closure inspection and maintenance requirements under county-issued solid waste permits. Detailed permit history and closure documentation will be provided in the RI.

2.4.3 Air Operating Permit

The pulp mill has long been regulated under the Clean Air Act, with documented compliance and enforcement actions in the early 1970s primarily related to sulfur dioxide and particulate emissions, including a notable 1973 release that prompted investigation and enforcement consideration (Weyerhaeuser 1973). In response, Weyerhaeuser implemented significant air pollution control upgrades and monitoring systems over subsequent decades. Since the late 1990s, the facility has operated under a Title V Air Operating Permit (AOP) administered by

Ecology, reflecting increasingly stringent state and federal requirements, including Maximum Achievable Control Technology standards. The most recent AOP, issued in 2021, established emissions limits, monitoring, and reporting requirements for multiple sources across the Main Mill Complex (Ecology 2021). Cosmo Specialty Fibers experienced several air permit exceedances and periods of noncompliance under its AOP that were reported to Ecology through monthly air reports and annual compliance certifications.

2.5 SPILL PREVENTION AND RELEASES

Weyerhaeuser maintained environmental compliance programs at the pulp mill that evolved from early pollution prevention efforts into more comprehensive spill control and stormwater management systems. Beginning in 1997, a Pollution Prevention Plan focused on reducing hazardous chemical use and waste generation (Weyerhaeuser 1997). In 2003, the company implemented a formal SPCC Plan, which established structured procedures for preventing, identifying, and responding to releases of hazardous materials, including petroleum products (Weyerhaeuser 2003). The SPCC Plan was updated in 2009 to reflect regulatory and operational changes and remained in place under subsequent ownership, with a comprehensive revision completed in 2024 (Weyerhaeuser 2009; Cosmo Specialty Fibers 2024).

During Weyerhaeuser's period of operations and beyond, the facility implemented multiple spill detection, containment, and monitoring measures, such as secondary containment systems for ASTs, oil/water separators and controlled drainage infrastructure, and routine monitoring and wastewater discharge to ensure compliance with the NPDES permit requirements.

A summary of documented spills through 2007 is provided in the Level I ESA (PES 2007). Since that time, additional spills, compliance issues, and remedial actions have been documented in permit-related records (e.g., SPCC plans, NPDES permit files, discharge monitoring reports, and Ecology correspondence); however, these post-2007 records have not been compiled into a detailed Site-wide spill summary. An overview of spills identified in available records is provided in Section 4.1.3.

3.0 Previous Investigations and Remedial Actions

Historical soil, groundwater, surface water, and sediment analytical data available for the Site were generated through a combination of permitting compliance monitoring, focused operational investigations, and closure-related monitoring activities. As a result, these datasets differ substantially relative to each other in analytical scope, spatial coverage, and reporting parameters. Importantly, they were not collected as part of a single, coordinated, site-wide investigation conducted under MTCA. Rather, the available information reflects discrete and purpose-specific data collection efforts and therefore does not provide a comprehensive characterization of nature and extent of contamination across all environmental media.

This section summarizes previous environmental investigations, monitoring programs, and documented remedial or interim actions completed at the Site. The objectives, scope, and field activities associated with each investigation are described in the following sections. Due to the focused scope and objectives of historical investigations, limited conclusions can be drawn regarding Site-wide soil, groundwater, surface water, or sediment quality. Tables 3.1 through 3.3 present available analytical results and provide context for the preliminary CSM. The locations of previous investigations and remedial actions are shown on Figures 3.1 and 3.2. Known spills and releases are shown on Figures 3.3 and 3.4.

3.1 MAIN MILL COMPLEX INVESTIGATIONS

Relatively few environmental investigations have been conducted within the Main Mill Complex, with the primary efforts consisting of a focused investigation of the caustic storage tank area (Golder 1995), a site-wide review completed as part of a Level I ESA (PES 2007), and sediment sampling to comply with NPDES permit requirements (Antea 2017). The location of the caustic storage tank investigation and 2017 NPDES sediment sampling, as well as documented remedial actions (discussed in Section 3.5), are shown on Figure 3.1.

3.1.1 Report for Soil and Groundwater Assessment, Caustic Storage Tanks, Cosmopolis Pulp Mill Facility (Golder 1995)

Golder Associates, Inc. (Golder) conducted a focused investigation in June 1995 to assess the soil, groundwater, and surface water quality in the immediate vicinity of the caustic storage tanks (Golder 1995). The caustic storage tanks, constructed in 1957, consisted of two 30-foot-diameter aboveground steel tanks storing 50% sodium hydroxide within a bermed (approximately 100 by 100 feet), asphalt-covered containment area (Figure 3.1). Spills were documented to occur periodically during routine operations and equipment handling and were managed via a sump pump to an underground collection tank installed several years prior to the investigation (Figure 3.3). Earlier drainage pathways are unknown.

Between June 7 and 9, 1995, Golder advanced 38 soil borings, collecting soil samples from 1 to 6 feet bgs and one groundwater sample per boring. Surface water samples were also collected

along the Chehalis River during high and low tide. All samples were analyzed only for pH (Golder 1995).

Elevated pH values in soil (ranging from 10.0 to 12.6), were observed in the railcar offloading area directly west of the tanks and beneath the asphalt pad within the bermed area. Additional elevated soil pH values (approximately 10 to 12) were identified in two samples located between the berm and the river, and one nearby surface water sample near a seep collected during low tide showed elevated pH (up to 10), suggesting limited or localized groundwater discharge to the river (Golder 1995). The remaining surface water samples had pH values ranging between 7 and 8. Soil and groundwater pH impacts appeared to be associated with miscellaneous spills, primarily in the railcar offloading area to the west, near the spill collection tank to the south, and within the bermed area (Golder 1995).

3.1.2 Level I Environmental Site Assessment (PES 2007)

The 2007 Level I ESA evaluated historical and existing environmental conditions associated with pulp mill operations, wastewater treatment systems, chemical and petroleum storage, and fill areas. The ESA identified multiple areas of interest related to historical chemical handling, petroleum storage and fueling areas, wastewater treatment infrastructure, unlined ponds, and historical fill and disposal practices (PES 2007).

Of particular relevance to the investigation, the ESA identified the diked area and associated North and South Fill Areas (refer to Figure 2.1) as historical disposal locations with limited prior subsurface characterization, the unlined secondary wastewater treatment bioponds and storage pond as potential sources of subsurface impact, and the buried Wood Stave Pipe as a potential pathway due to its age, construction, and limited inspection history. The ESA concluded that comprehensive soil and groundwater characterization had not been conducted across large portions of the Site, particularly in historical fill and wastewater affected areas (PES 2007).

3.2 WOOD STAVE PIPE CORRIDOR INVESTIGATIONS

The Wood Stave Pipe has experienced recurring leaks for decades, with over 16 major leaks documented since 1982 and additional incidents between 2019 and 2022 (Figure 3.4). Leaks have been concentrated in specific segments, including between the Sour Sewer Sump and West Gate, near Vent No. 4 and Mill Creek crossing, and between Fillmore Road and Pond A. The West Gate S-curve has also had repeated failures (Mill Creek 2023).

Failures are caused primarily by corrosion of steel tension hoops, especially at exposed threaded ends. In saturated soil, corrosion weakens the hoops that can result in failure, allowing the wood staves to separate and leak. Contributing factors include shallow burial, high groundwater, heavy traffic loads, rocky backfill, and acidic conditions from groundwater fluctuations and decomposing vegetation near Mill Creek.

In August 2019, Mill Creek Management Technologies Inc. conducted a survey of the Wood Stave Pipe alignment for Cosmo Specialty Fibers to assess its general condition and recommend ways

to repair and rehabilitate the areas where most historical leaks had occurred. Mill Creek Management Technologies recommended that four weakened segments of the pipe be rehabilitated via slip lining with HDPE pipe. After three additional leaks in 2022 within previously identified areas, Mill Creek Management Technologies recommended that Cosmo Specialty Fibers implement a phased rehabilitation program over a 3-year period. In 2023, approximately 1,200 feet of straight pipe between the Sour Sewer Sump and the West Gate was proposed to be slip lined with 40-inch-diameter HDPE, and approximately 760 feet of the S-curve was proposed to be replaced by open-cut installation of new HDPE pipe. Approximately 1,050 feet of pipe in the Mill Creek area were proposed for slip lining, with completion planned for 2024. Approximately 550 feet between Fillmore Road and Pond A were proposed for slip lining, with completion planned for 2025 (Mill Creek 2023). It is unknown whether slip lining occurred in these sections of pipe to date.

Ecology reports document leak inspections completed between 2018 and 2023 in certain areas of the Wood Stave Pipe and at vent stacks. These reports include NPDES Permit 5 Day Reports that Cosmo Specialty Fibers submitted to Ecology (Cosmo Specialty Fibers 2018a, 2018b, 2018c, 2019, 2020) and Ecology Wastewater Inspection Reports (Ecology 2020, 2022, 2023, 2024). These reports highlight leak events, compliance inspections, and actions taken to repair the Wood Stave Pipe.

3.3 WESTPORT PONDS AREA INVESTIGATIONS

3.3.1 Groundwater Investigations

Previous investigations in the Westport Ponds Area have primarily focused on evaluating groundwater conditions associated with sludge and dredge spoils disposal activities (Figure 3.3). Groundwater pH and conductivity summary statistics collected between 1987 and 2006 are presented in Table 3.2 and collected between 2007 and 2003 are presented in Table 3.3. Investigations were conducted intermittently between 1986 and 2005 by Weyerhaeuser and between 2008 to 2023 by Cosmo Specialty Fibers, as described in the following reports:

- Ground Water Investigations at the Settling Pond Dredge Disposal Site (Weyerhaeuser 1986b)
- Ground Water Investigations Cosmopolis Sludge Disposal Site (Unknown 1988)
- 1993 Annual Groundwater Monitoring Report Weyerhaeuser Dredge Spoils Lagoon (Weyerhaeuser 1994a)
- 1994 Annual Groundwater Monitoring Report Weyerhaeuser Dredge Spoils Area (Weyerhaeuser 1995c)
- 1995 Annual Groundwater Monitoring Report Weyerhaeuser Dredge Spoils Lagoon (Delta 1995)
- 2005 Annual Groundwater Sampling Report Fiber Sludge Disposal Site (Delta 2006)
- 2008 Annual Groundwater Sampling Report Weyerhaeuser Fiber Sludge Disposal Site (Delta 2008)

- Semiannual Groundwater Sampling Results Summary Weyerhaeuser Fiber Sludge Disposal Site (CH2M HILL 2009)
- Spoils Pond Groundwater Landfill Summary Report (Antea 2019b)
- 2021 Annual Groundwater and Sludge Monitoring Report (Antea 2021)
- 2023 Annual Groundwater and Sludge Monitoring Report (Antea 2023)

Groundwater investigations conducted between 1986 and 2023, as summarized in the reports listed above, indicate that groundwater flow and chemistry in the Westport Ponds Area are strongly influenced by tidal fluctuations, estuarine conditions, and saltwater intrusion from adjacent marsh and river systems. Groundwater occurs in a shallow, low-permeability unit and a deeper water-bearing zone, with limited vertical connectivity due to intervening fine-grained soil. Flow directions are variable and tidally influenced, with shallow groundwater generally flowing north to northeast and deeper groundwater flowing north to northeast or south to southwest, depending on the tide.

Early 1980s groundwater investigations at the East Pond were conducted to evaluate the hydrogeological conditions and to determine whether disposal of dredged solids was impacting groundwater quality, consistent with regulatory monitoring requirements at the time. These investigations included installation of piezometers to assess groundwater flow direction and gradients, as well as collection of groundwater samples from upgradient and downgradient locations for laboratory analysis that included metals, conductivity, chloride, and organic content. Results indicated that site hydrogeology limits contaminant migration, including the presence of low-permeability silt and clay soil, a perimeter moat that functions as a hydraulic barrier, and a slight upward vertical hydraulic gradient that reduces the potential for downward leachate transport. Groundwater chemistry was heavily influenced by saline/tidal conditions, with elevated conductivity and chloride reflecting saltwater intrusion rather than site-related contamination. Analytical results showed no significant increases in measured parameters in downgradient wells relative to background conditions, and bioassay testing demonstrated no evidence of acute toxicity in groundwater samples. Accordingly, there were no exceedances or patterns indicative of contaminant release, and the data provided no evidence of toxicity or substantial groundwater contamination associated with disposal of dredged solids at the East Pond.

Other investigations during the 1990s identified hydraulic connectivity between ponds and shallow and deep groundwater, with elevated conductivity, chloride, total dissolved solids (TDS), and organic constituents (e.g., total organic carbon [TOC], tannins, and lignin) in pond water and downgradient wells, indicating localized migration of organic-rich leachate.

Long-term groundwater monitoring conducted by Weyerhaeuser and Cosmo Specialty Fibers between 1993 and 2009 of the dredge spoils lagoons and fiber sludge disposal site showed that groundwater chemistry, including conductivity, chloride, sulfate, iron, manganese, AOX, and organic indicators, varied spatially but remained generally consistent with background conditions influenced by tidal mixing. Although some wells exhibited elevated parameters relative to background, these were largely attributed to natural saline intrusion and site hydrogeology. No

sustained increases or widespread exceedances of primary drinking water standards were identified.

More recent evaluations conducted by Antea on behalf of Cosmo Specialty Fibers between 2019 and 2023 confirm that groundwater conditions remain stable and are controlled primarily by estuarine and tidal processes rather than ongoing contaminant migration. Groundwater monitoring has been conducted by Antea through a network of eight monitoring wells installed across the Site to evaluate potential impacts from spoils ponds, including wells screened in both shallow and deep aquifers. As shown on Figure 3.3, the monitoring wells are distributed around the former disposal areas, including Ponds A through D, and the East and West Pond area, to assess groundwater quality both upgradient and downgradient of these areas.

Monitoring data collected from these wells indicate that AOX and organic indicators (e.g., tannins and lignins), which are an indicator of pulp waste, have generally decreased from historical levels or remained stable over time with long-term trends, and no persistent or expanding contaminant plume has been identified. Elevated concentrations of major ions including chloride, sodium, magnesium, and TDS continue to be observed in select monitoring wells (e.g., W-3, W-5, and W-8). However, these conditions are consistent with historical data and are attributed to natural brackish groundwater influences rather than impacts from the East and West Ponds.

Groundwater and sludge monitoring results indicate that Site conditions have remained stable over time, leachate migration is limited, and the East and West Ponds are not exerting a measurable adverse influence on surrounding groundwater. The monitoring network and analytical results, in conjunction with Site layout and disposal area locations depicted on Figure 3.3, support the conclusion that groundwater quality is not being adversely impacted by the former disposal areas.

3.3.2 Surface Water and Sludge Studies

A series of investigations and monitoring activities conducted by Weyerhaeuser in the 1990s evaluated sludge conditions, chemistry, and management approaches for Ponds A through D and the West and East Ponds. In 1994, the sludge in Ponds A through D was surveyed to determine potential dredging of sludge from Ponds A through D and placement of dredged material in the West Pond. The survey characterized sludge properties, including sulfur content, oxygen demand, and dioxins, and identified elevated oxygen demand in Ponds C and D due to greater sulfide concentrations and sludge volumes. Dioxins were detected at low concentrations in Pond A sludge (118.35 picograms per gram [pg/g] as 2,3,7,8-TCDD equivalents; Weyerhaeuser 1994b). A 1995 follow-up evaluation identified increased total sulfides and hydrogen sulfide concentrations relative to prior data, and other reduced sulfur compounds were low or not detected, reflecting evolving biogeochemical conditions within the system (Weyerhaeuser 1995d).

Routine monitoring in 1996 further evaluated dioxins/furans (D/Fs) in sludge and effluent. Results indicated that 2,3,7,8-TCDD was not detected, whereas 2,3,7,8-tetrachlorodibenzofuran (TCDF) was detected in Pond A sludge (523 to 832 pg/g dry weight). Effluent from Pond D

contained only trace or nondetect 2,3,7,8-TCDF, indicating that dioxin-like compounds were associated primarily with accumulated sludge rather than wastewater discharges (Weyerhaeuser 1996).

Between 1996 and 2000, monitoring and revegetation efforts supported long-term management of the ponds. Sludge volumes and sulfide concentrations decreased over time, indicating that natural biological processes were contributing to sludge mass reduction without the need for dredging. Revegetation using native species was implemented to stabilize pond margins, although success varied due to flooding and soil conditions. Collectively, these efforts reflect a transition toward long-term stabilization of sludge within the pond system (Sound Native Plants 1999).

3.4 NPDES-PERMIT-REQUIRED INVESTIGATIONS

This section summarizes the most recent NPDES-required investigations including baseline sediment sampling in the vicinity of Outfalls 001 and 002 and a Toxicity Identification and Reduction Evaluation (TI/RE).

3.4.1 Results of Baseline Sediment Sampling (Antea 2017)

Baseline sediment sampling was conducted by Cosmo Specialty Fibers in August 2017 in the vicinity of Outfalls 001 and 002 at the Cosmo Specialty Fibers facility, in accordance with NPDES (WA0000809) permit requirements (Antea 2017). The sampling was completed to satisfy permit requirements for a baseline evaluation (to be completed once within the permit cycle timeline) and to assess whether sediment near the outfalls exceed applicable Washington SMS for permitted discharges, the sediment quality standards (SQS).² The results provide a baseline for future comparison under the NPDES permit and related regulatory programs; refer to Tables 3.4 and 3.5.

A total of 26 surface sediment samples were collected from the upper 10 centimeters, including 19 samples near Outfall 001 in the Chehalis River adjacent to the Westport Ponds (Figure 3.2) and 7 samples in the vicinity of Outfall 002 in the Mill Slough (Figure 3.1). Outfall 001 samples were collected from a vessel using a hydraulic power-grab sampler in the south channel of the Chehalis River, and Outfall 002 samples were collected from shallow slough areas using hand tools or small boats where access allowed (Antea 2017).

All samples were analyzed for constituents with Washington marine SQS chemical criteria (Chapter 173-204 WAC, 2013 revision), along with conventional sediment parameters identified in the SCUM guidance (Ecology 2015), including total solids, total volatile solids, grain size, TOC, ammonia, and total sulfides (Ecology 2015). Additional analyses included D/Fs and resin acids.

² The sampling guidance for NPDES permits under the SMS indicates that marine sediment should be evaluated against the SQS as numeric chemical criteria; there are no adopted numeric criteria for the SQS for freshwater sediment (Sediment Cleanup User's Manual [SCUM], Appendix A; Ecology 2025a). The marine benthic chemical criteria that apply to permitted NPDES discharges, i.e., the SQS, are dry weight and organic carbon-normalized values identical to the marine sediment SMS SCOs and CSLs found in Table 8.1.

Guaiacols were initially included but subsequently removed from the analytical suite after coordination with Ecology due to the lack of certified laboratories capable of performing the analysis.

Analytical results were compared to marine SQS (Chapter 173-204 WAC). Detected concentrations were generally low and did not exceed applicable standards.³ Based on these results and coordination with Ecology, bioassay testing was not required (Antea 2017). The investigation concluded that sediment in the vicinity of Outfalls 001 and 002 was consistent with applicable standards and representative of existing background and site conditions (Antea 2017).

3.4.2 Toxicity Identification and Reduction Evaluation (Cosmo Specialty Fibers 2019)

Between 2017 and 2019, Cosmo Specialty Fibers conducted a TI/RE, as required under its NPDES permit, to evaluate chronic toxicity observed in effluent bioassays and identify contributing internal wastewater streams. Additionally, treatment technologies and process modifications that could reduce toxicity in wastewater streams were evaluated. Options evaluated included bioaugmentation, engineered wetlands, micronutrient addition, advanced oxidation, filtration technologies, and expanded biological treatment systems. Pilot testing of floating islands showed some reductions in chemical oxygen demand and tannin concentrations, although toxicity reduction results were inconclusive due to improvements in wastewater quality during the study period. The study concluded that although several treatment technologies could potentially reduce toxicity, additional treatment systems were not necessary at the time to meet permit requirements (Cosmo Specialty Fibers 2019).

3.5 REMEDIAL ACTIONS

Between 1990 and 1994, remedial actions were completed by Weyerhaeuser at the Main Mill Complex and Westport Ponds Area. These remedial actions were conducted under applicable state and federal regulatory framework, with notification to and/or oversight by Ecology, as appropriate. These remedial actions included confirmatory sampling and reporting and were concluded to have met applicable cleanup criteria at the time of completion. Locations of known documented remedial actions are shown on Figures 3.1. The remedial actions included the following:

- **Removal and treatment of petroleum-contaminated soil associated with truck fueling infrastructure:** In 1990, Weyerhaeuser excavated and treated petroleum-contaminated soil associated with truck fueling operations and underground product piping (PSU 1990). Approximately 864 cubic yards (CY) of contaminated soil were excavated and treated via on-site aeration to promote biodegradation. Monitoring conducted during treatment indicated petroleum hydrocarbon concentrations were reduced to meet the project cleanup criterion of 200 parts per million, after which the treated soil was reused as fill (Weyerhaeuser 1991).

³ One sample in the vicinity of Outfall 002 had a detected exceedance of bis(2-ethylhexyl)phthalate. Phthalates are commonly associated with anthropogenic plastics and there are no indications that phthalates are a Site COI.

- **Excavation and off-site disposal of lead-containing refractory brick waste from a former disposal area:** In 1990, Weyerhaeuser excavated lead-containing refractory brick and subsurface soil from the Former Brick Waste Disposal Site (Weyerhaeuser 1990). Approximately 226 CY of material was removed and disposed of at an off-site permitted hazardous waste landfill. Confirmatory sampling indicated that residual soil lead concentrations were less than applicable CULs, and based on the removal of the brick waste and the results of confirmatory sampling, the site was determined to have achieved clean closure. Weyerhaeuser subsequently requested that the disposal area be reclassified as a remediated dangerous waste site and assigned a status of No Further Action (NFA). It is unknown to Weyerhaeuser if the disposal area received an NFA.
- **Removal of an abandoned diesel underground storage tank (UST) and associated contaminated soil:** In 1994, Weyerhaeuser identified and reported to Ecology a release associated with an abandoned 250-gal diesel UST located behind the fire suppression pump building. The UST and approximately 10 CY of contaminated soil were excavated and transported off-site for disposal by KD&S Environmental Support Services. Confirmatory sampling indicated petroleum concentrations less than applicable CULs; refer to Table 3.1 (KD&S 1994).
- **Cleaning, encapsulation, and management of PCB-impacted transformer pads in accordance with Toxic Substances Control Act (TSCA) requirements.** In 1994, Weyerhaeuser removed all PCB-containing electrical equipment in accordance with TSCA requirements, and impacted transformer pads were cleaned, tested, and where necessary encapsulated (PES 2007). Follow-up sampling confirmed that PCB concentrations on the pads and in underlying soil met applicable MTCA and TSCA CULs (PES 2007).

4.0 Preliminary Conceptual Site Model

The preliminary CSM provides a working understanding of potential contaminant sources, release mechanisms, affected environmental media, and exposure pathways. After completion of RI activities with Site-wide analytical data for soil, groundwater, surface water, and sediment, a comprehensive CSM will be developed.

4.1 CONTAMINANT SOURCES

4.1.1 Potential Source Areas

Pulp mill operations included wood processing, chemical pulping, bleaching, energy generation, wastewater treatment, sandblasting activities, and materials handling. Potential contaminant source areas associated with these activities include the following:

- **Process Areas:** Digesters, accumulators, bleach plant, chlorine dioxide generation systems, pulp machine areas, power house and recovery boilers, and associated piping and sumps. Potential contaminants include red liquor, bleaching residuals (including historical AOX), caustic and acidic solutions, metals, and combustion byproducts. Potential release mechanisms included routine operational losses, leaks from piping and sumps, and historical wastewater handling practices.
- **Aboveground Storage Tanks:** ASTs, and chemical feed systems containing sodium hydroxide, sulfuric acids, fuel oils (Bunker C/No.6), diesel, and other process chemicals. Potential contaminants include petroleum hydrocarbons, semivolatile organic compounds (SVOCs), volatile organic compounds (VOCs), elevated pH associated with caustic materials, and metals. Potential release mechanisms included overfills, line failures, and transfer spills.
- **Waste Handling and Chemical Storage Areas:** Ash handling systems, drum storage areas, sandblasting area, vehicle maintenance shops, and laboratory chemical storage and disposal areas. Potential contaminants include metals, petroleum hydrocarbons, SVOCs, solvents, herbicides, and other laboratory-related constituents. Potential release mechanisms included spills, improper handling or storage, and leaks from containers or equipment.
- **Main Mill Complex Water Treatment System and Westport Ponds:** Bioponds, storage pond, clarifiers, and the Westport Ponds (including the East and West Ponds). Potential contaminants include metals and organic constituents associated with pulp mill wastewater (including polycyclic aromatic hydrocarbons [PAHs], PCBs, and D/Fs). Potential release mechanisms include historical solids management practices and unlined pond bottoms, as well as effluent discharges.

4.1.2 Waste Disposal and Fill Areas

Multiple areas of the Main Mill Complex were used for fill placement and/or waste disposal:

- **Woodwaste (Knots) Landfill:** A closed, limited-purpose landfill used for pulping residuals and boiler ash. Potential contaminants include wood-derived organic compounds (e.g., lignin-derived phenolics and resin acids), metals, and combustion-related byproducts (e.g., PAHs). D/Fs may be a potential consideration. Potential releases may occur through leaching of soluble constituents to underlying soil and groundwater. Leachate historically directed to the wastewater treatment system may have also contributed to groundwater impacts if system leakage or overflow occurred.
- **Ash Placement Areas:** Ash Pads and historical ash placement areas. Potential contaminants include metals and other combustion-related constituents (e.g., PAHs). D/Fs may be a potential consideration. Potential releases may occur through leaching of soluble constituents to soil and groundwater, as well as erosion or transport of ash particles via surface water.
- **Fill Areas of Uncertain Origin:** The Northwest Fill Area and diked area where demolition debris, digester brick (including lead mortar), solid sulfur and sulfur-bearing wastes, and other materials were placed. Potential contaminants include metals, sulfur and sulfur-related compounds, and combustion-related byproducts (e.g., PAHs). Potential releases may occur through leaching of soluble constituents to soil and groundwater, as well as erosion or transport of ash particles via surface water runoff. Although certain hazardous materials (lead-based bricks) were removed, residual impacts may still be present.

D/Fs may be a potential contaminant in the Woodwaste (Knots) Landfill or ash placement areas where ash or solids were derived from waste streams influenced by historical chlorine-based bleaching operations, primarily during earlier operational periods (pre-1990) prior to process changes that reduced chlorinated organics formation. Potential sources of D/Fs include the combustion of pre 1990 bleach influenced wastewater treatment solids (e.g., filter cakes or fiber rejects containing chlorinated organic material) burned in recovery boilers or furnaces. D/Fs are not typical byproducts of clean wood or fuel combustion and would be associated primarily with earlier operational periods when elemental chlorine bleaching was used.

4.1.3 Documented Spills and Releases

Documented and reported releases identified during review of available records include the following:

- **Mill Operations Releases:** Recent (since 2007) documented releases within the Main Mill Complex have involved process chemicals, bleaching agents, treatment chemicals, sulfur dioxide, sodium hypochlorite, chlorine dioxide, and sulfuric acid (Ecology 2024b, 2024c).
- **Caustic Releases:** Elevated pH in soil and water associated with sodium hydroxide handling and wastewater management (Golder 1995, 1996; PES 2007).

- **PCB-Containing Equipment:** Historical use and removal of PCB-containing transformers and capacitors and a reported 1993 transformer oil release (Weyerhaeuser n.d.).
- **Petroleum Releases:** Fuel handling and storage areas associated with ASTs, vehicle maintenance operations, and supplemental fuel systems (KD&S 1994).
- **Wood Stave Pipe Leaks:** Multiple documented leaks along the 42-inch-diameter Wood Stave Pipe, including leaks in residential areas within the past decade (Mill Creek 2023).
- **Effluent Discharge:** Treated effluent was discharged to Outfall 001 instead of Outfall 002 in 2020, resulting in exceedances tied to beneficial use criteria and temporary closure of downstream shellfish beds (Ecology 2020b).

These documented incidents indicate that releases have occurred in both on-site and off-site areas and may have resulted in localized soil and/or groundwater contamination.

4.1.4 Potential Ongoing Sources

Although the Main Mill Complex is currently inactive, residual source materials and contaminant transport pathways remain present and may continue to influence site conditions under both existing conditions and reasonably anticipated future industrial land use scenarios. Potential ongoing or residual sources may include the following:

- **Stormwater Infrastructure:** Catch basins, conveyance piping, and outfalls that may mobilize residual contamination from impacted soil
- **Groundwater Discharge:** Shallow groundwater potentially discharging to drainage ditches, sloughs, and the Chehalis River
- **Erosion:** Shoreline and ditch bank erosion that could expose or mobilize historically impacted soil or fill
- **Infrastructure Leaks:** Aging buried pipelines (including remaining wastewater conveyance features) that may still contain residual liquids or impacted sediment

4.2 POTENTIAL MEDIA OF CONCERN

The primary potential media of concern, in which historical releases of contaminants have been documented, include groundwater and soil. Secondary potential media of concern include surface water, sediment, and stormwater, which may be impacted by contaminant migration from soil and groundwater. Surface water and sediment within Site features, including the Mill Slough, Sweet Sewer Slough, and Woodyard Riverside Drain, may be affected by groundwater discharge, overland flow, and erosion of contaminated soil. Stormwater may act as a transport medium where runoff entrains contaminated soil or where infiltration into stormwater conveyance systems mobilizes contaminants to receiving waters, including the Chehalis River.

Limited sediment data collected in the vicinity of Outfall 001 indicate no exceedances of SMS criteria and D/Fs concentrations are less than background concentrations. As a result, sediment transport to the Chehalis River is not currently identified as a primary focus of the Phase 1 investigation but may be further evaluated if warranted based on investigation results.

Air is not currently considered a medium of concern because the Main Mill Complex is vacant and there are no occupied enclosed structures where vapor intrusion (VI) could occur. However, air may become a potential medium of concern under future Site use scenarios (e.g., resumption of mill operations) involving building occupancy; therefore, this pathway may be evaluated in future phases of the RI.

4.3 TRANSPORT IN THE ENVIRONMENT

This section summarizes potentially complete migration pathways. Data collected during the RI will be used to evaluate the extent to which these pathways are complete and contributing to impacts in Site media.

4.3.1 Soil to Groundwater

Releases of contaminants to surface and subsurface soil from historical operations within the Site may result in leaching of contaminants from soil to groundwater. This pathway is considered potentially complete in areas where impacted soil is present and where infiltration can occur (e.g., unpaved or pervious areas) and may be limited in paved areas depending on surface integrity.

Leaching is expected to be more significant for relatively mobile and soluble constituents (e.g., metals under certain geochemical conditions, dissolved organic compounds, and petroleum hydrocarbons) and less significant for strongly sorbing constituents (e.g., PCBs and D/Fs), which tend to remain associated with soil. Data collected during the RI will be used to evaluate the extent to which this pathway is complete and contributing to groundwater impacts.

4.3.2 Soil to Surface Water and Sediment

The Site is located adjacent to the Chehalis River near its confluence with Grays Harbor and also includes or is hydraulically connected to smaller surface water features, including the Mill Slough, Sweet Sewer Slough, and Woodyard Riverside Drain.

Contaminated soil has the potential to be transported to surface water and sediment through several mechanisms, which are considered potentially complete given Site conditions:

- **Overland Flow:** Stormwater runoff may mobilize and entrain contaminated soil particles from exposed areas and transport them to drainage features and ultimately to the Chehalis River.
- **Flooding and Inundation:** Portions of the Main Mill Complex are subject to periodic flooding, which may mobilize contaminants from soil and transport them to surface water and sediment.

4.3.3 Groundwater to Surface Water and Sediment

Groundwater is expected to generally flow toward and discharge to the Chehalis River and smaller Site surface water features, including the Mill Slough, Sweet Sewer Slough, and Woodward Riverside Drain. Groundwater elevations and flow directions in nearshore areas in the Main Mill Complex and Westport Ponds Area may be influenced by tidal fluctuations, resulting in temporal variability in discharge and, in some locations, periods of reduced or reversed hydraulic gradients.

As a result, contaminants present in groundwater may discharge to surface water and sediment. This pathway is considered potentially complete where contaminated groundwater is present and hydraulically connected to the river and/or Site surface water features. The magnitude of this pathway will depend on groundwater gradients, hydraulic conductivity, and contaminant concentrations.

4.3.4 Erosion and Sediment Transport

Contaminants associated with soil or sediment may be transported to and within Site surface water bodies and the Chehalis River through erosion and sediment transport processes. Upland sources may contribute contaminated particulates via overland flow, shoreline erosion, or stormwater discharge. In addition, contaminated groundwater discharging to surface water may contribute dissolved-phase contaminants that can partition to sediment. Sediment transport within surface water bodies is influenced by flow conditions, grain size, and sediment cohesion.

The Phase 1 investigation will focus on sediment within Site surface water features, including the Mill Slough, Sweet Sewer Slough, and Woodyard Riverside Drain, where direct inputs from potential upland source areas are most likely to occur. Sediment transport to the Chehalis River will be further evaluated if needed based on results of the Phase 1 investigation.

4.4 NATURAL ATTENUATION

Natural attenuation refers to the unaided reduction of contaminant concentration and mass by using the natural assimilative capacity of a site groundwater/soil system in situ. As defined in WAC 173 340-200, these in situ processes include natural biodegradation; dispersion; dilution; sorption; volatilization; and chemical or biological stabilization, transformation, or destruction of hazardous substances.

Natural attenuation processes are expected to occur to varying degrees across the Site and may influence the extent and persistence of contaminant plumes, if present. The significance of natural attenuation as a controlling mechanism will be evaluated based on data collected during the RI.

4.5 POTENTIAL EXPOSURE PATHWAYS AND RECEPTORS

Potential receptors to contamination in soil, groundwater, surface water, and sediment at the Site include both human and ecological receptors. The preliminary CSM, presented in Figure 4.1, depicts potential source–pathway–receptor relationships.

The facility is currently inactive and has not been mothballed, and the current owner has indicated that future resumption of Site operations is under consideration. The Site is generally vacant and fenced; however, human access to the Main Mill Complex is not completely restricted. Potential human receptors include trespassers, site workers (Cosmo Specialty Fiber security staff), and future facility operators. The RI/FS will evaluate potential receptors and routes of exposure based on existing conditions and reasonably anticipated future site use, including future resumption of Site operations. The following potential exposure pathways have not been confirmed and will be evaluated as part of the RI:

- **Human Exposure via Direct Contact:** Site workers (including future facility workers associated with planned mill operations), as well as potential trespassers, may be exposed to contaminants through direct contact with impacted soil, sediment, surface water, or shallow groundwater during routine activities or ground-disturbing work. This pathway may be complete in accessible areas where impacted media are present at or near the ground surface.
- **Aquatic Receptor Exposure via Surface Water and Groundwater Discharge:** Contaminants may be transported via surface water and stormwater runoff or groundwater discharge to adjacent water bodies resulting in potential exposure of aquatic organisms to impacted water.
- **Benthic Receptor Exposure via Sediment:** Contaminants may accumulate in sediment through surface water transport, groundwater discharge, or erosion of impacted soil. Benthic invertebrates and other sediment-dwelling organisms may be exposed through direct contact and ingestion.
- **Terrestrial Receptor Exposure via Direct Contact:** Terrestrial plants and animals may be exposed to contaminants in surface soil through direct contact, ingestion, or uptake, particularly in vegetated and wetland areas of the Site.

5.0 Contaminants of Interest and Preliminary Screening Level Development

This section describes the process used to identify COIs for groundwater and soil at the Site. COIs are contaminants selected for further evaluation based on existing Site data, historical site operations, waste management and fill practices, documented releases, and potential contaminant migration pathways identified in the preliminary CSM.

After identification of COIs, PSLs are selected for each medium based on ARARs and the exposure pathways identified in the CSM.

5.1 IDENTIFICATION OF CONTAMINANTS OF INTEREST

COIs for the Site were identified based on the following:

- Historical use, storage, handling, or generation of chemicals associated with pulp and paper mill operations
- Potential association with historical fill materials, waste disposal practices, or unlined wastewater management features
- Chemicals historically detected or reasonably expected to be present based on Site-specific operational history and documented releases

COIs are identified for potentially impacted media as described in the following sections.

5.1.1 Groundwater

Groundwater COIs that may be present as a result of historical site operations include constituents associated with pulp mill processes, petroleum storage and handling, electrical equipment, and historical fill materials.

Groundwater COIs include the following:

- Metals: aluminum, arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium, silver, and zinc
- Total petroleum hydrocarbons (TPH): gasoline-range organics (GRO), diesel-range organics (DRO), and oil-range organics (ORO)
- PAHs
- SVOCs
- VOCs
- PCBs
- D/Fs

5.1.2 Soil

Soil COIs include contaminants that may impact groundwater, surface water, or sediment depending on soil location, depth, and exposure or transport mechanisms. Surface soil is defined in this report as soil within the top 2 feet and subsurface is defined as soil greater than 2 feet bgs and may consist of fill or native material. COIs for soil include persistent contaminants associated with historical operations and fill materials. Because groundwater observed in historical explorations ranged between approximately 1 and 7 feet bgs, surface and subsurface soil may be within the vadose zone, capillary fringe, or saturated zone.

Soil COIs include the following:

- Metals: aluminum, arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium, silver, and zinc
- TPH: GRO, DRO, and ORO
- PAHs
- SVOCs
- VOCs
- Herbicides
- PCBs
- D/Fs

5.1.3 Surface Water

Surface water COIs include chemicals that may be present as a result of historical site operations and include constituents associated with pulp mill processes, petroleum storage and handling, electrical equipment, wastewater conveyance systems, and historical fill materials.

Surface water COIs include the following:

- Metals: aluminum, arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium, silver, and zinc
- TPH: GRO, DRO, and ORO
- SVOCs
- VOCs
- PCBs

5.1.4 Sediment

Sediment COIs include chemicals that may be present as a result of historical site operations and focus on persistent contaminants commonly associated with pulp and paper mill operations and upland industrial activities.

Sediment COIs include the following:

- Metals: arsenic, cadmium, chromium, copper, lead, manganese, mercury, silver, and zinc
- Petroleum-related compounds (diesel and residual hydrocarbons)
- PAHs
- SVOCs
- VOCs
- PCBs
- D/Fs

Sediment sampling under this Phase 1 RIWP is focused on Site sloughs and drainage features and will not include sampling of the Chehalis River.

5.2 PRELIMINARY SCREENING LEVELS

This section provides a summary of the approach to identify the PSLs for soil, groundwater, surface water, and sediment through evaluation of anticipated ARARs and the available Site data. The preliminary cleanup regulations (chemical-specific ARARs) that apply to this Site are MTCA and its implementing regulations (WAC 173-340); SMS (WAC 173-204); Water Quality Standards for Surface Waters of the State of Washington (WAC 173-201A); and federal surface water quality ARARs for protection of the adjacent groundwater-receiving bodies, the Chehalis River and on-site freshwater bodies.

PSLs are protective of direct contact and select cross-media exposure scenarios. Cross-media protection pathways require that (1) the contaminant migrates from one medium (or location) to another and that (2) an exposure occurs between a receptor and the medium that is being protected. PSLs are inherently conservative because contaminant migration is modeled by simple equilibrium partitioning equations that are not typically calibrated to site-specific conditions. PSLs do not consider site-specific conditions that limit or eliminate contaminant migration and exposure, including natural attenuation processes and physical barriers to exposure. These factors combine to create PSLs that are intentionally conservative, which ensures the use of analytical methods with appropriate sensitivity to assess risk, regardless of site-specific conditions.

The following sections identify regulatory criteria corresponding with the potentially applicable exposure pathways and receptors, for each of the potentially impacted media, as well as the

source of background data and other considerations relevant to PSL development. The most conservative criteria for each media, adjusted to natural background where feasible, are presented in the QAPP (Appendix C; Tables C.1, C.2, and C.3).

COI practical quantitation limits (PQLs) associated with the analytical methods to be used during the RI are presented in the QAPP (Appendix C). Laboratory methods were chosen to ensure that the PQLs will be less than the future Site CULs so that no data evaluation issues arise during CUL development in the RI/FS.

5.2.1 Groundwater and Surface Water

QAPP Table C.3 presents the most conservative PSLs for groundwater for each of the COIs. The exposure pathways considered potentially complete for developing PSLs for groundwater are presented as follows:

- **Protection of Surface Water Quality:** Groundwater at the Site has the potential to discharge into freshwater bodies on-site and ultimately discharge into the Chehalis River. Consistent with requirements in MTCA, groundwater that discharges into surface water must meet the surface water quality standards for protection of the adjacent groundwater receiving water body at the point where the discharge occurs, without taking dilution into account. ARARs to address this exposure pathway include the following:
 - Water Quality Standards for Surface Water of the State of Washington (WAC 173-201A). These criteria are used for protection of acute and chronic effects to marine and freshwater aquatic life and for protection of human health assuming fish and water consumption.
 - National Recommended Water Quality Criteria (Clean Water Act [CWA] Section 304, 33 CFR 26.1314). These criteria are used for protection of acute and chronic effects to marine and freshwater aquatic life and for protection of human health assuming fish and freshwater consumption.
 - Washington Toxics Rule (40 CFR 131.45). In November 2016, the USEPA promulgated certain federal human health criteria applicable to Washington State surface water under the CWA. These criteria replace criteria in the National Toxics Rule (40 CFR 131).
 - Additional human health and aquatic life criteria are considered when no promulgated surface water ARARs are available. For human health, MTCA Method A/B groundwater criteria are included as potentially relevant criteria when no promulgated values are available. For aquatic life, literature values are included where available, including Ecology's Implementation Memorandum No. 23 for TPH and benzene, toluene, ethylbenzene, and xylenes (BTEX; Ecology 2021).
- **Protection of Sediment Quality:** Sediment quality must be protected at the point where groundwater is discharged to sediment. To address this pathway, groundwater concentrations protective of marine and freshwater sediment were calculated using

the fixed parameter three-phase partitioning model, MTCA Equation 747-1, with the most stringent sediment PSLs (based on the SMS SCO marine and freshwater criteria) as target sediment concentrations. Groundwater PSLs are therefore based on the concentration protective of the marine and freshwater sediment PSLs.

- **Protection of Indoor Air:** Volatile contaminants in shallow groundwater have the potential to volatilize, rise through the soil column, and discharge to ambient air. PSLs for this pathway are based on the MTCA modified Method B groundwater values for unrestricted/commercial land use published in Ecology's Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action (Ecology 2022). VI risk to indoor air will be evaluated further during future phases of study, depending on Phase 1 findings.
- **Protection of Drinking Water Quality:** Site groundwater is likely not potable due to saltwater intrusion into both the shallow and deep water-bearing zones at the Westport Ponds monitoring wells and shallow depth to groundwater (approximately 1 to 7 feet bgs) within the Main Mill Complex (refer to Section 2.2.1). At the Site, the shallow-water bearing zone is within the top 6 feet and within silt and clay layers with low permeability. Drinking water PSLs have been retained as a conservative measure for the purposes of screening. RI activities will generate Site-specific groundwater data to evaluate whether the water-bearing zones underlying the Main Mill Complex are present and not potable under the WAC Chapter 173-340-720(2). ARARs for the protection of drinking water include maximum contaminant levels (MCLs) from the National Primary Drinking Water Regulations and MTCA Method B CULs. Where MTCA Method B CULs are not available, Method A values are used as surrogates. The minimum of MTCA Methods A/B or the federal MCLs are used as PSLs for the protection of drinking water. Because Site groundwater is likely not potable, these PSLs will be used for screening in the RI contaminant of potential concern (COPC) screening process and only where no criteria are available for other applicable exposure pathways. In these cases, MTCA allows use of potable groundwater criteria in lieu of a site-specific risk assessment, per WAC 173-340-720(6)(b)(i).

As with soil, natural background was considered when establishing PSLs. For natural background in groundwater, the only value that has been established is for arsenic. This value is based on the 50th percentile natural background value for the Southwest watershed basin calculated for arsenic in Ecology's Natural Background Groundwater Arsenic Concentrations in Washington State (Ecology 2022).

5.2.2 Soil

QAPP Table C.1 presents the most conservative PSLs for soil for each of the COIs. The exposure pathways considered potentially complete for developing the PSLs for soil are presented as follows:

- **Protection of Human Health—Direct Contact:** The Site is in an area zoned for manufacturing/industrial use. However, to be conservative for the purpose of evaluating reporting limits and method detection limits, the PSLs included are MTCA Method A values for unrestricted land use and MTCA Method C standard formula

table values for industrial land use, or MTCA Method A table values for industrial land use where MTCA Method C values were not available (lead and TPH). Industrial values will be used during the RI to screen data for selection of COPCs.

- **Protection of Terrestrial Ecological Receptors:** The terrestrial ecological evaluation (TEE) PSL is the minimum of the values for protection of plants, soil biota, and wildlife in the Site-specific TEE under unrestricted land use (MTCA Table 749-3). Other sources of criteria will be evaluated as needed during the RI, per WAC 173 340-7493.
- **Protection of Sediment Quality:** Target sediment concentrations were identified as soil PSLs protective of potential bank erosion. Sediment concentrations are based on the SMS SCOs for marine and fresh water.
- **Protection of Groundwater Quality:** PSLs that are protective of contaminants leaching from soil to groundwater were calculated using the fixed parameter three-phase partitioning model, MTCA Equation 747-1, using standard inputs. These values will be updated with Site-specific inputs as needed.
- **Protection of Indoor Air:** MTCA specifies that soil to soil vapor pathway be evaluated to determine if there is a VI risk to indoor air. As with groundwater to indoor air, volatile contaminants in the vadose zone have the potential to volatilize, rise through the soil column, and discharge to ambient air. Results from the RI activities will determine if VI risk needs to be evaluated. If so, PSLs for this pathway will be based on the MTCA modified Method B values for unrestricted/commercial land use published in Ecology's Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action (Ecology 2022).

A number of COIs are naturally occurring in the environment, and therefore natural background concentrations can be used as PSLs. In soil, some metals and D/Fs have established statewide background concentrations. Values from Ecology's Natural Background Soil Metals Concentrations in Washington State (Ecology 1994) are used for the background concentrations for metals, and the value from Ecology's Natural Background for D/Fs in Washington Soils—Technical Memorandum #8 (Ecology 2010) is used as a natural background concentration for D/Fs.

5.2.3 Sediment

QAPP Table C.2 presents the most conservative PSLs for sediment for each of the COIs for the purposes of evaluating laboratory PQLs. The exposure pathways considered potentially complete for developing the PSLs for sediment are presented as follows:

- **Protection of the Benthic Community:** Target sediment concentrations were identified based on the dry-weight SMS SCOs for marine and fresh water and included in the PSL evaluation (Ecology 2025a).
- **Protection of Human Health:** Site-specific sediment CULs to protect human health will be evaluated during the RI if there is a complete pathway for human health and sediment. Calculated risk-based criteria protective of human health based on the fish/shellfish consumption exposure pathway can be assumed to be less than natural

background concentrations (Ecology 2025a). Calculated risk-based criteria for bioaccumulative chemicals typically found at cleanup sites (e.g., D/Fs) are less than or near natural and regional background or PQLs, regardless of the specific exposure assumptions. Therefore, it is appropriate to default to natural background in the PSL development to determine laboratory PQLs for this RI.

6.0 Remedial Investigation Approach

The Phase 1 RI will be conducted to collect soil, groundwater, surface water, and sediment data to characterize potential contamination at the Site, identify potential COIs within AOPCs, and further develop the CSM. Phase 1 RI activities will be conducted across all three primary operational areas of the Site: the Main Mill Complex, the Wood Stave Pipe Corridor, and the Westport Ponds Area.

Main Mill Complex: Up to 49 soil borings will be advanced, with a drill rig or hand auger, within the Main Mill Complex, with 18 locations being completed as monitoring wells. Up to 8 well points will be installed, and 1 seep sample is anticipated to be collected at a previously identified seep location. A focused visual seep survey will also be conducted, and samples will be collected from any newly identified seeps. Groundwater samples will be collected from 26 well points and monitoring wells, and surface water and sediment samples will be collected from up to 13 locations.

Wood Stave Pipe Corridor: Up to 17 soil borings will be advanced, using a direct-push drill rig, along the Wood Stave Pipe Corridor; soil samples will be collected from these boring, and up to 10 groundwater grab samples will be collected from select soil borings.

Westport Ponds Area: Up to 25 soil borings will be advanced, with a drill rig or hand auger, within the Westport Ponds Area with 10 locations being completed as monitoring wells screened within the shallow and deep water-bearing zones. Groundwater samples will be collected from up to 18 existing and proposed monitoring wells.

Results from the Phase 1 investigation will be used to inform the scope and design of subsequent RI phases as needed to further define and characterize the Site in support of the RI/FS.

The general investigation approach and associated data quality objectives (DQOs) for soil, groundwater, surface water, and sediment are presented in Section 6.1. Section 6.2 presents additional DQOs and associated investigation approaches for specific AOPCs. These AOPC-specific DQOs build on the media-based DQOs described in Section 6.1 and are intended to refine understanding of potential contaminant sources, COIs, and relevant transport and exposure pathways identified in the preliminary CSM. Field activities that will be conducted to address DQOs are summarized in Table 6.1, and proposed sample locations are shown on Figures 6.1 through 6.3.

Sample collection and handling procedures developed to meet the project DQOs are described in the SAP provided in Appendix B. Quality assurance objectives, analytical methods, and laboratory procedures developed for RI sample analysis are presented in the QAPP provided in Appendix C. Work activities will be conducted in accordance with the HASP presented in Appendix D.

6.1 PHASE 1 INVESTIGATION APPROACH BY MEDIUM

This section summarizes the RI approach and associated DQOs for soil, groundwater, surface water, and sediment. The DQOs are summarized in Table 6.1.

6.1.1 Soil

The DQOs related to soil are as follows:

- **DQO 1:** Refine understanding of Site stratigraphy, including key geologic units, fill–native soil interfaces, and depths to key soil horizons (vadose zone, capillary fringe, and saturated zone) to support evaluation of potential contaminant migration pathways and groundwater flow.
- **DQO 2:** Evaluate soil chemistry data relative to PSLs to identify presence or absence of contamination and potential COIs and to support RI development of the CSM, including relationships between potential sources and contaminant migration pathways.
- **DQO 3:** Identify potential source areas in locations lacking prior environmental data through soil and groundwater sampling and analysis.
- **DQO 4:** Refine the vertical distribution of contamination in fill areas, including evaluation of impacts at the fill–native soil interface and underlying soil.
- **DQO 5:** Evaluate the potential for contaminant migration from soil to groundwater based on soil chemistry, stratigraphy, and hydrogeologic conditions.

Soil samples will be collected from surface and subsurface soil via a direct-push rig, hollow-stem auger, or sonic drill rig or hand tools (e.g., hand auger) in areas that are not accessible to a drilling rig. The proposed soil boring and hand auger locations are shown on Figures 6.1 through 6.3. At locations proposed for hand auger sampling, test pits may be advanced using an excavator, with samples collected using hand tools, pending further evaluation of location accessibility. Section 6.2 contains additional detail regarding source area-specific soil investigation.

All direct-push or sonic drill rig soil borings will be advanced to a minimum depth of 15 feet bgs, and hand auger borings will be advanced to a maximum depth of 10 feet bgs (if feasible), or to the depth groundwater infiltrates into the borehole or refusal is encountered. Soil borings may be advanced beyond the target depths specified in the SAP if field indications of contamination are observed at depth to delineate the vertical extent of impacts. To address DQO 1, the field geologist will continuously log and describe the soil according to the protocols detailed in the SAP. For all soil investigation locations, soil will be continuously screened for indications of contamination, including sheens, odors, staining, debris, and elevated headspace volatiles using a photoionization detector (PID). If a confining unit is observed that may be slowing or stopping vertical migration of contamination between separate groundwater units, additional measures may be implemented in the field to prevent cross-contamination of groundwater units.

Additionally, care will be taken to ensure that newly installed monitoring wells are not screened across separate groundwater units.

To address DQO 2, representative samples will be collected over discrete intervals (typically on the order of 2 feet or less) within each target soil unit (with depth measurements beginning below asphalt or concrete, if present). Sample intervals may be adjusted as needed in the field to target smaller intervals and will be based on field indications of contamination and lithology.

Soil samples will be analyzed for the following chemical groups, at minimum, within the specified soil horizons (refer to Table B.1 in the SAP for details):

- Metals: Vadose soil, capillary fringe, and uppermost saturated soil
- PAHs: Vadose soil, capillary fringe, and uppermost saturated soil, based on field observations and lithology
- SVOCs: Vadose soil, capillary fringe, and uppermost saturated soil, based on field observations and lithology

Additional AOPC-specific analytes will be included at select locations as noted in the SAP (Table B.1) and as described in Section 6.2:

- pH: Vadose soil and capillary fringe.
- VOCs, including chlorinated VOCs and/or BTEX: Lowermost vadose soil, capillary fringe, and uppermost saturated soil, based on field screening observations and lithology.
- Total PCB Aroclors: Vadose soil and capillary fringe.
- D/Fs: Uppermost vadose soil and capillary fringe or shallow soil (0 to 2 feet bgs), as specified in Section 6.2.
- Herbicides: Vadose soil, capillary fringe, and saturated soil.
- GRO, DRO, and ORO: Vadose soil, capillary fringe, and uppermost saturated soil. Sample depth intervals will be determined in the field and based on field observations and lithology.
- Extractable petroleum hydrocarbons (EPH) and volatile petroleum hydrocarbons (VPH): All potentially unique TPH source areas where petroleum impacts are observed during field screening. EPH/VPH sample analysis will be collocated with TPH, VOC, naphthalene, and carcinogenic PAH (cPAH) analysis. Sample depth intervals will be determined in the field and based on field observations and lithology. Results from these additional analyses can be used to calculate Site-specific MTCA Method B or Method C CULs for TPH.
- TOC: TOC samples will be collected at a minimum of three clean locations within the vadose soil (below rooting depth), capillary fringe, and saturated soil. Sample depth intervals will be determined in the field and based on field observations and lithology.

6.1.2 Groundwater

The DQOs related to groundwater are as follows:

- **DQO 6:** Refine understanding of hydrostratigraphy, groundwater elevations, and the influence of tidal fluctuations to support development of the hydrogeologic CSM.
- **DQO 7:** Evaluate groundwater chemistry data relative to PSLs to identify the presence or absence of contamination and potential COIs and to support development of the RI CSM.
- **DQO 8:** Evaluate groundwater chemistry data to assess contaminant distribution and the potential for migration within and beyond the Site, including downgradient transport and potential migration toward surface water features.
- **DQO 9:** Evaluate groundwater–surface water interactions in areas where hydraulic connectivity is anticipated, to assess the potential for exchange between groundwater and surface water and associated contaminant transport.

To address these DQOs, monitoring wells and well points will be installed at the locations shown on Figures 6.1 through 6.3. Well points will be installed at locations inaccessible to the drill rig and will be sampled during groundwater monitoring events. A subset of the well points are collocated with surface water and sediment locations and will be sampled contemporaneously with surface water and sediment sampling as described in Section 6.1.3. In addition, groundwater grabs will be collected at select direct-push locations along the Wood Stave Pipe alignment. The wells and well points will be installed and developed following the protocols detailed in the SAP. Detailed information regarding well screen and exploration depths at each location and groundwater sampling methods are included in the SAP.

Groundwater sampling is expected to occur on a semiannual basis leading up to or concurrent with the Phase 2 investigation. Because monitoring well installation and soil sampling will most likely occur in late summer, the first groundwater monitoring event is expected to occur during the end of the dry season when groundwater elevations are lowest (summer/fall). The second groundwater monitoring event will occur within the wet season when groundwater elevations are highest (winter/spring). Phase 1 groundwater monitoring will not be restricted to specific tidal windows; however, this may change depending on the results of the Phase 1 soil sampling and first tidal study (Section 6.1.2.1).

Groundwater samples will be analyzed for the following chemical groups, at minimum:

- Total and dissolved metals
- PAHs
- SVOC
- VOCs
- TDS

Additional AOPC-specific analytes will be included as described in Section 6.2:

- TPH: DRO and ORO (with and without silica gel cleanup), and GRO
- Total PCB Aroclors
- D/Fs
- Geochemical parameters (i.e., TOC, alkalinity, hardness, ammonia, sulfates/sulfides, and nitrates/nitrites)

Specific analysis at monitoring wells is subject to change, depending on the results of the soil sampling. For example, COIs that are not detected in saturated soil may not be analyzed in groundwater after reviewing the soil sampling results. Modifications to the proposed groundwater sampling scope will be coordinated with Ecology.

6.1.2.1 Hydrogeologic Testing

To address DQO 6, data are needed to determine the range and magnitude of flow directions from the uplands to the Chehalis River and Mill Slough, tidal influence of the Chehalis River, and long-term Site groundwater level fluctuations.

Site-wide groundwater levels will be collected during each groundwater monitoring event from all Site monitoring wells. Water levels will be collected within the same day, ideally prior to the start of groundwater sampling activities.

Two tidal studies will be conducted at select shoreline wells during one wet season and one dry season groundwater monitoring event. Proposed monitoring wells in the Main Mill Complex will be screened within the shallow water-bearing zone, and proposed monitoring wells in the Westport Ponds Area will be screened in the shallow and deep water-bearing zones, which are separated by a presumably continuous confining layer (Section 2.3.1). Transducers will be placed in wells to target these water-bearing zones at increasing horizontal distances from tidally influenced water bodies; refer to the SAP for details.

Additional hydrogeologic testing may be conducted for subsequent RI activities in the Westport Ponds Area, depending on the Phase 1 results. For example, if results determine that COIs are present in the deep water-bearing zone at concentrations exceeding the PSLs, the hydraulic conductivity between the shallow and deep water-bearing zones will be evaluated. Hydrogeologic testing activities may include aquifer testing (e.g., pump/slug tests, limited drawdown tests) or additional monitoring well installation within the shallow and/or deeper water bearing zones.

6.1.3 Surface Water and Sediment

On-site surface water features, including the Mill Slough, Sweet Sewer Slough, and Woodyard Riverside Drain, receive stormwater runoff from the Main Mill Complex and may also receive groundwater discharge. These features historically conveyed wash water, backwash

water, and other operational discharges associated with mill operations and ultimately discharge to the Chehalis River.

Existing surface water chemistry data are not available for these features, and prior sediment sampling has been limited in scope and focused primarily near Outfall 002. Available sediment results did not exceed SMS criteria, and D/Fs were reported at concentrations less than background levels (Antea 2017). Additional sediment and surface water sampling is included as part of the Phase 1 investigation to provide sufficient spatial coverage to evaluate whether contaminants from upland source areas may be migrating to on-site surface water features.

The DQOs related to surface water and sediment are as follows:

- **DQO 10:** Evaluate surface water and sediment chemistry data relative to PSLs to identify the presence or absence of contamination and potential COIs and to support development of the RI CSM.
- **DQO 11:** Evaluate surface water and sediment data to assess whether contaminants from upland source areas may be migrating to on-site surface water features.

To address these DQOs, collocated surface water and sediment samples will be collected from the following on-site surface water features: the Mill Slough, Sweet Sewer Slough, and Woodyard Riverside Drain (Figure 6.1). Well points will be installed adjacent to select surface water and sediment sample locations in the Mill Slough to address DQO 9 (refer to Sections 6.1.2 and 6.2.2.2). Proposed sample locations are shown in Figures 6.1 through 6.3.

Surface water samples will be analyzed for the following chemical groups: conventionals, total and dissolved metals, PAHs, SVOCs, TPH, and nutrients (ammonia and nitrate/nitrite). However, TPH will be analyzed only in surface water samples collocated with well point locations.

Sediment samples will be analyzed for sediment COI with SMS (Chapter 173-204 WAC) including the following chemical groups: metals, PAHs, SVOCs, TPH, and PCBs. Samples will also be analyzed for D/Fs and conventional parameters, including ammonia, total sulfides, grain size, and TOC. Sediment samples will be screened in the field for indications of petroleum contamination. Samples exhibiting sheen or petroleum-like odor will be analyzed for BTEX.

6.2 PHASE 1 INVESTIGATION APPROACH BY AOPC

The scope of the Phase 1 investigation across the Main Mill Complex, Wood Stave Pipe Corridor, and the Westport Ponds Area is intentionally focused to support a phased RI approach that accounts for existing site conditions and reasonably anticipated future industrial site use, including the potential for mill operations to resume during or after the RI. Potential changes associated with a restart of operations could introduce new release mechanisms or alter site conditions, which may affect the representativeness of investigation results, particularly in actively industrial or infrastructure-dense areas.

In addition, health and safety considerations associated with deteriorating infrastructure (e.g., leaking tanks, damaged equipment, and loose metal sheeting), as well as physical access limitations in certain areas, may constrain field activities. As a result, the Phase 1 investigation scope may be refined based on site conditions encountered in the field, and additional investigation will be conducted where conditions and access allow and may be further evaluated in subsequent RI phases based on initial findings.

For each AOPC, this section summarizes applicable DQOs and the approach for sample collection and analysis. Public and private utility locates will be completed prior to the commencement of field activities as described in the SAP (Appendix B). Sample collection and analysis will be conducted in accordance with the SAP (Appendix B) and QAPP (Appendix C). Applicable DQOs and field activities for each AOPC are summarized in Table 6.1. Proposed sample locations are shown on Figures 6.1 through 6.3.

AOPC-specific analytes were selected based on results of previous investigations (Section 3.0), where possible, and consideration of potential sources (Section 4.1).

6.2.1 Main Mill Complex—Primary Operations Area

Field activities associated with the primary operations area at the Main Mill Complex are summarized in Sections 6.2.1.1 through 6.2.1.5 and will include a few select soil borings near buildings and former fuel AST locations to evaluate whether potential spills or leaks have impacted soil. Monitoring wells are planned downgradient of the Main Mill Complex, including along the northern Site boundary adjacent to the Chehalis River and along the eastern extent of the primary operations area. Selected wells are located downgradient of specific AOPCs, and groundwater samples from these wells may be analyzed for additional analytes as described below.

6.2.1.1 Caustic Storage AST Area

- **Groundwater DQOs that are applicable to this area include DQOs 6, 7, and 8.**

Data from Golder's 1995 investigation indicate that elevated pH values (>8) associated with the caustic storage tanks previously impacted soil, groundwater, and a seep in the vicinity of the AST. The current nature and extent of pH impacts are not known. It is also unknown if this AST currently contains sodium hydroxide and if it is still in service.

Well points will be installed near the seep to determine if elevated pH conditions are present in groundwater discharging to surface water. If a seep is observed, a seep sample will also be collected. A focused seep survey will be conducted at low tide on the riverbank adjacent to the caustic storage tanks to identify the locations of any additional seeps.

Groundwater and seep samples will be collected and analyzed as specified in the SAP.

6.2.1.2 Chip Storage, Chip Plant, and Receiving Areas

- **Soil DQOs that are applicable to this area include DQOs 1, 2, 3, and 5.**
- **Groundwater DQOs that are applicable to this area include DQOs 6, 7, and 8.**

The Chip Storage, Chip Plant, and Receiving Areas occupy the northern portion of the Main Mill Complex. Related structures and features include chip dumps, outdoor chip storage areas, chip merchandiser, six concrete chip storage silos, fuel ASTs (containing diesel and used oil) and a maintenance shop (LeTourneau shop). The plant was used to process raw logs into chips. It is unknown if these ASTs currently contain fuel and are still in service. Potential COIs include TPH, metals, PAHs, SVOCs, VOCs, and PCB Aroclors.

Soil borings and downgradient monitoring wells will be advanced in this area (refer to the SAP and Figure 6.1 for details on locations and sampling approach). Soil and groundwater samples will be analyzed for the standard analyte suite described in Sections 6.1.1 and 6.1.2, as well as PCBs. Where TPH impacts are observed (e.g., sheen, elevated PID readings, and odor), soil samples may also be analyzed for TPH and the following analytes to support calculation of Site-specific CULs: EPH/VPH, naphthalenes, cPAHs, methyl *tert*-butyl ether (MTBE), ethylene dibromide (EBD), 1,2-dichloroethane (EDC), and *n*-hexane. Results from these additional analyses will be used to calculate Site-specific MTCA Method B or Method C CULs for TPH, as per Ecology's guidance for calculating CULs (Ecology 2025b).

6.2.1.3 Former Log Storage and Hog Fuel Piles

- **Soil DQOs that are applicable to this area include DQOs 1, 2, 3, and 5.**
- **Groundwater DQOs that are applicable to this area include DQOs 6, 7, and 8.**

The Former Log Storage and Hog Fuel Piles stored materials used during operations. Used oil was also reportedly added to the Hog Fuel Pile on the southeast side of power house. The pile was uncovered and the underlying surface unpaved. Potential COIs include metals, SVOCs, VOCs, and TPH.

Soil borings and downgradient monitoring wells will be advanced in this area. Soil and groundwater samples will be analyzed for the standard analyte suite described in Sections 6.1.1 and 6.1.2. Where TPH impacts are observed (e.g., sheen, elevated PID readings, and odor), soil samples may also be analyzed for TPH and the following analytes to support calculation of Site-specific CULs: EPH/VPH, MTBE, EBD, EDC, and *n*-hexane.

6.2.1.4 Former Jet Fuel AST

- **Soil DQOs that are applicable to this area include DQOs 1, 2, 3, and 5.**
- **Groundwater DQOs that are applicable to this area include DQOs 6, 7, and 8.**

A former AST was located near the ERT building, helipad, and scale house. The AST historically stored approximately 2,000 gal of Jet A fuel within a concrete containment vault and associated dispensing equipment. The AST and associated equipment were removed in 2005, but no analytical data associated with the AST are available. Potential COIs include metals, PAHs, SVOCs, VOCs, and TPH.

Soil borings and downgradient monitoring wells will be advanced in this area. Soil and groundwater samples will be analyzed for the standard analyte suite described in Sections 6.1.1 and 6.1.2. Where TPH impacts are observed (e.g., sheen, elevated PID readings, and odor), soil samples may also be analyzed for TPH and the following analytes to support calculation of Site-specific CULs: EPH/VPH, naphthalenes, cPAHs, BTEX, MTBE, EBD, EDC, and *n*-hexane.

6.2.1.5 Power House ASTs

- **Soil DQOs that are applicable to this area include DQOs 1, 2, 3, and 5.**
- **Groundwater DQOs that are applicable to this area include DQOs 6, 7, and 8.**

Three ASTs located southeast of the power house were used for fuel oil and diesel fuel storage within a containment structure that consists of an epoxy-coated, concrete-lined earthen berm. There is one 200,000-gal AST used for Bunker C or No. 6 fuel oil and two (one 21,000-gal and one 1,900-gal) ASTs for diesel fuel #2. The 200,000-gal Bunker C or No. 6 fuel oil tank and the 21,000-gal diesel tank were cleaned in 2006, but no analytical data associated with the ASTs are available. In addition, it is unknown if these ASTs currently contain fuel and are still in service. Potential COIs include metals, PAHs, SVOCs, VOCs, and TPH.

Soil borings and downgradient monitoring wells will be advanced in this area. Soil and groundwater samples will be analyzed for the standard analyte suite described in Sections 6.1.1 and 6.1.2. Where TPH impacts are observed (e.g., sheen, elevated PID readings, and odor), soil samples may also be analyzed for TPH and the following analytes to support calculation of Site-specific CULs: EPH/VPH, naphthalenes, cPAHs, BTEX, MTBE, EBD, EDC, and *n*-hexane.

6.2.1.6 Forestry Storage Building

- **Soil DQOs that are applicable to this area include DQOs 1, 2, 3, and 5.**
- **Groundwater DQOs that are applicable to this area include DQOs 6, 7, and 8.**

The forestry storage building was used for storing herbicides and other materials used by the Timberlands operations and for storage of related equipment and supplies. Soil borings will be advanced to determine if COIs are present in soil. Potential COIs include metals, PAHs, VOCs, and herbicides. The era and duration of building use is unknown.

Soil borings will be advanced with a direct-push drill rig in this area, and samples will be analyzed for the standard analyte suite described in Sections 6.1.1, as well as select herbicides.

6.2.2 Main Mill Complex—Eastern Operations Area

6.2.2.1 Wastewater Treatment System Ponds Area

- **Soil DQOs that are applicable to this area include DQOs 1, 2, 3, and 5.**
- **Groundwater DQOs that are applicable to this area include DQOs 6, 7, and 8.**

The four bioponds and storage pond were used for storage and treatment of process wastewater and received leachate from the closed Woodwaste (Knots) Landfill. Additionally, two secondary clarifiers and associated water and wastewater solids treatment chemical, equipment, and a 300-gal diesel AST are located adjacent to the ponds. The AST replaced a 250-gal UST that was used to store diesel fuel and was removed in 1994 (PES 2007). Contaminants from inadvertent spills and potential leaching could contaminate soil and groundwater in the Wastewater Treatment System Ponds Area. Potential COIs include metals, PAHs, SVOCs, and VOCs.

Monitoring wells will be installed downgradient of the bioponds. Additionally, one monitoring well will be installed upgradient of the five ponds to evaluate background concentrations and potential influence from upgradient sources. Soil samples collected during monitoring well installation and groundwater will be analyzed for the standard analyte suite described in Sections 6.1.1 and 6.1.2.

Surface water and sediment sampling is not included for the wastewater treatment system ponds (including the bioponds, storage pond, and Westport Ponds). These ponds are engineered components of the mill's wastewater treatment system designed to manage process-related wastewater associated with mill operations. Because these units could be returned to service if mill operations resume, surface water and sediment conditions within the ponds may change in response to future operational activities and wastewater management practices. As a result, sampling these engineered treatment units was considered outside the scope of environmental sampling for this phase of the RI.

6.2.2.2 *Mill Slough, Sweet Sewer Slough, and Woodyard Riverside Drain*

- **Groundwater DQOs that are applicable to this area include DQOs 6, 7, 8, and 9.**
- **Surface water and sediment DQOs that are applicable to this area include DQOs 10 and 11.**

The Mill Slough, Sweet Sewer Slough, and Woodyard Riverside Drain are surface water features that drain to the Chehalis River located in the eastern portion of Main Mill Complex. As described in Section 6.1.3, collocated surface water and sediment samples will be collected in these surface water features and well points will be installed adjacent to select surface water and sediment locations. The approach for surface water and sediment sampling is summarized in Section 6.1.3.

Groundwater samples will be collected during a one-time event contemporaneous with surface water and sediment sample collection. Groundwater samples will be analyzed for the standard analyte suite described in Sections 6.1.2. Groundwater samples from well point locations that are collocated with surface water locations will also be analyzed for TPH.

6.2.2.3 *Ash Pad Areas*

- **Soil DQOs that are applicable to this area include DQOs 1, 2, 3, and 5.**
- **Groundwater DQOs that are applicable to this area include DQOs 6, 7, and 8.**

Ash generated by the boilers was managed on a paved and bermed ash pad adjacent to the bioponds. The ash was washed and leachate from the ash pad was directed to northernmost biopond, after which ash was hauled off-site for disposal. An additional ash pad is located in the northern portion of the Site, south of the Woodyard Riverside Drain (Figure 6.1). Potential COIs associated with the ash pads include metals, PAHs, SVOCs, VOCs, and D/Fs. There has been no characterization of materials in the Ash Pad Areas to date.

Soil borings will be advanced within the middle of the two ash pad areas, and groundwater monitoring wells will be installed downgradient. Soil and groundwater samples will be analyzed for the standard analyte suite described in Sections 6.1.1 and 6.1.2. Additionally, soil samples will be analyzed for D/Fs.

6.2.3 Main Mill Complex—Waste and Fill Areas

Waste and fill areas including the Northwest Fill Area, North and South Fill Areas, and Woodwaste (Knots) Landfill and Rejects Area are located in the eastern portion of the Site. These areas are heavily forested and are not accessible via a drill rig or excavator without extensive tree clearing. Due to these access restrictions, the fill will be delineated with hand tools and hand auger, where feasible.

6.2.3.1 Northwest Fill Area

- **Soil DQOs that are applicable to this area include DQOs 2, 3, 4, and 5.**
- **Groundwater DQOs that are applicable to this area include DQOs 6, 7, and 8.**

Materials reportedly placed in the Northwest Fill Area included ash, pulp rejects, stainless steel piping, and demolition/construction debris. Potential COIs include metals, PAHs, SVOCs, VOCs, and D/Fs.

A monitoring well and well points will be installed downgradient of the Northwest Fill Area, with well points used in areas with access limitations. Soil samples will be collected using hand tools because these areas are generally inaccessible to a drill rig. Soil and groundwater samples will be analyzed for the standard analyte suite described in Sections 6.1.1 and 6.1.2. Additionally, select soil samples will be analyzed for D/Fs.

6.2.3.2 North and South Fill Areas

- **Soil DQOs that are applicable to this area include DQOs 2, 3, 4, and 5.**

The North and South Fill Areas received additional fill materials including digester bricks, sulfur, and tower packing material (Tellerette). Bricks and lead-containing mortar from digester and accumulator linings were disposed of in the South Fill Area (reportedly up to eight linings between 1960 and 1986) and were removed in the early 1990s and disposed of at a hazardous waste landfill in Oregon. Potential COIs associated with the North and South Fill Areas include metals, PAHs, SVOCs, VOCs, and D/Fs.

Soil samples will be collected using hand tools because these areas are generally inaccessible to a drill rig. Soil samples will be analyzed for the standard analyte suite described in Sections 6.1.1, and select samples will be analyzed for D/Fs.

6.2.3.3 Woodwaste (Knots) Landfill and Rejects Area

- **Soil DQOs that are applicable to this area include DQOs 2, 3, 4, and 5.**
- **Groundwater DQOs that are applicable to this area include DQOs 6, 7, and 8.**

The Woodwaste (Knots) Landfill located east of the bioponds was used as a fill area for pulping residuals (knots and tailings) and boiler ash. The primary fill material was pulping knots; ash placement reportedly occurred at the west end of the landfill in 1996 and 1997. The Woodwaste (Knots) Landfill was closed in 1997. The soil cover consisted of 2 feet of compacted soil obtained from off-site and on-site sources and hydroseeded, and the leachate collection system draining to the wastewater treatment bioponds was left in place. Stormwater from the Woodwaste (Knots) Landfill was directed to the bioponds or Outfall 002.

The Rejects Area, located east of the closed Woodwaste (Knots) Landfill, was used for storage and disposal of wood debris and pulping rejects from approximately the mid-1970s to the mid-to late 1980s. The composition and potential impacts to soil and groundwater in this area are not known. Potential COIs associated with the Woodwaste (Knots) Landfill and Rejects Area include metals, PAHs, SVOCs, VOCs, and D/Fs.

Groundwater monitoring wells and well points will be installed downgradient of the Woodwaste (Knots) Landfill and Rejects Area. The well points are located adjacent to collocated surface water and sediment samples in the Mill Slough (refer to Section 6.2.2.2). Soil samples will be collected using hand tools because these areas are generally inaccessible to a drill rig. Groundwater and soil samples will be analyzed for the standard analyte suite described in Sections 6.1.1 and 6.1.2, and select soil samples will be analyzed for D/Fs.

6.2.4 Wood Stave Pipe Corridor

- **Soil DQOs that are applicable to this area include DQOs 1, 2, 3, and 5.**
- **The groundwater DQO applicable to this area is DQO 7.**

The Wood Stave Pipe Corridor historically conveyed treated mill effluent from the Main Mill Complex to the Westport Ponds Area. Multiple leaks along the Wood Stave Pipe Corridor have been documented in the Main Mill Complex and along the Wood Stave Pipe Corridor (Mill Creek 2022). Potential COIs include metals, PAHs, SVOCs, VOCs, D/Fs, and geochemical parameters.

Soil borings will be advanced in select areas around the pipe, with a focus on areas where known leaks have been identified. The top of the Wood Stave Pipe is approximately 2 to 3 feet bgs and a portion is likely seasonally submerged in groundwater. Therefore, groundwater grab samples will be collected from temporary monitoring wells installed in select soil borings adjacent to the

Wood Stave Pipe. Groundwater grab sampling is further described below and in the SAP in Appendix B. The screened interval will be preferentially placed at the unsaturated–saturated soil horizon and/or areas where leaks were observed. The groundwater data collected from these temporary monitoring wells will not be compared to regulatory criteria in the RI because the samples are likely to be turbid; instead, these data will be used to evaluate presence or absence of COIs in groundwater.

Public and private utility locates will be completed prior to the commencement of field activities consistent with the SAP procedures for drilling. Additionally, soil boring locations around the Wood Stave Pipe will be cleared for utilities using hand tools or a vacuum truck to a minimum depth of 5 feet bgs or until the location all known utilities and the Wood Stave Pipe are identified.

Soil and groundwater samples will be analyzed for the standard analyte suite described in Sections 6.1.1 and 6.1.2. Additionally, select soil samples will be analyzed for D/Fs.

6.2.5 Westport Ponds Area

- **Soil DQOs that are applicable to this area include DQOs 1, 2, 3, 4, and 5.**
- **Groundwater DQOs that are applicable to this area include DQOs 6, 7, and 8.**

The Westport Ponds were used for wastewater surge storage and final neutralization of pulp mill wastewater, and the wastewater treatment solids ponds are separated from the Chehalis River tidelands by constructed berms. Transformers, capacitors, and other potentially PCB-containing equipment were also located in sheds near the ponds. Diesel and sodium hydroxide ASTs are located near Pond A, but the diesel AST appeared empty during a site visit in February 2026; it is unclear if the sodium hydroxide AST is empty. Ponds A through D were clay lined; however, the condition of the liner is not known. During the February 2026 site visit, it was observed that the sheds near the ponds have been extensively vandalized. Potential COIs associated with the Westport Ponds and to be investigated in adjacent soil and groundwater include metals, PAHs, SVOCs, VOCs, PCBs, and geochemical parameters, such as nitrates/nitrites and sulfates/sulfites; refer to Table B.3 of the SAP for details.

To address soil DQOs, soil borings will be advanced around the ASTs and transformer pads and temporary monitoring wells will be installed in a subset of soil borings in the vicinity of the transformer pads. Temporary monitoring wells will be preferentially placed in soil borings with field indications of contamination. If no field indications are observed, a temporary well will be installed in the final boring in the area. To address groundwater DQOs, shallow and deep monitoring wells will be installed in the berm downgradient of the ponds. The Ecology Dam Safety Office will be consulted prior to advancing any borings or installing monitoring wells in the berm of Ponds A through D, to ensure that the drilling activities do not risk compromising the berm. Soil and groundwater samples will be analyzed for the standard analyte suite described in Sections 6.1.1 and 6.1.2. Additionally, select soil and groundwater samples will be analyzed for PCBs.

Surface water and sediment sampling is not included for the wastewater treatment system ponds (including the bioponds, storage pond, and Westport Ponds). These ponds are engineered

components of the mill's wastewater treatment system designed to manage process-related wastewater associated with mill operations. Because these units could be returned to service if mill operations resume, surface water and sediment conditions within the ponds may change in response to future operational activities and wastewater management practices. As a result, sampling these engineered treatment units was considered outside the scope of environmental sampling for this phase of the RI.

7.0 Field Implementation and Supporting Plans

Section 7.0 summarizes the supporting plans and processes associated with implementation of Phase 1 RIWP field activities. These include cultural resource considerations through implementation of the IDP, public notification and coordination for field activities conducted within public ROWs, and site access agreements required to conduct the field investigation.

7.1 INADVERTENT DISCOVERY PLAN

All ground-disturbing activities associated with the project will be conducted in accordance with WAC 173-0340-815 and the approved IDP provided in Appendix E. Ecology will provide notification of field activities to affected Tribes and will offer opportunities for Tribal participation in monitoring, as appropriate.

7.2 NOTIFICATION OF FIELD ACTIVITIES

Field activities associated with the RI, particularly for sampling along the Wood Stave Pipe, include sampling within public ROWs and/or near residential areas. For sampling in these areas, the project team will coordinate with Ecology and may provide advance notification to nearby residents or property owners, as appropriate, to inform them of the nature and timing of field sampling activities.

At Ecology's request, the project team may also participate in public meetings or presentations to provide technical information regarding investigation activities and findings.

7.3 SITE ACCESS

RI activities will be conducted at locations within the Site boundary, including parcels owned by Cosmo Specialty Fibers, TVT Capital Source LLC, Weyerhaeuser, and other potentially affected properties. Sampling activities will include work at the Main Mill Complex, Westport Ponds Area, and along the Wood Stave Pipe, as well as within public ROWs where access is available.

The project team will coordinate with Ecology and property owners and responsible parties to obtain access agreements where needed to conduct RI field activities. Where sampling occurs within city ROWs, the project team will coordinate with appropriate local agencies such as the City of Cosmopolis and/or City of Aberdeen to obtain all necessary permissions including ROW/street use permits, traffic control plan approvals (as needed), and utility locates and clearance. The project team will comply with applicable local requirements to ensure that field activities are conducted safely with minimal disruption to traffic, adjacent properties, and existing infrastructure.

Ecology will be kept informed of access needs, and it is the project team's understanding Ecology will provide support as necessary consistent with the AO requirements for Site access and coordination. If access cannot be obtained for specific properties or locations, the project team will notify Ecology and work collaboratively to identify alternative sampling locations or adjust the sampling schedule as appropriate. Limitations in Site access may affect the timing or location of certain sampling activities and will be documented in project communications and progress reports.

8.0 Reporting and Schedule

The following schedule provides anticipated submittal dates for Phase 1 field investigation activities and major deliverables associated with Phase 1 of the RI and is in accordance with Exhibit D – Schedule of Deliverables included in the AO. In addition to the milestones in the schedule, all analytical data will be submitted to Ecology in both printed and electronic formats in accordance with Section 7 of the AO (Work to be Performed), Ecology’s Toxics Cleanup Program Policy 840 (Data Submittal Requirements), and/or any subsequent procedures specified by Ecology for data submittal. Adjustment to the deliverable schedule may occur based on the findings of Phase 1 Investigation work and will be determined in coordination with Ecology.

Deliverable/Milestone	Date
Agency Review Draft Phase 1 RIWP	May 14, 2026
Final Phase 1 RIWP	30 calendar days after receipt of Ecology comments on Agency Review Draft Phase 1 RIWP
Initiation of Phase 1 RI field work (including two groundwater sampling events)	Anticipated summer/fall 2026; pending Ecology approval of the Final Phase 1 RIWP and acquisition of access agreements
Completion of Phase 1 RI field work	Within 12 months after initiation of the Phase 1 RI field work
Agency Review Draft Phase 1 Data Report	Within 90 calendar days after receipt of final, validated laboratory data for all Phase 1 field activities (including two groundwater sampling events)
Final Phase 1 Data Report	Within 45 calendar days after receipt of Ecology comments on Agency Review Draft Phase 1 RI Data Report

Notes:

Ecology review periods are assumed to be 60 days for draft documents and 30 days for draft final Phase 1 RIWP and 45 days for the draft final Phase 1 Data Report.

If the due date falls on a weekend or a holiday, the following workday becomes the default due date.

The AO requires that the RI field work is completed within 12 months after the completion of the final SAP, QAPP, and HASP; if the Phase 1 mobilization is not completed by May 2027, a request for an extension of schedule will be submitted to Ecology in accordance with AO No. 23839 Section 8.10.1.

Final laboratory data must be submitted to EIM within 180 days of receipt; this completion date may change based on the field data collection completion and data validation completion dates.

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Phase 1 Remedial Investigation Work Plan

Cosmo Specialty Fibers Site

Tables

Table 2.1
Summary of Parcels, Owners, and Facilities

Parcel Number	Property Owner	Address (if applicable)	Total Acres	Facilities/Features Located within Parcel	Number of Sample Locations ⁽¹⁾	Sample Location Type
Main Mill Complex						
417091442001	Cosmo Specialty Fibers, Inc.	Physical Address: 1701 1st Street Cosmopolis, WA 98537	77.48	• Soil Stockpile Area • Former Log Storage Area • Hog Fuel Area • Fuel Oil & Diesel ASTs • Fuel AST Area Near Chip Plant • Chip Plant and Dumps • Chip Receiving • Acid Plant • Power house • Pulp Mill • Filter Plant • Northern portion of Truck Shop • Boneyard • Portions of Sweet Sewer Slough	19	Soil Borings, Monitoring Wells, Surface Sediment, Surface Water
35503400000	Cosmo Specialty Fibers, Inc.	Physical Address: 1701 1st Street Cosmopolis, WA 98537	6.55	• Paint Shop • Maintenance Building • Chainsaw Building • Fuel Transfer Area • Start of Wood Stave Pipe	None	None
417091431003	Cosmo Specialty Fibers, Inc.	Physical Address: 1701 1st Street Cosmopolis, WA 98537	84.03	• West Gate Entrance • Caustic Storage Tanks • Contractor Parking/Contractor Gate • Former AST Area adjacent to Scale House • Scale House • Drum Storage Area adjacent to Water Tower • Water Tower • ERT Building • Sandblast Area • Hyster Shop • Oil AST and Washing Area • Western portion of Maintenance Building • Red Liquor Tank • Former Diesel UST near Filter Plant • Filter Plant • Old Warehouse and Machine Room • New Warehouse • Chainsaw Building • Wood Stave Pipe • Pulp Mill • Main Office • Medical/Fitness Center	5	Soil Borings, Monitoring Wells
417091431004	Cosmo Specialty Fibers, Inc.	Physical Address: 1701 1st Street Cosmopolis, WA 98537	0.66	• Northern corner of Old Warehouse • Northwestern corner of Machine Room	None	None
031005302101	Cosmo Specialty Fibers, Inc.	Physical Address: 1701 1st Street Cosmopolis, WA 98537	1.1	• Southern portion of Main Office • Small southern portion of Pulp Mill • Parking Area	None	None
170923110010	Cosmo Specialty Fibers, Inc.	N/A	22.19	• Portion of westernmost biopond • Sweet Sewer Slough north of Herbicide Mixing Area • Forestry Storage Building • Truck wash • Southern portion of Truck Shop • ASTs and Fuel Dispensers • Retaining Sweet Sewer Slough adjacent to Blue Slough Road	2	Soil Borings
3550290000000	Cosmo Specialty Fibers, Inc.	N/A	7.25	• Ash pad • Landslide debris	None	None
31005500000	Cosmo Specialty Fibers, Inc.	N/A	1.21	• Shoreline and intertidal area along Chehalis River	None	None
35503500001	Cosmo Specialty Fibers, Inc.	N/A	0.2	• Portion of parking area	None	None
35503900000	Cosmo Specialty Fibers, Inc.	N/A	0.24	• Intertidal/shoreline area adjacent to the Caustic Storage Tanks	None	None
170924230010	Cosmo Specialty Fibers, Inc.	N/A	180.71	• Vacant vegetated land south of bioponds	None	None
417091332001	TVT Capital Source LLC	Owner Address: 1407 Broadway, Floor 29 New York, NY 10018	42.63	• Aerated pond • Northwest Fill Area • Outfall 002 • Main tributary that discharges to Chehalis River • Sweet Sewer Slough	15	Well Point, Surface Sediment, Surface Water, Soil Borings
1701913330000	TVT Capital Source LLC	Owner Address: 1407 Broadway, Floor 29 New York, NY 10018	181.7	• North Fill Area • South Fill Area • Pond and aerator • Northernmost bioponds • Northern portion of biopond north of the storage pond • ASTs and Chemical Storage Area • Main tributary that discharges to Chehalis River • Sweet Sewer Slough • Large portion of vacant vegetated land along Chehalis River	22	Well Point, Monitoring Well, Surface Sediment, Surface Water, Soil Boring
170924130000	TVT Capital Source LLC	Owner Address: 1407 Broadway, Floor 29 New York, NY 10018	180	• Main tributary that discharges to Chehalis River • Storage pond • Southern portion of biopond north of storage pond • Entire biopond west of the storage pond • Eastern portion of biopond located adjacent to the biopond that is fully on the property • Large vacant vegetated area adjacent to Chehalis River	17	Well Point, Monitoring Well, Surface Sediment, Surface Water, Soil Boring
170923110040	Weyerhaeuser NR Company	Owner Address: 220 Occidental Avenue S Seattle, WA 98104	3.31	• Abandoned railroad right-of-way • East parking lot access • Vegetative strip along Blue Slough Road	None	None

Table 2.1
Summary of Parcels, Owners, and Facilities

Parcel Number	Property Owner	Address (if applicable)	Total Acres	Facilities/Features Located within Parcel	Number of Sample Locations ⁽¹⁾	Sample Location Type
Main Mill Complex (cont.)						
170924220010	TVT Capital Source LLC	Owner Address: 1407 Broadway, Floor 29 New York, NY 10018	1.55	• Southeastern portion of storage pond	1	Monitoring Well
170924220020	Weyerhaeuser NR Company	Owner Address: 220 Occidental Avenue S Seattle, WA 98104	6.41	• Abandoned railroad right-of-way • Vegetative strip along Blue Slough Road	None	None
170924420010	Weyerhaeuser NR Company	Owner Address: 220 Occidental Avenue S Seattle, WA 98104	7.8	• Abandoned railroad right-of-way • Vegetative strip along Blue Slough Road	None	None
417091443002	Public Utility District No. 1	N/A	0.1	• Portion of Power House infrastructure	None	None
417091442002	Public Utility District No. 1	N/A	0.12	• Transmission Tower	None	None
031000900500	Lipski Property Management	Physical Address: 1101 1st Street Cosmopolis, WA 98537 Owner Address: 126 Schafer Meadows Lane S Montesano, WA 98563	0.25	• Cosmopolis Police and Fire	None	None
Westport Ponds Area						
029902100100	Radiant LLC	Owner Address: C/O Rayonier Tax Services 1 Rayonier Way Wildlight, FL, 32097	180.7	• Tidelands (Lots 1 through 13) north of and adjacent to the Westport Ponds A, B, C, and D.	2	Monitoring Wells
317091632001	Cosmo Specialty Fibers, Inc.	Address: PO Box 539 Cosmopolis, WA 98537	3.77	• Westport Ponds—eastern portion of Pond A	1	Soil Boring
317091733001	TVT Capital Source LLC	Owner Address: 1407 Broadway, Floor 29 New York, NY 10018	37.58	• Westport Ponds—Ponds A, B, and C	18	Soil Borings, Monitoring Wells
317091844001	TVT Capital Source LLC	Owner Address: 1407 Broadway, Floor 29 New York, NY 10018	12.84	• Westport Ponds—Pond D	3	Soil Borings, Monitoring Wells
317091621004	City of Aberdeen	Owner Address: 200 East Market Street Aberdeen, WA 98520	2.064	• Small northern portion of Pond A • Vacant and vegetated land adjacent to Pond A	None	None
317091621003	City of Aberdeen	Owner Address: 200 East Market Street Aberdeen, WA 98520	0.304	• Driveway turnaround and access to Pond A	1	Soil Boring
317091623002	City of Aberdeen	Owner Address: 200 East Market Street Aberdeen, WA 98520	5.43	• Eastern portion of road/trail access to Pond A	2	Soil Borings, Monitoring Wells
317091743003	City of Aberdeen	Owner Address: 200 East Market Street Aberdeen, WA 98520	6.41	• Central portion of road/trail access to Ponds A and B	None	None
317091733003	City of Aberdeen	Owner Address: 200 East Market Street Aberdeen, WA 98520	6.67	• Central portion of road/trail access to Pond C	None	None
317091844002	City of Aberdeen	Owner Address: 200 East Market Street Aberdeen, WA 98520	1.22	• Western portion of road/trail access at Pond D and bridge over tributary leading to Gray's Harbor	None	None
317091912001	City of Aberdeen	Owner Address: 200 East Market Street Aberdeen, WA 98520	7.05	• Western portion of road/trail access at Pond D and beyond	None	None
170919210010	Cosmo Specialty Fibers, Inc.	Owner Address: PO Box 539 Cosmopolis, WA 98537	16.56	• Small portion of the western corner of Pond D and adjacent vacant and vegetated Land to west of Pond D	None	None
317091743002	TVT Capital Source LLC	Owner Address: 1407 Broadway, Floor 29 New York, NY 10018	58.35	• East and West Ponds and access road • Vacant and vegetated land west of West and East Ponds	None	None
170920120010	TVT Capital Source LLC	Owner Address: 1407 Broadway, Floor 29 New York, NY 10018	42.35	• Southern portions of East and West Ponds and access road • Vacant and vegetated land adjacent to SR 105	2	Monitoring Wells
317091744001	Skarperud Timber Co.	Owner Address: 8616 SE 40th St. Mercer Island, WA 98040	39.49	• Vacant and vegetated land east and adjacent to the East and West Ponds • Vacant and vegetated land adjacent to SR 105	None	None
317091744002	Cosmo Specialty Fibers, Inc.	Owner Address: PO Box 539 Cosmopolis, WA 98537	0.45	• Small square-spaced parcel between the East and West Ponds (Parcel No. 317091743002) and the Skarperud Timber Co. (Parcel No. 317091744001).	None	None
849102400100	Port of Grays Harbor	Owner Address: PO Box 660 Aberdeen, WA 98520	29.35	• Vacant and vegetated land west of Pond D and at the confluence of a tributary and Grays Harbor • Tidelands (Lots 1 through 5 and 8.51 feet of Lot 6)	None	None

Note:

1 Sample locations in the public right-of-way are not listed in this table.

Abbreviations:

AST Aboveground storage tank
ERT Emergency response team
SR State Route
UST Underground storage tank

Table 3.1
Previous Investigations Soil Data

Location Name				BT7D	NE5SC	SW6C
Sample Date				4/20/1994	4/20/1994	4/20/1994
Analyte	CAS No.	Soil SL ⁽¹⁾	Unit			
Total Petroleum Hydrocarbons						
Diesel-range organics	DRO	200	mg/kg	42	31 U	110 ⁽²⁾

Notes:

Data from KD&S Environmental 1994 independent cleanup (KD&S 1994).

All results rounded to two significant figures.

1 The soil SL for these historical samples is based on interim cleanup levels developed by Ecology and based on the USEPA water quality criteria for fish ingestion and water consumption. The SLs were provided by Ecology to Weyerhaeuser to support cleanup.

2 Undefined laboratory qualifier of "X2" was in original report; this was assumed to be a note related to chromatograms.

Abbreviations:

CAS Chemical Abstracts Service

Ecology Washington State Department of Ecology

mg/kg Milligrams per kilogram

SL Screening level

USEPA U.S. Environmental Protection Agency

Weyerhaeuser Weyerhaeuser NR Company

Table 3.2

Previous Investigations Groundwater Data—Westport Ponds pH and Conductivity Summary Statistics (Prior to 2007)

Measurement	pH Results						Specific Conductance Results (µS/cm)			
Location Name	First Sample	Last Sample	Number of Results	Minimum Result	Average Result	Maximum Result	Number of Results	Minimum Result	Average Result	Maximum Result
Monitoring Wells										
W-01	10/26/1987	11/27/2006	68	5.7	6.4	7.1	77	200	1,713	3,030
W-02	4/13/1988	11/27/2006	66	5.4	6.4	7.2	75	220	2,265	3,170
W-03	10/26/1987	11/27/2006	68	4.8	6.1	7.6	77	1,410	6,103	7,220
W-04	2/17/1988	11/27/2006	67	6	6.6	7.14	76	300	2,693	3,300
W-05	10/26/1987	11/27/2006	68	6	6.6	7.3	77	580	5,489	7,180
W-06 ⁽¹⁾	10/26/1987	6/29/1993	20	6	6.3	6.7	20	570	2,182	6,900
W-06A	10/7/1993	11/27/2006	44	4.5	6.1	7.5	53	60	505	1,110
W-07	12/1/1988	11/27/2006	63	6.04	6.6	7.5	71	430	4,542	6,800
W-08	12/1/1988	11/27/2006	60	5.8	6.7	7.28	68	130	4,001	7,200

Notes:

Minimum and maximum pH and specific conductance results are not rounded. Average results are rounded to two significant figures for pH and to the nearest integer for specific conductance.

The dataset consists of all groundwater samples collected prior to 1/1/2007.

1 Monitoring well W-06 was decommissioned and replaced with W-06A after the June 1993 sampling event.

Abbreviation:

µS/cm Microsiemens per centimeter

Table 3.3
Previous Investigations Groundwater Data—Westport Ponds pH and Conductivity Summary Statistics (2007–Present)

Measurement	pH Results						Specific Conductance Results (μS/cm)			
	First Sample	Last Sample	Number of Results	Minimum Result	Average Result	Maximum Result	Number of Results	Minimum Result	Average Result	Maximum Result
Monitoring Wells										
W-01	5/21/2007	12/18/2023	66	5.69	6.5	7.53	66	100	2,004	3,380
W-02	5/21/2007	12/18/2023	66	3.82	6.3	7.4	66	1,365	1,911	2,700
W-03	5/21/2007	12/18/2023	66	5.03	6.2	7.19	66	229	6,882	17,180
W-04	5/21/2007	12/18/2023	66	4.91	6.7	7.8	66	469	731	1,250
W-05	5/21/2007	12/18/2023	66	5.35	6.9	8.09	66	3,651	6,362	7,240
W-06A	5/21/2007	12/18/2023	66	4.5	5.7	7.2	66	26	222	449
W-07	5/21/2007	12/18/2023	66	5.4	6.7	7.8	66	1,010	2,150	3,670
W-08	5/21/2007	12/18/2023	66	4	6.5	7.6	66	225	7,435	9,882

Notes:

Minimum and maximum pH and specific conductance results are not rounded. Average results are rounded to two significant figures for pH and to the nearest integer for specific conductance.

The dataset consists of all groundwater samples collected 1/1/2007 to present.

Abbreviation:

μS/cm Microsiemens per centimeter

Table 3.4
Previous Investigations Sediment Data—Outfall 001 NPDES Sediment Monitoring (2017)

Location Area							Upstream of Outfall 001										
Location Name							CSF-001-U1	CSF-001-U2	CSF-001-U3	CSF-001-U4	CSF-001-U5	CSF-001-U6		CSF-001-U7	CSF-001-U8	CSF-001-U9	CSF-001-U10
Sample Name							CSF-001-U1	CSF-001-U2	CSF-001-U3	CSF-001-U4	CSF-001-U5	CSF-001-U6	CSF-001-U6-DUP	CSF-001-U7	CSF-001-U8	CSF-001-U9	CSF-001-U10
Sample Date							8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/30/2017
Sample Depth (cm)							0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10
Analyte	CAS No.	SMS Marine SCO ⁽¹⁾	SMS Marine CSL ⁽¹⁾	SMS Marine AET SCO ⁽¹⁾	SMS Marine AET CSL ⁽¹⁾	Unit											
Convetionals																	
TOC	TOC	--	--	--	--	%	0.61	1.16	2.89	0.61	0.76	1.11	1.13	0.45 ⁽²⁾	0.64	0.61	3.63 ⁽²⁾
Metals																	
Arsenic	7440-38-2	57	93	57	93	mg/kg	5.46	6.33	9.84	6.44	5.96	7.25	6.98	6.06	5.82	6.67	7.61
Cadmium	7440-43-9	5.1	6.7	5.1	6.7	mg/kg	0.108	0.109	0.152	0.0850	0.104	0.128	0.104	0.0860	0.0840	0.0800	0.200
Chromium	7440-47-3	260	270	260	270	mg/kg	31.1	33.5	32.9	31.8	31.1	30.7	28.6	30.4	29.9	21.2	39.6
Copper	7440-50-8	390	390	390	390	mg/kg	38.8	40.8	45.3	39.4	41.1	37.0	35.9	38.5	39.8	22.5	55.4
Lead	7439-92-1	450	530	450	530	mg/kg	4.76	5.40	7.66	4.91	5.17	7.22	6.20	4.69	4.55	4.43	10.4
Mercury	7439-97-6	0.41	0.59	0.41	0.59	mg/kg	0.0190 U	0.0210	0.0420	0.0220 U	0.0220	0.0290	0.0290	0.0210 U	0.0200 U	0.0210 U	0.0810
Silver	7440-22-4	6.1	6.1	6.1	6.1	mg/kg	0.0300	0.0330	0.0680	0.0270	0.0350	0.0460	0.0450	0.0280	0.0320	0.0260	0.173
Zinc	7440-66-6	410	960	410	960	mg/kg	76.5	80.0	79.3	75.5	77.6	94.4	72.2	75.8	76.9	53.5	85.7
Semivolatile Organic Compounds—Dry Weight																	
2,4-Dimethylphenol	105-67-9	0.029	0.029	0.029	0.029	mg/kg	0.035 U	0.038 U	0.032 U	0.035 U	0.036 U	0.042 U	0.042 U	0.034 U	0.034 U	0.036 U	0.053 U
2-Methylphenol	95-48-7	0.063	0.063	0.063	0.063	mg/kg	0.0070 U	0.0076 U	0.021 U	0.0070 U	0.0071 U	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.0072 U	0.011 U
4-Methylphenol	106-44-5	0.67	0.67	0.67	0.67	mg/kg	0.0070 U	0.0076 U	0.047 U	0.0070 U	0.0098	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.0072 U	0.076
Benzoic acid	65-85-0	0.65	0.65	0.65	0.65	mg/kg	0.28 U	0.31 U	0.48 U	0.28 U	0.29 U	0.34 U	0.33 U	0.27 U	0.28 U	0.29 U	0.42 U
Benzyl alcohol	100-51-6	0.057	0.073	0.057	0.073	mg/kg	0.014 U	0.016 U	0.025 U	0.014 U	0.015 U	0.017 U	0.017 U	0.014 U	0.014 U	0.015 U	0.021 U
Pentachlorophenol	87-86-5	0.36	0.69	0.36	0.69	mg/kg	0.070 U	0.076 U	0.47 U	0.070 U	0.071 U	0.083 U	0.083 U	0.068 U	0.068 U	0.072 U	0.11 U
Phenol	108-95-2	0.42	1.2	0.42	1.2	mg/kg	0.021 U	0.023 U	0.15 U	0.021 U	0.022 U	0.025 U	0.025 U	0.021 U	0.021 U	0.022 U	0.032 U
1,2,4-Trichlorobenzene	120-82-1	--	--	0.031	0.051	mg/kg	0.0026 U	0.0076 U	0.013 U	0.0026 U	0.0026 U	0.0083 U	0.0083 U	0.0026 U	0.0026 U	0.0026 U	0.011 U
1,2-Dichlorobenzene	95-50-1	--	--	0.035	0.05	mg/kg	0.0070 U	0.0076 U	0.047 U	0.0070 U	0.0071 U	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.0072 U	0.011 U
1,4-Dichlorobenzene	106-46-7	--	--	0.11	0.11	mg/kg	0.0070 U	0.0076 U	0.047 U	0.0070 U	0.0071 U	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.0072 U	0.011 U
Dibenzofuran	132-64-9	--	--	0.54	0.54	mg/kg	0.0098	0.0076 U	0.047 U	0.0070 U	0.0071 U	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.0072 U	0.011 U
Hexachlorobenzene	118-74-1	--	--	0.022	0.07	mg/kg	0.0033 U	0.0033 U	0.017 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.011 U
Hexachlorobutadiene	87-68-3	--	--	0.011	0.12	mg/kg	0.0070 U	0.0076 U	0.047 U	0.0070 U	0.0071 U	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.0072 U	0.011 U
Hexachloroethane	67-72-1	--	--	--	--	mg/kg	0.0070 U	0.0076 U	0.047 U	0.0070 U	0.0071 U	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.0072 U	0.011 U
N-Nitrosodiphenylamine	86-30-6	--	--	0.028	0.04	mg/kg	0.0070 U	0.0076 U	0.047 U	0.0070 U	0.0071 U	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.0072 U	0.011 U
Bis(2-ethylhexyl)phthalate	117-81-7	--	--	1.3	1.9	mg/kg	0.070 U	0.076 U	0.47 U	0.070 U	0.071 U	0.083 U	0.083 U	0.068 U	0.068 U	0.072 U	0.11 U
Butyl benzyl phthalate	85-68-7	--	--	0.063	0.9	mg/kg	0.0070 U	0.0076 U	0.047 U	0.0070 U	0.0071 U	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.0072 U	0.036
Diethylphthalate	84-66-2	--	--	0.2	1.2	mg/kg	0.0070 U	0.0076 U	0.047 U	0.0070 U	0.0071 U	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.0072 U	0.011 U
Dimethyl phthalate	131-11-3	--	--	0.071	0.16	mg/kg	0.0070 U	0.0076 U	0.047 U	0.0070 U	0.0071 U	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.0072 U	0.011 U
Di-n-butyl phthalate	84-74-2	--	--	1.4	1.4	mg/kg	0.014 U	0.016 U	0.094 U	0.014 U	0.015 U	0.017 U	0.017 U	0.014 U	0.014 U	0.015 U	0.021 U
Di-n-octyl phthalate	117-84-0	--	--	6.2	6.2	mg/kg	0.0070 U	0.0076 U	0.047 U	0.011	0.010	0.0094	0.010	0.0068 U	0.0068 U	0.0090	0.022
Total LPAH (U=0)	T_LPAH (U=0)	--	--	5.2	5.2	mg/kg	0.092	0.027	0.85	0.076	0.020	0.045	0.0083 U	0.0068 U	0.015	0.13	0.048
Total LPAH (U=1/2)	T_LPAH (U=1/2)	--	--	5.2	5.2	mg/kg	0.099	0.042	0.94	0.080	0.034	0.062	0.0083 U	0.0068 U	0.029	0.14	0.070
2-Methylnaphthalene	91-57-6	--	--	0.67	0.67	mg/kg	0.0070 U	0.0076 U	0.047 U	0.0070 U	0.0071 U	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.0072 U	0.011 U
Acenaphthene	83-32-9	--	--	0.5	0.5	mg/kg	0.014	0.0076 U	0.047 U	0.0074	0.0071 U	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.0072 U	0.011 U
Acenaphthylene	208-96-8	--	--	1.3	1.3	mg/kg	0.0070 U	0.0076 U	0.047 U	0.0070 U	0.0071 U	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.0072 U	0.011 U
Anthracene	120-12-7	--	--	0.96	0.96	mg/kg	0.0070 U	0.0076 U	0.26	0.0071	0.0071 U	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.020	0.011 U
Fluorene	86-73-7	--	--	0.54	0.54	mg/kg	0.011	0.0076 U	0.047 U	0.0085	0.0071 U	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.017	0.011 U
Naphthalene	91-20-3	--	--	2.1	2.1	mg/kg	0.028	0.014	0.047 U	0.019	0.0096	0.015	0.0083 U	0.0068 U	0.0073	0.0081	0.022
Phenanthrene	85-01-8	--	--	1.5	1.5	mg/kg	0.039	0.013	0.59	0.034	0.010	0.030	0.0083 U	0.0068 U	0.0076	0.084	0.026
Total HPAH (U=0)	T_HPAH (U=0)	--	--	12	17	mg/kg	0.15	0.024	6.4	0.13	0.028	0.13	0.0083	0.0074	0.020	0.24	0.085
Total HPAH (U=1/2)	T_HPAH (U=1/2)	--	--	12	17	mg/kg	0.17	0.054	6.4	0.15	0.056	0.15	0.046	0.038	0.047	0.24	0.12
Benzo(a)anthracene	56-55-3	--	--	1.3	1.6	mg/kg	0.0075	0.0076 U	0.67	0.015	0.0071 U	0.014	0.0083 U	0.0068 U	0.0068 U	0.024	0.011 U
Benzo(a)pyrene	50-32-8	--	--	1.6	1.6	mg/kg	0.0070 U	0.0076 U	0.60	0.0089	0.0071 U	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.020	0.011 U
Benzo(b)fluoranthene	205-99-2	--	--	--	--	mg/kg	0.0070 U	0.0076 U	0.67	0.015	0.0071 U	0.011	0.0083 U	0.0068 U	0.0068 U	0.021	0.012
Benzo(k)fluoranthene	207-08-9	--	--	--	--	mg/kg	0.0070 U	0.0076 U	0.24	0.0070 U	0.0071 U	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.0085	0.011 U

Table 3.4
Previous Investigations Sediment Data—Outfall 001 NPDES Sediment Monitoring (2017)

Location Area							Upstream of Outfall 001										
Location Name							CSF-001-U1	CSF-001-U2	CSF-001-U3	CSF-001-U4	CSF-001-U5	CSF-001-U6		CSF-001-U7	CSF-001-U8	CSF-001-U9	CSF-001-U10
Sample Name							CSF-001-U1	CSF-001-U2	CSF-001-U3	CSF-001-U4	CSF-001-U5	CSF-001-U6	CSF-001-U6-DUP	CSF-001-U7	CSF-001-U8	CSF-001-U9	CSF-001-U10
Sample Date							8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/30/2017
Sample Depth (cm)							0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10
Analyte	CAS No.	SMS Marine SCO ⁽¹⁾	SMS Marine CSL ⁽¹⁾	SMS Marine AET SCO ⁽¹⁾	SMS Marine AET CSL ⁽¹⁾	Unit											
Semivolatile Organic Compounds—Dry Weight (cont.)																	
Benzo(a)fluoranthenes (total) (U=0)	56832-73-6	--	--	3.2	3.6	mg/kg	0.0070 U	0.0076 U	0.91	0.015	0.0071 U	0.011	0.0083 U	0.0068 U	0.0068 U	0.030	0.012
Benzo(a)fluoranthenes (total) (U=1/2)	T_Bkflanth (U=1/2)	--	--	3.2	3.6	mg/kg	0.0070 U	0.0076 U	0.91	0.019	0.0071 U	0.015	0.0083 U	0.0068 U	0.0068 U	0.030	0.018
Benzo(g,h,i)perylene	191-24-2	--	--	0.67	0.72	mg/kg	0.0070 U	0.0076 U	0.28	0.0070 U	0.0071 U	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.0091	0.011 U
Chrysene	218-01-9	--	--	1.4	2.8	mg/kg	0.0077	0.0076 U	0.65	0.015	0.0071 U	0.014	0.0083 U	0.0068 U	0.0068 U	0.024	0.011 U
Dibenzo(a,h)anthracene	53-70-3	--	--	0.23	0.23	mg/kg	0.0070 U	0.0076 U	0.074	0.0070 U	0.0071 U	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.0072 U	0.011 U
Fluoranthene	206-44-0	--	--	1.7	2.5	mg/kg	0.076	0.014	1.6	0.047	0.015	0.048	0.0083	0.0074	0.010	0.061	0.038
Indeno(1,2,3-c,d)pyrene	193-39-5	--	--	0.6	0.69	mg/kg	0.0070 U	0.0076 U	0.32	0.0070 U	0.0071 U	0.0083 U	0.0083 U	0.0068 U	0.0068 U	0.0096	0.011 U
Pyrene	129-00-0	--	--	2.6	3.3	mg/kg	0.054	0.010	1.3	0.032	0.013	0.041	0.0083 U	0.0068 U	0.0096	0.060	0.035
cPAHs (MTCA TEQ-ZeroND)	BaPEq (U=0)	--	--	--	--	mg/kg	0.00083	0.0076 U	0.80	0.012	0.0071 U	0.0026	0.0083 U	0.0068 U	0.0068 U	0.027	0.0012
cPAHs (MTCA TEQ-HalfND)	BaPEq (U=1/2)	--	--	--	--	mg/kg	0.0057	0.0076 U	0.80	0.013	0.0071 U	0.0080	0.0083 U	0.0068 U	0.0068 U	0.027	0.0090
Total PAH (U=0)	T_PAH (U=0)	--	--	--	--	mg/kg	0.24	0.051	7.3	0.21	0.048	0.17	0.0083	0.0074	0.035	0.37	0.13
Total PAH (U=1/2)	T_PAH (U=1/2)	--	--	--	--	mg/kg	0.27	0.097	7.3	0.23	0.090	0.21	0.071	0.058	0.075	0.38	0.19
Semivolatile Organic Compounds—TOC-Normalized																	
1,2,4-Trichlorobenzene	120-82-1	0.81	1.8	--	--	mg/kg-OC	0.43 U	0.66 U	0.45 U	0.43 U	0.34 U	0.75 U	0.73 U	0.58 U	0.41 U	0.43 U	0.30 U
1,2-Dichlorobenzene	95-50-1	2.3	2.3	--	--	mg/kg-OC	1.2 U	0.66 U	1.6 U	1.2 U	0.93 U	0.75 U	0.73 U	1.5 U	1.1 U	1.2 U	0.30 U
1,4-Dichlorobenzene	106-46-7	3.1	9	--	--	mg/kg-OC	1.2 U	0.66 U	1.6 U	1.2 U	0.93 U	0.75 U	0.73 U	1.5 U	1.1 U	1.2 U	0.30 U
Dibenzofuran	132-64-9	15	58	--	--	mg/kg-OC	1.6	0.66 U	1.6 U	1.2 U	0.93 U	0.75 U	0.73 U	1.5 U	1.1 U	1.2 U	0.30 U
Hexachlorobenzene	118-74-1	0.38	2.3	--	--	mg/kg-OC	0.54 U	0.28 U	0.59 U	0.54 U	0.43 U	0.30 U	0.29 U	0.73 U	0.52 U	0.54 U	0.30 U
Hexachlorobutadiene	87-68-3	3.9	6.2	--	--	mg/kg-OC	1.2 U	0.66 U	1.6 U	1.2 U	0.93 U	0.75 U	0.73 U	1.5 U	1.1 U	1.2 U	0.30 U
N-Nitrosodiphenylamine	86-30-6	11	11	--	--	mg/kg-OC	1.2 U	0.66 U	1.6 U	1.2 U	0.93 U	0.75 U	0.73 U	1.5 U	1.1 U	1.2 U	0.30 U
Bis(2-ethylhexyl)phthalate	117-81-7	47	78	--	--	mg/kg-OC	11 U	6.6 U	16 U	11 U	9.3 U	7.5 U	7.4 U	15 U	11 U	12 U	3.0 U
Butyl benzyl phthalate	85-68-7	4.9	64	--	--	mg/kg-OC	1.2 U	0.66 U	1.6 U	1.2 U	0.93 U	0.75 U	0.73 U	1.5 U	1.1 U	1.2 U	0.99
Diethylphthalate	84-66-2	61	110	--	--	mg/kg-OC	1.2 U	0.66 U	1.6 U	1.2 U	0.93 U	0.75 U	0.73 U	1.5 U	1.1 U	1.2 U	0.30 U
Dimethyl phthalate	131-11-3	53	53	--	--	mg/kg-OC	1.2 U	0.66 U	1.6 U	1.2 U	0.93 U	0.75 U	0.73 U	1.5 U	1.1 U	1.2 U	0.30 U
Di-n-butyl phthalate	84-74-2	220	1,700	--	--	mg/kg-OC	2.3 U	1.4 U	3.3 U	2.3 U	2.0 U	1.5 U	1.5 U	3.1 U	2.2 U	2.5 U	0.58 U
Di-n-octyl phthalate	117-84-0	58	4,500	--	--	mg/kg-OC	1.2 U	0.66 U	1.6 U	1.8	1.3	0.85	0.88	1.5 U	1.1 U	1.5	0.61
Total LPAH (U=0)	T_LPAH (U=0)	370	780	--	--	mg/kg-OC	15	2.3	29	12	2.6	4.1	0.73 U	1.5 U	2.3	21	1.3
Total LPAH (U=1/2)	T_LPAH (U=1/2)	370	780	--	--	mg/kg-OC	16	3.7	33	13	4.4	5.6	0.73 U	1.5 U	4.5	22	1.9
2-Methylnaphthalene	91-57-6	38	64	--	--	mg/kg-OC	1.2 U	0.66 U	1.6 U	1.2 U	0.93 U	0.75 U	0.73 U	1.5 U	1.1 U	1.2 U	0.30 U
Acenaphthene	83-32-9	16	57	--	--	mg/kg-OC	2.3	0.66 U	1.6 U	1.2	0.93 U	0.75 U	0.73 U	1.5 U	1.1 U	1.2 U	0.30 U
Acenaphthylene	208-96-8	66	66	--	--	mg/kg-OC	1.2 U	0.66 U	1.6 U	1.2 U	0.93 U	0.75 U	0.73 U	1.5 U	1.1 U	1.2 U	0.30 U
Anthracene	120-12-7	220	1,200	--	--	mg/kg-OC	1.2 U	0.66 U	9.0	1.2	0.93 U	0.75 U	0.73 U	1.5 U	1.1 U	3.3	0.30 U
Fluorene	86-73-7	23	79	--	--	mg/kg-OC	1.8	0.66 U	1.6 U	1.4	0.93 U	0.75 U	0.73 U	1.5 U	1.1 U	2.8	0.30 U
Naphthalene	91-20-3	99	170	--	--	mg/kg-OC	4.6	1.2	1.6 U	3.1	1.3	1.4	0.73 U	1.5 U	1.1	1.3	0.61
Phenanthrene	85-01-8	100	480	--	--	mg/kg-OC	6.4	1.1	20	5.6	1.3	2.7	0.73 U	1.5 U	1.2	14	0.72
Total HPAH (U=0)	T_HPAH (U=0)	960	5,300	--	--	mg/kg-OC	24	2.1	220	22	3.7	12	0.73	1.6	3.1	39	2.3
Total HPAH (U=1/2)	T_HPAH (U=1/2)	960	5,300	--	--	mg/kg-OC	27	4.7	220	24	7.4	13	4	8.4	7.3	39	3.4
Benzo(a)anthracene	56-55-3	110	270	--	--	mg/kg-OC	1.2	0.66 U	23	2.5	0.93 U	1.3	0.73 U	1.5 U	1.1 U	3.9	0.30 U
Benzo(a)pyrene	50-32-8	99	210	--	--	mg/kg-OC	1.2 U	0.66 U	21	1.5	0.93 U	0.75 U	0.73 U	1.5 U	1.1 U	3.3	0.30 U
Benzo(b)fluoranthene	205-99-2	--	--	--	--	mg/kg-OC	1.2 U	0.66 U	23	2.5	0.93 U	0.99	0.73 U	1.5 U	1.1 U	3.4	0.33
Benzo(k)fluoranthene	207-08-9	--	--	--	--	mg/kg-OC	1.2 U	0.66 U	8.3	1.2 U	0.93 U	0.75 U	0.73 U	1.5 U	1.1 U	1.4	0.30 U
Benzo(a)fluoranthenes (total) (U=0)	56832-73-6	230	450	--	--	mg/kg-OC	1.2 U	0.66 U	31	2.5	0.93 U	0.99	0.73 U	1.5 U	1.1 U	4.8	0.33
Benzo(a)fluoranthenes (total) (U=1/2)	T_Bkflanth (U=1/2)	230	450	--	--	mg/kg-OC	1.2 U	0.66 U	31	3.0	0.93 U	1.4	0.73 U	1.5 U	1.1 U	4.8	0.48
Benzo(g,h,i)perylene	191-24-2	31	78	--	--	mg/kg-OC	1.2 U	0.66 U	9.7	1.2 U	0.93 U	0.75 U	0.73 U	1.5 U	1.1 U	1.5	0.30 U
Chrysene	218-01-9	110	460	--	--	mg/kg-OC	1.3	0.66 U	22	2.5	0.93 U	1.3	0.73 U	1.5 U	1.1 U	3.9	0.30 U
Dibenzo(a,h)anthracene	53-70-3	12	33	--	--	mg/kg-OC	1.2 U	0.66 U	2.6	1.2 U	0.93 U	0.75 U	0.73 U	1.5 U	1.1 U	1.2 U	0.30 U
Fluoranthene	206-44-0	160	1,200	--	--	mg/kg-OC	12	1.2	55	7.7	2.0	4.3	0.73	1.6	1.6	10	1.1

Table 3.4
Previous Investigations Sediment Data—Outfall 001 NPDES Sediment Monitoring (2017)

Location Area							Upstream of Outfall 001										
Location Name							CSF-001-U1	CSF-001-U2	CSF-001-U3	CSF-001-U4	CSF-001-U5	CSF-001-U6		CSF-001-U7	CSF-001-U8	CSF-001-U9	CSF-001-U10
Sample Name							CSF-001-U1	CSF-001-U2	CSF-001-U3	CSF-001-U4	CSF-001-U5	CSF-001-U6	CSF-001-U6-DUP	CSF-001-U7	CSF-001-U8	CSF-001-U9	CSF-001-U10
Sample Date							8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/30/2017
Sample Depth (cm)							0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10
Analyte	CAS No.	SMS Marine SCO ⁽¹⁾	SMS Marine CSL ⁽¹⁾	SMS Marine AET SCO ⁽¹⁾	SMS Marine AET CSL ⁽¹⁾	Unit											
Semivolatile Organic Compounds—TOC-Normalized (cont.)																	
Indeno(1,2,3-c,d)pyrene	193-39-5	34	88	--	--	mg/kg-OC	1.2 U	0.66 U	11	1.2 U	0.93 U	0.75 U	0.73 U	1.5 U	1.1 U	1.6	0.30 U
Pyrene	129-00-0	1,000	1,400	--	--	mg/kg-OC	8.9	0.86	45	5.3	1.7	3.7	0.73 U	1.5 U	1.5	9.8	0.96
Polychlorinated Biphenyls (PCBs)—Dry Weight																	
Aroclor 1016	12674-11-2	--	--	--	--	mg/kg	0.013 U	0.014 U	0.017 U	0.013 U	0.013 U	0.017 U	0.016 U	0.012 U	0.014 U	0.013 U	0.018 U
Aroclor 1221	11104-28-2	--	--	--	--	mg/kg	0.025 U	0.027 U	0.034 U	0.026 U	0.025 U	0.033 U	0.032 U	0.023 U	0.027 U	0.025 U	0.036 U
Aroclor 1232	11141-16-5	--	--	--	--	mg/kg	0.013 U	0.014 U	0.017 U	0.013 U	0.013 U	0.017 U	0.016 U	0.012 U	0.014 U	0.013 U	0.018 U
Aroclor 1242	53469-21-9	--	--	--	--	mg/kg	0.013 U	0.014 U	0.017 U	0.013 U	0.013 U	0.017 U	0.016 U	0.012 U	0.014 U	0.013 U	0.020
Aroclor 1248	12672-29-6	--	--	--	--	mg/kg	0.013 U	0.014 U	0.017 U	0.013 U	0.013 U	0.017 U	0.016 U	0.012 U	0.014 U	0.013 U	0.018 U
Aroclor 1254	11097-69-1	--	--	--	--	mg/kg	0.013 U	0.014 U	0.017 U	0.013 U	0.013 U	0.017 U	0.016 U	0.012 U	0.014 U	0.013 U	0.023
Aroclor 1260	11096-82-5	--	--	--	--	mg/kg	0.013 U	0.014 U	0.017 U	0.013 U	0.013 U	0.017 U	0.016 U	0.012 U	0.014 U	0.013 U	0.020
Total PCB Aroclors (U=0)	T_PCB (U=0)	--	--	0.13	1	mg/kg	0.025 U	0.027 U	0.034 U	0.026 U	0.025 U	0.033 U	0.032 U	0.023 U	0.027 U	0.025 U	0.063
Total PCB Aroclors (U=1/2)	T_PCB (U=1/2)	--	--	0.13	1	mg/kg	0.025 U	0.027 U	0.034 U	0.026 U	0.025 U	0.033 U	0.032 U	0.023 U	0.027 U	0.025 U	0.11
Polychlorinated Biphenyls (PCBs)—TOC-Normalized																	
Total PCB Aroclors (U=0)	T_PCB (U=0)	12	65	--	--	mg/kg-OC	4.1 U	2.3 U	1.2 U	4.3 U	3.3 U	3.0 U	2.8 U	5.1 U	4.2 U	4.1 U	1.7
Total PCB Aroclors (U=1/2)	T_PCB (U=1/2)	12	65	--	--	mg/kg-OC	4.1 U	2.3 U	1.2 U	4.3 U	3.3 U	3.0 U	2.8 U	5.1 U	4.2 U	4.9 U	3.0
Dioxins/Furans																	
2,3,7,8-TCDD	1746-01-6	--	--	--	--	ng/kg	0.507	0.659	0.408	0.403	0.196	0.915	1.2	0.459	0.704	0.661	2.63
1,2,3,7,8-PeCDD	40321-76-4	--	--	--	--	ng/kg	0.51	0.835	0.517	0.537	0.178	1.38	1.59	0.479	0.702	0.667	2.48
1,2,3,4,7,8-HxCDD	39227-28-6	--	--	--	--	ng/kg	0.179	0.242	0.146	0.127	0.08 U	0.345	0.381	0.222	0.238	0.272	1.41
1,2,3,6,7,8-HxCDD	57653-85-7	--	--	--	--	ng/kg	0.575	0.739	0.529	0.418	0.192	0.977	1.46	0.414	0.59	0.624	6.07
1,2,3,7,8,9-HxCDD	19408-74-3	--	--	--	--	ng/kg	1.5	2.3	1.05	1.57	0.461	3.16	4.23	1.36	1.74	1.94	8.21
1,2,3,4,6,7,8-HpCDD	35822-46-9	--	--	--	--	ng/kg	8.9	9.71	10.3	7.49	3.14	15.5	19	5.57	8.18	8	142
OCDD	3268-87-9	--	--	--	--	ng/kg	66.8	55.7	76.7	49.3	22.5	100	117	36	49.9	50.8	1110
2,3,7,8-TCDF	51207-31-9	--	--	--	--	ng/kg	0.833	0.487	0.333	0.371	0.087 U	0.549	0.558	0.243	0.332	0.279	5.44
1,2,3,7,8-PeCDF	57117-41-6	--	--	--	--	ng/kg	0.065	0.088	0.064 U	0.0619	0.043 U	0.0877	0.12	0.051 U	0.0715	0.075 U	0.51
2,3,4,7,8-PeCDF	57117-31-4	--	--	--	--	ng/kg	0.14	0.165	0.146	0.129	0.038 U	0.245	0.25	0.091 U	0.168	0.085 U	1.56
1,2,3,4,7,8-HxCDF	70648-26-9	--	--	--	--	ng/kg	0.161	0.172	0.179	0.124	0.0902	0.244	0.292	0.136	0.164	0.167	1.77
1,2,3,6,7,8-HxCDF	57117-44-9	--	--	--	--	ng/kg	0.13	0.1 U	0.0875	0.077 U	0.038 U	0.157	0.286	0.069 U	0.138	0.086 U	1.13
1,2,3,7,8,9-HxCDF	72918-21-9	--	--	--	--	ng/kg	0.083 U	0.058 U	0.0893	0.087 U	0.059 U	0.081 U	0.0892	0.086 U	0.0742	0.14 U	0.41 U
2,3,4,6,7,8-HxCDF	60851-34-5	--	--	--	--	ng/kg	0.224	0.173	0.173	0.14	0.0734	0.286	0.368	0.11 U	0.168	0.13 U	2.18
1,2,3,4,6,7,8-HpCDF	67562-39-4	--	--	--	--	ng/kg	3.16	3.48	3.08	3.25	1.22	7.23	7.64	2.57	3.4	3.33	40.2
1,2,3,4,7,8,9-HpCDF	55673-89-7	--	--	--	--	ng/kg	0.096 U	0.114	0.115	0.083 U	0.0566	0.223	0.26 U	0.1 U	0.0951	0.182	2.06
OCDF	39001-02-0	--	--	--	--	ng/kg	1.55	2.11	2.4	2.8	1.29	6.3	9.27	2.58	3.15	3.57	78.6
Dioxins/Furans (MTCA TEQ-ZeroND)	DF_TEQ (U=0)	--	--	--	--	ng/kg	1.56	2.11	1.39	1.38	0.507	3.2	3.94	1.27	1.94	1.79	10.4
Dioxins/Furans (MTCA TEQ-HalfND)	DF_TEQ (U=1/2)	--	--	--	--	ng/kg	1.57	2.12	1.39	1.39	0.527	3.21	3.94	1.3	1.94	1.82	10.4

Notes:

- All results are rounded to two significant figures, except for metals and dioxins/furans, which are rounded to three, and TOC, which is presented to two decimal places.
- Not established.

Italic: Analyte was not detected at a reporting limit greater than applicable criterion.

- 1 The SMS marine chemical criteria are TOC-normalized for nonpolar organics and dry-weight values are used for metals and polar organics. Data are screened to the SMS marine chemical criteria (TOC-normalized and dry-weight values) and also the marine sediment dry-weight AETs.
- 2 When TOC is outside the range of 0.5% to 3.5%, results may be compared to both the TOC-normalized criteria and the dry-weight AET values.

Abbreviations:

AET Apparent Effects Threshold	HpCDD Heptachlorodibenzo-p-dioxin	mg/kg-OC Milligrams per kilogram organic carbon-normalized	PAH Polycyclic aromatic hydrocarbon	TCDF Tetrachlorodibenzofuran
CAS Chemical Abstracts Service	HpCDF Heptachlorodibenzofuran	MTCA Model Toxics Control Act	PeCDD Pentachlorodibenzo-p-dioxin	TEQ Toxic equivalent
cm Centimeters	HxCDD Hexachlorodibenzo-p-dioxin	ng/kg Nanograms per kilogram	PeCDF Pentachlorodibenzofuran	TOC Total organic carbon
cPAH Carcinogenic polycyclic aromatic hydrocarbon	HxCDF Hexachlorodibenzofuran	NPDES National Pollutant Discharge Elimination System	SCO Sediment Cleanup Objective	
CSL Cleanup screening level	LPAH Low molecular weight polycyclic aromatic hydrocarbon	OCDD Octachlorodibenzo-p-dioxin	SMS Sediment Management Standards	
HPAH High molecular weight polycyclic aromatic hydrocarbon	mg/kg Milligrams per kilogram	OCDF Octachlorodibenzofuran	TCDD Tetrachlorodibenzo-p-dioxin	

Qualifier:

- U Analyte was not detected at the associated reporting limit.

Table 3.4
Previous Investigations Sediment Data—Outfall 001 NPDES Sediment Monitoring (2017)

Location Area							Downstream of Outfall 001								
Location Name							CSF-001-D1	CSF-001-D2	CSF-001-D3	CSF-001-D4	CSF-001-D5	CSF-001-D6	CSF-001-D7	CSF-001-D8	CSF-001-D9
Sample Name							CSF-001-D1	CSF-001-D2	CSF-001-D3	CSF-001-D4	CSF-001-D5	CSF-001-D6	CSF-001-D7	CSF-001-D8	CSF-001-D9
Sample Date							8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/30/2017	8/30/2017	8/30/2017	8/30/2017	8/30/2017
Sample Depth (cm)							0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10
Analyte	CAS No.	SMS Marine SCO ⁽¹⁾	SMS Marine CSL ⁽¹⁾	SMS Marine AET SCO ⁽¹⁾	SMS Marine AET CSL ⁽¹⁾	Unit									
Convetionals															
TOC	TOC	--	--	--	--	%	0.59	0.81	1.37	0.59	0.91	2.52	0.64	0.89	1.81
Metals															
Arsenic	7440-38-2	57	93	57	93	mg/kg	6.23	6.56	7.16	6.28	5.63	10.0	6.55	6.01	5.84
Cadmium	7440-43-9	5.1	6.7	5.1	6.7	mg/kg	0.0930	0.0990	0.128	0.0970	0.0990	0.158	0.105	0.107	0.152
Chromium	7440-47-3	260	270	260	270	mg/kg	32.9	29.7	29.4	31.5	28.2	35.2	35.3	31.4	29.2
Copper	7440-50-8	390	390	390	390	mg/kg	40.3	38.8	41.6	39.8	36.9	43.0	43.3	41.8	39.5
Lead	7439-92-1	450	530	450	530	mg/kg	4.99	5.02	5.93	5.07	4.97	7.74	5.69	5.13	6.11
Mercury	7439-97-6	0.41	0.59	0.41	0.59	mg/kg	0.0210 U	0.0230 U	0.0290	0.0220 U	0.0230 U	0.0380	0.0220 U	0.0220	0.0300
Silver	7440-22-4	6.1	6.1	6.1	6.1	mg/kg	0.0310	0.0350	0.0560	0.0310	0.0340	0.0610	0.0280	0.0470	0.0610
Zinc	7440-66-6	410	960	410	960	mg/kg	77.9	72.7	71.5	77.5	69.7	85.7	86.4	77.4	73.1
Semivolatile Organic Compounds—Dry Weight															
2,4-Dimethylphenol	105-67-9	0.029	0.029	0.029	0.029	mg/kg	0.035 U	0.036 U	0.041 U	0.035 U	0.037 U	0.050 U	0.036 U	0.037 U	0.043 U
2-Methylphenol	95-48-7	0.063	0.063	0.063	0.063	mg/kg	0.0070 U	0.0071 U	0.0082 U	0.0070 U	0.0074 U	0.0099 U	0.0071 U	0.0073 U	0.0085 U
4-Methylphenol	106-44-5	0.67	0.67	0.67	0.67	mg/kg	0.0070 U	0.0071 U	0.0087	0.0070 U	0.0086	0.012	0.013	0.012	0.011
Benzoic acid	65-85-0	0.65	0.65	0.65	0.65	mg/kg	0.28 U	0.29 U	0.33 U	0.28 U	0.30 U	0.40 U	0.29 U	0.30 U	0.34 U
Benzyl alcohol	100-51-6	0.057	0.073	0.057	0.073	mg/kg	0.014 U	0.015 U	0.017 U	0.014 U	0.015 U	0.020 U	0.015 U	0.015 U	0.017 U
Pentachlorophenol	87-86-5	0.36	0.69	0.36	0.69	mg/kg	0.070 U	0.071 U	0.082 U	0.070 U	0.074 U	0.099 U	0.071 U	0.073 U	0.0085 U
Phenol	108-95-2	0.42	1.2	0.42	1.2	mg/kg	0.024	0.022 U	0.025 U	0.023	0.025	0.030 U	0.022 U	0.029	0.026 U
1,2,4-Trichlorobenzene	120-82-1	--	--	0.031	0.051	mg/kg	0.0026 U	0.0026 U	0.0082 U	0.0026 U	0.0026 U	0.0099 U	0.0026 U	0.0026 U	0.0085 U
1,2-Dichlorobenzene	95-50-1	--	--	0.035	0.05	mg/kg	0.0070 U	0.0071 U	0.0082 U	0.0070 U	0.0074 U	0.0099 U	0.0071 U	0.0073 U	0.0085 U
1,4-Dichlorobenzene	106-46-7	--	--	0.11	0.11	mg/kg	0.0070 U	0.0071 U	0.0082 U	0.0070 U	0.0074 U	0.0099 U	0.0071 U	0.0073 U	0.0085 U
Dibenzofuran	132-64-9	--	--	0.54	0.54	mg/kg	0.015	0.0085	0.0094	0.0070 U	0.0074 U	0.058	0.0071 U	0.0073 U	0.010
Hexachlorobenzene	118-74-1	--	--	0.022	0.07	mg/kg	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U
Hexachlorobutadiene	87-68-3	--	--	0.011	0.12	mg/kg	0.0070 U	0.0071 U	0.0082 U	0.0070 U	0.0074 U	0.0099 U	0.0071 U	0.0073 U	0.0085 U
Hexachloroethane	67-72-1	--	--	--	--	mg/kg	0.0070 U	0.0071 U	0.0082 U	0.0070 U	0.0074 U	0.0099 U	0.0071 U	0.0073 U	0.0085 U
N-Nitrosodiphenylamine	86-30-6	--	--	0.028	0.04	mg/kg	0.0070 U	0.0071 U	0.0082 U	0.0070 U	0.0074 U	0.0099 U	0.0071 U	0.0073 U	0.0085 U
Bis(2-ethylhexyl)phthalate	117-81-7	--	--	1.3	1.9	mg/kg	0.070 U	0.071 U	0.082 U	0.070 U	0.074 U	0.099 U	0.071 U	0.073 U	0.085 U
Butyl benzyl phthalate	85-68-7	--	--	0.063	0.9	mg/kg	0.0070 U	0.0071 U	0.0082 U	0.0070 U	0.0074 U	0.010	0.0071 U	0.0073 U	0.0085 U
Diethylphthalate	84-66-2	--	--	0.2	1.2	mg/kg	0.0070 U	0.0071 U	0.0082 U	0.0070 U	0.0074 U	0.0099 U	0.0071 U	0.0073 U	0.0085 U
Dimethyl phthalate	131-11-3	--	--	0.071	0.16	mg/kg	0.0070 U	0.0071 U	0.0082 U	0.0070 U	0.0074 U	0.0099 U	0.0071 U	0.0073 U	0.0085 U
Di-n-butyl phthalate	84-74-2	--	--	1.4	1.4	mg/kg	0.014 U	0.015 U	0.017 U	0.014 U	0.015 U	0.020 U	0.015 U	0.015 U	0.017 U
Di-n-octyl phthalate	117-84-0	--	--	6.2	6.2	mg/kg	0.0070 U	0.0071 U	0.0082 U	0.0078	0.0074 U	0.036	0.0081	0.0079	0.017
Total LPAH (U=0)	T_LPAH (U=0)	--	--	5.2	5.2	mg/kg	0.18	0.089	0.078	0.091	0.030	0.53	0.018	0.051	0.15
Total LPAH (U=1/2)	T_LPAH (U=1/2)	--	--	5.2	5.2	mg/kg	0.18	0.093	0.086	0.094	0.045	0.53	0.033	0.062	0.16
2-Methylnaphthalene	91-57-6	--	--	0.67	0.67	mg/kg	0.0070 U	0.0071 U	0.0082 U	0.0070 U	0.0074 U	0.031	0.0071 U	0.0073 U	0.0085 U
Acenaphthene	83-32-9	--	--	0.5	0.5	mg/kg	0.023	0.013	0.014	0.0084	0.0074 U	0.082	0.0071 U	0.0073 U	0.011
Acenaphthylene	208-96-8	--	--	1.3	1.3	mg/kg	0.0070 U	0.0071 U	0.0082 U	0.0070 U	0.0074 U	0.0099 U	0.0071 U	0.0073 U	0.0085 U
Anthracene	120-12-7	--	--	0.96	0.96	mg/kg	0.021	0.0074	0.0082 U	0.0087	0.0074 U	0.044	0.0071 U	0.0079	0.021
Fluorene	86-73-7	--	--	0.54	0.54	mg/kg	0.022	0.012	0.013	0.0086	0.0074 U	0.084	0.0071 U	0.0073 U	0.014
Naphthalene	91-20-3	--	--	2.1	2.1	mg/kg	0.014	0.018	0.017	0.022	0.012	0.050	0.0074	0.013	0.027
Phenanthrene	85-01-8	--	--	1.5	1.5	mg/kg	0.10	0.039	0.034	0.043	0.018	0.27	0.011	0.030	0.080
Total HPAH (U=0)	T_HPAH (U=0)	--	--	12	17	mg/kg	0.19	0.11	0.11	0.14	0.030	0.56	0.085	0.13	0.39
Total HPAH (U=1/2)	T_HPAH (U=1/2)	--	--	12	17	mg/kg	0.21	0.13	0.13	0.16	0.060	0.58	0.10	0.14	0.40
Benzo(a)anthracene	56-55-3	--	--	1.3	1.6	mg/kg	0.016	0.0096	0.011	0.016	0.0074 U	0.033	0.014	0.012	0.038
Benzo(a)pyrene	50-32-8	--	--	1.6	1.6	mg/kg	0.0070 U	0.0071 U	0.0082 U	0.0070 U	0.0074 U	0.014	0.0071 U	0.0091	0.027
Benzo(b)fluoranthene	205-99-2	--	--	--	--	mg/kg	0.0078	0.0079	0.0090	0.013	0.0074 U	0.028	0.0086	0.011	0.033
Benzo(k)fluoranthene	207-08-9	--	--	--	--	mg/kg	0.0070 U	0.0071 U	0.0082 U	0.0070 U	0.0074 U	0.0099 U	0.0071 U	0.0073 U	0.012

Table 3.4
Previous Investigations Sediment Data—Outfall 001 NPDES Sediment Monitoring (2017)

Location Area							Downstream of Outfall 001								
Location Name							CSF-001-D1	CSF-001-D2	CSF-001-D3	CSF-001-D4	CSF-001-D5	CSF-001-D6	CSF-001-D7	CSF-001-D8	CSF-001-D9
Sample Name							CSF-001-D1	CSF-001-D2	CSF-001-D3	CSF-001-D4	CSF-001-D5	CSF-001-D6	CSF-001-D7	CSF-001-D8	CSF-001-D9
Sample Date							8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/30/2017	8/30/2017	8/30/2017	8/30/2017	8/30/2017
Sample Depth (cm)							0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10
Analyte	CAS No.	SMS Marine SCO ⁽¹⁾	SMS Marine CSL ⁽¹⁾	SMS Marine AET SCO ⁽¹⁾	SMS Marine AET CSL ⁽¹⁾	Unit									
Semivolatile Organic Compounds—Dry Weight (cont.)															
Benzofluoranthenes (total) (U=0)	56832-73-6	--	--	3.2	3.6	mg/kg	0.0078	0.0079	0.0090	0.013	0.0074 U	0.028	0.0086	0.011	0.045
Benzofluoranthenes (total) (U=1/2)	T_Bkflanth (U=1/2)	--	--	3.2	3.6	mg/kg	0.011	0.011	0.013	0.017	0.0074 U	0.033	0.012	0.015	0.045
Benzo(g,h,i)perylene	191-24-2	--	--	0.67	0.72	mg/kg	0.0070 U	0.0071 U	0.0082 U	0.0070 U	0.0074 U	0.0099 U	0.0071 U	0.0073 U	0.014
Chrysene	218-01-9	--	--	1.4	2.8	mg/kg	0.020	0.0085	0.010	0.016	0.0074 U	0.035	0.012	0.014	0.035
Dibenzo(a,h)anthracene	53-70-3	--	--	0.23	0.23	mg/kg	0.0070 U	0.0071 U	0.0082 U	0.0070 U	0.0074 U	0.0099 U	0.0071 U	0.0073 U	0.0085 U
Fluoranthene	206-44-0	--	--	1.7	2.5	mg/kg	0.087	0.048	0.046	0.061	0.018	0.28	0.033	0.045	0.12
Indeno(1,2,3-c,d)pyrene	193-39-5	--	--	0.6	0.69	mg/kg	0.0070 U	0.0071 U	0.0082 U	0.0070 U	0.0074 U	0.0099 U	0.0071 U	0.0073 U	0.015
Pyrene	129-00-0	--	--	2.6	3.3	mg/kg	0.060	0.036	0.032	0.035	0.012	0.17	0.017	0.037	0.097
cPAHs (MTCA TEQ-ZeroND)	BaPEq (U=0)	--	--	--	--	mg/kg	0.0026	0.0018	0.0021	0.0031	0.0074 U	0.020	0.0024	0.012	0.037
cPAHs (MTCA TEQ-HalfND)	BaPEq (U=1/2)	--	--	--	--	mg/kg	0.0071	0.0065	0.0074	0.0076	0.0074 U	0.022	0.0070	0.013	0.038
Total PAH (U=0)	T_PAH (U=0)	--	--	--	--	mg/kg	0.37	0.20	0.19	0.23	0.060	1.1	0.10	0.18	0.54
Total PAH (U=1/2)	T_PAH (U=1/2)	--	--	--	--	mg/kg	0.39	0.22	0.21	0.25	0.10	1.1	0.13	0.20	0.55
Semivolatile Organic Compounds—TOC-Normalized															
1,2,4-Trichlorobenzene	120-82-1	0.81	1.8	--	--	mg/kg-OC	0.44 U	0.32 U	0.60 U	0.44 U	0.29 U	0.39 U	0.41 U	0.29 U	0.47 U
1,2-Dichlorobenzene	95-50-1	2.3	2.3	--	--	mg/kg-OC	1.2 U	0.88 U	0.60 U	1.2 U	0.81 U	0.39 U	1.1 U	0.82 U	0.47 U
1,4-Dichlorobenzene	106-46-7	3.1	9	--	--	mg/kg-OC	1.2 U	0.88 U	0.60 U	1.2 U	0.81 U	0.39 U	1.1 U	0.82 U	0.47 U
Dibenzofuran	132-64-9	15	58	--	--	mg/kg-OC	2.5	1.1	0.69	1.2 U	0.81 U	2.3	1.1 U	0.82 U	0.55
Hexachlorobenzene	118-74-1	0.38	2.3	--	--	mg/kg-OC	0.56 U	0.41 U	0.24 U	0.56 U	0.36 U	0.13 U	0.52 U	0.37 U	0.18 U
Hexachlorobutadiene	87-68-3	3.9	6.2	--	--	mg/kg-OC	1.2 U	0.88 U	0.60 U	1.2 U	0.81 U	0.39 U	1.1 U	0.82 U	0.47 U
N-Nitrosodiphenylamine	86-30-6	11	11	--	--	mg/kg-OC	1.2 U	0.88 U	0.60 U	1.2 U	0.81 U	0.39 U	1.1 U	0.82 U	0.47 U
Bis(2-ethylhexyl)phthalate	117-81-7	47	78	--	--	mg/kg-OC	12 U	8.8 U	6.0 U	12 U	8.1 U	3.9 U	11 U	8.2 U	4.7 U
Butyl benzyl phthalate	85-68-7	4.9	64	--	--	mg/kg-OC	1.2 U	0.88 U	0.60 U	1.2 U	0.81 U	0.40	1.1 U	0.82 U	0.47 U
Diethylphthalate	84-66-2	61	110	--	--	mg/kg-OC	1.2 U	0.88 U	0.60 U	1.2 U	0.81 U	0.39 U	1.1 U	0.82 U	0.47 U
Dimethyl phthalate	131-11-3	53	53	--	--	mg/kg-OC	1.2 U	0.88 U	0.60 U	1.2 U	0.81 U	0.39 U	1.1 U	0.82 U	0.47 U
Di-n-butyl phthalate	84-74-2	220	1,700	--	--	mg/kg-OC	2.4 U	1.9 U	1.2 U	2.4 U	1.7 U	0.79 U	2.3 U	1.7 U	0.94 U
Di-n-octyl phthalate	117-84-0	58	4,500	--	--	mg/kg-OC	1.2 U	0.88 U	0.60 U	1.3	0.81 U	1.4	1.3	0.89	0.94
Total LPAH (U=0)	T_LPAH (U=0)	370	780	--	--	mg/kg-OC	31	11	5.7	15	3.3	21	2.9	5.7	8.5
Total LPAH (U=1/2)	T_LPAH (U=1/2)	370	780	--	--	mg/kg-OC	31	11	6.3	16	4.9	21	5.1	7	8.7
2-Methylnaphthalene	91-57-6	38	64	--	--	mg/kg-OC	1.2 U	0.88 U	0.60 U	1.2 U	0.81 U	1.2	1.1 U	0.82 U	0.47 U
Acenaphthene	83-32-9	16	57	--	--	mg/kg-OC	3.9	1.6	1.0	1.4	0.81 U	3.3	1.1 U	0.82 U	0.61
Acenaphthylene	208-96-8	66	66	--	--	mg/kg-OC	1.2 U	0.88 U	0.60 U	1.2 U	0.81 U	0.39 U	1.1 U	0.82 U	0.47 U
Anthracene	120-12-7	220	1,200	--	--	mg/kg-OC	3.6	0.91	0.60 U	1.5	0.81 U	1.8	1.1 U	0.89	1.2
Fluorene	86-73-7	23	79	--	--	mg/kg-OC	3.7	1.5	0.95	1.5	0.81 U	3.3	1.1 U	0.82 U	0.77
Naphthalene	91-20-3	99	170	--	--	mg/kg-OC	2.4	2.2	1.2	3.7	1.3	2.0	1.2	1.5	1.5
Phenanthrene	85-01-8	100	480	--	--	mg/kg-OC	17	4.8	2.5	7.3	2.0	11	1.7	3.4	4.4
Total HPAH (U=0)	T_HPAH (U=0)	960	5,300	--	--	mg/kg-OC	32	14	7.9	24	3.3	22	13	14	22
Total HPAH (U=1/2)	T_HPAH (U=1/2)	960	5,300	--	--	mg/kg-OC	35	16	9.4	27	6.5	23	16	16	22
Benzo(a)anthracene	56-55-3	110	270	--	--	mg/kg-OC	2.7	1.2	0.80	2.7	0.81 U	1.3	2.2	1.4	2.1
Benzo(a)pyrene	50-32-8	99	210	--	--	mg/kg-OC	1.2 U	0.88 U	0.60 U	1.2 U	0.81 U	0.56	1.1 U	1.0	1.5
Benzo(b)fluoranthene	205-99-2	--	--	--	--	mg/kg-OC	1.3	0.98	0.66	2.2	0.81 U	1.1	1.3	1.2	1.8
Benzo(k)fluoranthene	207-08-9	--	--	--	--	mg/kg-OC	1.2 U	0.88 U	0.60 U	1.2 U	0.81 U	0.39 U	1.1 U	0.82 U	0.66
Benzofluoranthenes (total) (U=0)	56832-73-6	230	450	--	--	mg/kg-OC	1.3	0.98	0.66	2.2	0.81 U	1.1	1.3	1.2	2.5
Benzofluoranthenes (total) (U=1/2)	T_Bkflanth (U=1/2)	230	450	--	--	mg/kg-OC	1.9	1.4	0.96	2.8	0.81 U	1.3	1.9	1.7	2.5
Benzo(g,h,i)perylene	191-24-2	31	78	--	--	mg/kg-OC	1.2 U	0.88 U	0.60 U	1.2 U	0.81 U	0.39 U	1.1 U	0.82 U	0.77
Chrysene	218-01-9	110	460	--	--	mg/kg-OC	3.4	1.1	0.73	2.7	0.81 U	1.4	1.9	1.6	1.9
Dibenzo(a,h)anthracene	53-70-3	12	33	--	--	mg/kg-OC	1.2 U	0.88 U	0.60 U	1.2 U	0.81 U	0.39 U	1.1 U	0.82 U	0.47 U
Fluoranthene	206-44-0	160	1,200	--	--	mg/kg-OC	15	5.9	3.4	10	2.0	11	5.2	5.1	6.6

Table 3.4
Previous Investigations Sediment Data—Outfall 001 NPDES Sediment Monitoring (2017)

Location Area							Downstream of Outfall 001								
Location Name							CSF-001-D1	CSF-001-D2	CSF-001-D3	CSF-001-D4	CSF-001-D5	CSF-001-D6	CSF-001-D7	CSF-001-D8	CSF-001-D9
Sample Name							CSF-001-D1	CSF-001-D2	CSF-001-D3	CSF-001-D4	CSF-001-D5	CSF-001-D6	CSF-001-D7	CSF-001-D8	CSF-001-D9
Sample Date							8/29/2017	8/29/2017	8/29/2017	8/29/2017	8/30/2017	8/30/2017	8/30/2017	8/30/2017	8/30/2017
Sample Depth (cm)							0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10
Analyte	CAS No.	SMS Marine SCO ⁽¹⁾	SMS Marine CSL ⁽¹⁾	SMS Marine AET SCO ⁽¹⁾	SMS Marine AET CSL ⁽¹⁾	Unit									
Semivolatile Organic Compounds—TOC-Normalized (cont.)															
Indeno(1,2,3-c,d)pyrene	193-39-5	34	88	--	--	mg/kg-OC	1.2 U	0.88 U	0.60 U	1.2 U	0.81 U	0.39 U	1.1 U	0.82 U	0.83
Pyrene	129-00-0	1,000	1,400	--	--	mg/kg-OC	10	4.4	2.3	5.9	1.3	6.8	2.7	4.2	5.4
Polychlorinated Biphenyls (PCBs)—Dry Weight															
Aroclor 1016	12674-11-2	--	--	--	--	mg/kg	0.012 U	0.012 U	0.015 U	0.012 U	0.014 U	0.018 U	0.013 U	0.012 U	0.016 U
Aroclor 1221	11104-28-2	--	--	--	--	mg/kg	0.023 U	0.024 U	0.029 U	0.024 U	0.027 U	0.036 U	0.025 U	0.024 U	0.031 U
Aroclor 1232	11141-16-5	--	--	--	--	mg/kg	0.012 U	0.012 U	0.015 U	0.012 U	0.014 U	0.018 U	0.013 U	0.012 U	0.016 U
Aroclor 1242	53469-21-9	--	--	--	--	mg/kg	0.012 U	0.012 U	0.015 U	0.012 U	0.014 U	0.018 U	0.013 U	0.012 U	0.016 U
Aroclor 1248	12672-29-6	--	--	--	--	mg/kg	0.012 U	0.012 U	0.015 U	0.012 U	0.014 U	0.018 U	0.013 U	0.012 U	0.016 U
Aroclor 1254	11097-69-1	--	--	--	--	mg/kg	0.012 U	0.012 U	0.015 U	0.012 U	0.014 U	0.018 U	0.013 U	0.012 U	0.016 U
Aroclor 1260	11096-82-5	--	--	--	--	mg/kg	0.012 U	0.012 U	0.015 U	0.012 U	0.014 U	0.018 U	0.013 U	0.012 U	0.016 U
Total PCB Aroclors (U=0)	T_PCB (U=0)	--	--	0.13	1	mg/kg	0.023 U	0.024 U	0.029 U	0.024 U	0.027 U	0.036 U	0.025 U	0.024 U	0.031 U
Total PCB Aroclors (U=1/2)	T_PCB (U=1/2)	--	--	0.13	1	mg/kg	0.023 U	0.024 U	0.029 U	0.024 U	0.027 U	0.036 U	0.025 U	0.024 U	0.031 U
Polychlorinated Biphenyls (PCBs)—TOC-Normalized															
Total PCB Aroclors (U=0)	T_PCB (U=0)	12	65	--	--	mg/kg-OC	3.9 U	3.0 U	2.1 U	4.1 U	3.0 U	1.4 U	3.9 U	2.7 U	1.7 U
Total PCB Aroclors (U=1/2)	T_PCB (U=1/2)	12	65	--	--	mg/kg-OC	3.9 U	3.0 U	2.1 U	4.1 U	3.0 U	1.4 U	3.9 U	2.7 U	1.7 U
Dioxins/Furans															
2,3,7,8-TCDD	1746-01-6	--	--	--	--	ng/kg	0.467	0.649	1.13	0.588	0.508	1.52	0.565	0.832	1.38
1,2,3,7,8-PeCDD	40321-76-4	--	--	--	--	ng/kg	0.589	0.972	1.51	0.688	0.721	2	0.758	0.946	1.65
1,2,3,4,7,8-HxCDD	39227-28-6	--	--	--	--	ng/kg	0.194	0.377	0.386	0.188	0.223	0.561	0.234	0.23 U	0.425
1,2,3,6,7,8-HxCDD	57653-85-7	--	--	--	--	ng/kg	0.554	0.62	1.21	0.611	0.546	1.75	0.99	0.919	1.77
1,2,3,7,8,9-HxCDD	19408-74-3	--	--	--	--	ng/kg	1.75	2.38	3.52	1.97	1.65	5.22	2.14	2.5	4.93
1,2,3,4,6,7,8-HpCDD	35822-46-9	--	--	--	--	ng/kg	10.7	11	25.8	8.97	9.39	24	17.4	11.2	22.1
OCDD	3268-87-9	--	--	--	--	ng/kg	77.5	72.6	208	56.1	58.1	150	128	70.8	132
2,3,7,8-TCDF	51207-31-9	--	--	--	--	ng/kg	0.377	0.437	0.728	0.432	0.497	1.01	0.437	5.81	0.821
1,2,3,7,8-PeCDF	57117-41-6	--	--	--	--	ng/kg	0.064 U	0.074 U	0.14 U	0.071 U	0.053 U	0.183	0.103	0.194	0.15 U
2,3,4,7,8-PeCDF	57117-31-4	--	--	--	--	ng/kg	0.097 U	0.19 U	0.247	0.1223	0.174	0.32	0.179	0.664	0.303
1,2,3,4,7,8-HxCDF	70648-26-9	--	--	--	--	ng/kg	0.15 U	0.24 U	0.304	0.136	0.109	0.363	0.236	0.193	0.339
1,2,3,6,7,8-HxCDF	57117-44-9	--	--	--	--	ng/kg	0.078 U	0.127	0.2 U	0.0973	0.101	0.316	0.158	0.154	0.248
1,2,3,7,8,9-HxCDF	72918-21-9	--	--	--	--	ng/kg	0.097 U	0.1 U	0.1 U	0.078 U	0.11 U	0.167	0.059 U	0.0507	0.0601
2,3,4,6,7,8-HxCDF	60851-34-5	--	--	--	--	ng/kg	0.146	0.187	0.33 U	0.16	0.149	0.471	0.341	0.214	0.42
1,2,3,4,6,7,8-HpCDF	67562-39-4	--	--	--	--	ng/kg	2.63	4.24	8.12	3.25	3.73	9.38	5.91	3.92	9.01
1,2,3,4,7,8,9-HpCDF	55673-89-7	--	--	--	--	ng/kg	0.1 U	0.148	0.32 U	0.101	0.13	0.403	0.308	0.133	0.306
OCDF	39001-02-0	--	--	--	--	ng/kg	2.82	3.87	8.95	3.5	3.53	12.9	13.4	5.04	11.6
Dioxins/Furans (MTCA TEQ-ZeroND)	DF_TEQ (U=0)	--	--	--	--	ng/kg	1.52	2.21	3.73	1.81	1.76	4.99	2.11	3.14	4.38
Dioxins/Furans (MTCA TEQ-HalfND)	DF_TEQ (U=1/2)	--	--	--	--	ng/kg	1.55	2.26	3.77	1.82	1.77	4.99	2.11	3.15	4.38

Notes:

- All results are rounded to two significant figures, except for metals and dioxins/furans, which are rounded to three, and TOC, which is presented to two decimal places.
- Not established.
- Italic* Analyte was not detected at a reporting limit greater than applicable criterion.
- 1 The SMS marine chemical criteria are TOC-normalized for nonpolar organics and dry-weight values are used for metals and polar organics. Data are screened to the SMS marine chemical criteria (TOC-normalized and dry-weight values) and also the marine sediment dry-weight AETs.
- 2 When TOC is outside the range of 0.5% to 3.5%, results may be compared to both the TOC-normalized criteria and the dry-weight AET values.

Abbreviations:

AET Apparent Effects Threshold	HpCDD Heptachlorodibenzo-p-dioxin	mg/kg-OC Milligrams per kilogram organic carbon-normalized	PAH Polycyclic aromatic hydrocarbon	TCDF Tetrachlorodibenzofuran
CAS Chemical Abstracts Service	HpCDF Heptachlorodibenzofuran	MTCA Model Toxics Control Act	PeCDD Pentachlorodibenzo-p-dioxin	TEQ Toxic equivalent
cm Centimeters	HxCDD Hexachlorodibenzo-p-dioxin	ng/kg Nanograms per kilogram	PeCDF Pentachlorodibenzofuran	TOC Total organic carbon
cPAH Carcinogenic polycyclic aromatic hydrocarbon	HxCDF Hexachlorodibenzofuran	NPDES National Pollutant Discharge Elimination System	SCO Sediment Cleanup Objective	
CSL Cleanup screening level	LPAH Low molecular weight polycyclic aromatic hydrocarbon	OCDD Octachlorodibenzo-p-dioxin	SMS Sediment Management Standards	
HPAH High molecular weight polycyclic aromatic hydrocarbon	mg/kg Milligrams per kilogram	OCDF Octachlorodibenzofuran	TCDD Tetrachlorodibenzo-p-dioxin	

Qualifier:

- U Analyte was not detected at the associated reporting limit.

Table 3.5
Previous Investigations Sediment Data—Outfall 002 NPDES Sediment Monitoring (2017)

Location Area							Upstream of Outfall 002		Downstream of Outfall 002					
Location Name							CSF-002-U1	CSF-002-1	CSF-002-2	CSF-002-3	CSF-002-4	CSF-002-5	CSF-002-6	
Sample Name							CSF-002-U1	CSF-002-1	CSF-002-2	CSF-002-3	CSF-002-4	CSF-002-5	CSF-002-6	CSF-002-6-DUP
Sample Date							8/28/2017	8/28/2017	8/28/2017	8/28/2017	8/28/2017	8/28/2017	8/28/2017	8/28/2017
Sample Depth (cm)							0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10
Analyte	CAS No.	SMS Marine SCO ⁽¹⁾	SMS Marine CSL ⁽¹⁾	SMS Marine AET SCO ⁽¹⁾	SMS Marine AET CSL ⁽¹⁾	Unit								
Convetionals														
TOC	TOC	--	--	--	--	%	2.98	2.61	2.26	0.58	0.64	3.06	3.33	0.41 ⁽²⁾
Metals														
Arsenic	7440-38-2	57	93	57	93	mg/kg	6.63	7.09	5.79	12.0	2.97	3.64	7.14	7.22
Cadmium	7440-43-9	5.1	6.7	5.1	6.7	mg/kg	0.0730	0.176	0.298	0.132	0.0800	0.912	0.166	0.171
Chromium	7440-47-3	260	270	260	270	mg/kg	29.1	36.2	35.2	37.6	21.9	24.5	36.7	36.0
Copper	7440-50-8	390	390	390	390	mg/kg	49.5	55.7	55.2	48.3	38.3	44.9	48.7	46.8
Lead	7439-92-1	450	530	450	530	mg/kg	6.35	9.32	16.8	7.00	2.98	3.59	6.22	6.03
Mercury	7439-97-6	0.41	0.59	0.41	0.59	mg/kg	0.0150 U	0.0530	0.0400	0.0380	0.0170 U	0.0190 U	0.0390	0.0410
Silver	7440-22-4	6.1	6.1	6.1	6.1	mg/kg	0.0210 U	0.0920	0.0790	0.0810	0.0210 U	0.0280	0.0800	0.0750
Zinc	7440-66-6	410	960	410	960	mg/kg	68.4	87.0	111	72.7	58.4	62.9	72.4	74.7
Semivolatile Organic Compounds—Dry Weight														
2,4-Dimethylphenol	105-67-9	0.029	0.029	0.029	0.029	mg/kg	0.032 U	0.0076 U	0.063 U	0.045 U	0.032 U	0.034 U	0.047 U	0.045 U
2-Methylphenol	95-48-7	0.063	0.063	0.063	0.063	mg/kg	0.0063 U	0.012 U	0.041 U	0.0090 U	0.021 U	0.0067 U	0.0094 U	0.0090 U
4-Methylphenol	106-44-5	0.67	0.67	0.67	0.67	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.36
Benzoic acid	65-85-0	0.65	0.65	0.65	0.65	mg/kg	0.26 U	0.48 U	0.96 U	0.36 U	0.48 U	0.27 U	0.38 U	0.36 U
Benzyl alcohol	100-51-6	0.057	0.073	0.057	0.073	mg/kg	0.013 U	0.024 U	0.049 U	0.018 U	0.025 U	0.014 U	0.019 U	0.018 U
Pentachlorophenol	87-86-5	0.36	0.69	0.36	0.69	mg/kg	0.063 U	0.12 U	0.053 U	0.090 U	0.33 U	0.067 U	0.094 U	0.090 U
Phenol	108-95-2	0.42	1.2	0.42	1.2	mg/kg	0.019 U	0.036 U	0.24 U	0.027 U	0.097 U	0.020 U	0.029 U	0.027 U
1,2,4-Trichlorobenzene	120-82-1	--	--	0.031	0.051	mg/kg	0.0063 U	0.012 U	0.026 U	0.0090 U	0.013 U	0.0067 U	0.0094 U	0.0090 U
1,2-Dichlorobenzene	95-50-1	--	--	0.035	0.05	mg/kg	0.0063 U	0.012 U	0.024 U	0.0090 U	0.012 U	0.0067 U	0.0094 U	0.0090 U
1,4-Dichlorobenzene	106-46-7	--	--	0.11	0.11	mg/kg	0.0063 U	0.012 U	0.025 U	0.0090 U	0.013 U	0.0067 U	0.0094 U	0.0090 U
Dibenzofuran	132-64-9	--	--	0.54	0.54	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U
Hexachlorobenzene	118-74-1	--	--	0.022	0.07	mg/kg	0.0033 U	0.0040 U	0.033 U	0.0033 U	0.017 U	0.0033 U	0.0094 U	0.0090 U
Hexachlorobutadiene	87-68-3	--	--	0.011	0.12	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.015 U	0.0067 U	0.0094 U	0.0090 U
Hexachloroethane	67-72-1	--	--	--	--	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U
N-Nitrosodiphenylamine	86-30-6	--	--	0.028	0.04	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U
Bis(2-ethylhexyl)phthalate	117-81-7	--	--	1.3	1.9	mg/kg	0.063 U	0.12 U	25 ⁽³⁾	0.090 U	0.045 U	0.067 U	0.094 U	0.090 U
Butyl benzyl phthalate	85-68-7	--	--	0.063	0.9	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.019 U	0.0067 U	0.0094 U	0.0090 U
Diethylphthalate	84-66-2	--	--	0.2	1.2	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U
Dimethyl phthalate	131-11-3	--	--	0.071	0.16	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U
Di-n-butyl phthalate	84-74-2	--	--	1.4	1.4	mg/kg	0.013 U	0.024 U	0.16 U	0.018 U	0.065 U	0.014 U	0.019 U	0.018 U
Di-n-octyl phthalate	117-84-0	--	--	6.2	6.2	mg/kg	0.016	0.059	0.080 U	0.011	0.033 U	0.010	0.0094 U	0.027
Total LPAH (U=0)	T_LPAH (U=0)	--	--	5.2	5.2	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U
Total LPAH (U=1/2)	T_LPAH (U=1/2)	--	--	5.2	5.2	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U
2-Methylnaphthalene	91-57-6	--	--	0.67	0.67	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U
Acenaphthene	83-32-9	--	--	0.5	0.5	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U
Acenaphthylene	208-96-8	--	--	1.3	1.3	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U
Anthracene	120-12-7	--	--	0.96	0.96	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U
Fluorene	86-73-7	--	--	0.54	0.54	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U
Naphthalene	91-20-3	--	--	2.1	2.1	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U
Phenanthrene	85-01-8	--	--	1.5	1.5	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U
Total HPAH (U=0)	T_HPAH (U=0)	--	--	12	17	mg/kg	0.0063 U	0.026	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U
Total HPAH (U=1/2)	T_HPAH (U=1/2)	--	--	12	17	mg/kg	0.0063 U	0.074	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U
Benzo(a)anthracene	56-55-3	--	--	1.3	1.6	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U
Benzo(a)pyrene	50-32-8	--	--	1.6	1.6	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U

Table 3.5
Previous Investigations Sediment Data—Outfall 002 NPDES Sediment Monitoring (2017)

Location Area							Upstream of Outfall 002		Downstream of Outfall 002						
Location Name							CSF-002-U1		CSF-002-1	CSF-002-2	CSF-002-3	CSF-002-4	CSF-002-5	CSF-002-6	
Sample Name							CSF-002-U1		CSF-002-1	CSF-002-2	CSF-002-3	CSF-002-4	CSF-002-5	CSF-002-6	CSF-002-6-DUP
Sample Date							8/28/2017		8/28/2017	8/28/2017	8/28/2017	8/28/2017	8/28/2017	8/28/2017	8/28/2017
Sample Depth (cm)							0–10		0–10	0–10	0–10	0–10	0–10	0–10	0–10
Analyte	CAS No.	SMS Marine SCO ⁽¹⁾	SMS Marine CSL ⁽¹⁾	SMS Marine AET SCO ⁽¹⁾	SMS Marine AET CSL ⁽¹⁾	Unit									
Semivolatile Organic Compounds—Dry Weight (cont.)															
Benzo(b)fluoranthene	205-99-2	--	--	--	--	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U	
Benzo(k)fluoranthene	207-08-9	--	--	--	--	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U	
Benzo(a)fluoranthenes (total) (U=0)	56832-73-6	--	--	3.2	3.6	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U	
Benzo(a)fluoranthenes (total) (U=1/2)	T_Bkflanth (U=1/2)	--	--	3.2	3.6	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U	
Benzo(g,h,i)perylene	191-24-2	--	--	0.67	0.72	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U	
Chrysene	218-01-9	--	--	1.4	2.8	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U	
Dibenzo(a,h)anthracene	53-70-3	--	--	0.23	0.23	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U	
Fluoranthene	206-44-0	--	--	1.7	2.5	mg/kg	0.0063 U	0.013	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U	
Indeno(1,2,3-c,d)pyrene	193-39-5	--	--	0.6	0.69	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U	
Pyrene	129-00-0	--	--	2.6	3.3	mg/kg	0.0063 U	0.013	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U	
cPAHs (MTCA TEQ-ZeroND)	BaPEq (U=0)	--	--	--	--	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U	
cPAHs (MTCA TEQ-HalfND)	BaPEq (U=1/2)	--	--	--	--	mg/kg	0.0063 U	0.012 U	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U	
Total PAH (U=0)	T_PAH (U=0)	--	--	--	--	mg/kg	0.0063 U	0.026	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U	
Total PAH (U=1/2)	T_PAH (U=1/2)	--	--	--	--	mg/kg	0.0063 U	0.11	0.080 U	0.0090 U	0.033 U	0.0067 U	0.0094 U	0.0090 U	
Semivolatile Organic Compounds—TOC-Normalized															
1,2,4-Trichlorobenzene	120-82-1	0.81	1.8	--	--	mg/kg-OC	1.5 U	0.40 U	1.0 U	0.40 U	2.2 U	1.1 U	0.31 U	0.27 U	
1,2-Dichlorobenzene	95-50-1	2.3	2.3	--	--	mg/kg-OC	1.5 U	0.40 U	0.92 U	0.40 U	2.1 U	1.1 U	0.31 U	0.27 U	
1,4-Dichlorobenzene	106-46-7	3.1	9	--	--	mg/kg-OC	1.5 U	0.40 U	0.96 U	0.40 U	2.2 U	1.1 U	0.31 U	0.27 U	
Dibenzofuran	132-64-9	15	58	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U	
Hexachlorobenzene	118-74-1	0.38	2.3	--	--	mg/kg-OC	0.80 U	0.13 U	1.3 U	0.15 U	5.7 U	0.52 U	0.31 U	0.27 U	
Hexachlorobutadiene	87-68-3	3.9	6.2	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	2.6 U	1.1 U	0.31 U	0.27 U	
N-Nitrosodiphenylamine	86-30-6	11	11	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U	
Bis(2-ethylhexyl)phthalate	117-81-7	47	78	--	--	mg/kg-OC	15 U	4.0 U	960 ⁽³⁾	4.0 U	7.8 U	10 U	3.1 U	2.7 U	
Butyl benzyl phthalate	85-68-7	4.9	64	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	3.3 U	1.1 U	0.31 U	0.27 U	
Diethylphthalate	84-66-2	61	110	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U	
Dimethyl phthalate	131-11-3	53	53	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U	
Di-n-butyl phthalate	84-74-2	220	1,700	--	--	mg/kg-OC	3.2 U	0.81 U	6.1 U	0.80 U	11 U	2.2 U	0.62 U	0.54 U	
Di-n-octyl phthalate	117-84-0	58	4,500	--	--	mg/kg-OC	3.9	2.0	3.1 U	0.49	5.7 U	1.6	0.31 U	0.81	
Total LPAH (U=0)	T_LPAH (U=0)	370	780	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U	
Total LPAH (U=1/2)	T_LPAH (U=1/2)	370	780	--	--	mg/kg-OC	1.5 U	0.4 U	3.1 U	0.4 U	5.7 U	1.1 U	0.31 U	0.27 U	
2-Methylnaphthalene	91-57-6	38	64	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U	
Acenaphthene	83-32-9	16	57	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U	
Acenaphthylene	208-96-8	66	66	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U	
Anthracene	120-12-7	220	1,200	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U	
Fluorene	86-73-7	23	79	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U	
Naphthalene	91-20-3	99	170	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U	
Phenanthrene	85-01-8	100	480	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U	
Total HPAH (U=0)	T_HPAH (U=0)	960	5,300	--	--	mg/kg-OC	1.5 U	0.88	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U	
Total HPAH (U=1/2)	T_HPAH (U=1/2)	960	5,300	--	--	mg/kg-OC	1.5 U	2.5	3.1 U	0.4 U	5.7 U	1.1 U	0.31 U	0.27 U	
Benzo(a)anthracene	56-55-3	110	270	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U	
Benzo(a)pyrene	50-32-8	99	210	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U	
Benzo(b)fluoranthene	205-99-2	--	--	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U	
Benzo(k)fluoranthene	207-08-9	--	--	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U	
Benzo(a)fluoranthenes (total) (U=0)	56832-73-6	230	450	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U	
Benzo(a)fluoranthenes (total) (U=1/2)	T_Bkflanth (U=1/2)	230	450	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U	

Table 3.5
Previous Investigations Sediment Data—Outfall 002 NPDES Sediment Monitoring (2017)

Location Area							Upstream of Outfall 002	Downstream of Outfall 002						
Location Name							CSF-002-U1	CSF-002-1	CSF-002-2	CSF-002-3	CSF-002-4	CSF-002-5	CSF-002-6	
Sample Name							CSF-002-U1	CSF-002-1	CSF-002-2	CSF-002-3	CSF-002-4	CSF-002-5	CSF-002-6	CSF-002-6-DUP
Sample Date							8/28/2017	8/28/2017	8/28/2017	8/28/2017	8/28/2017	8/28/2017	8/28/2017	8/28/2017
Sample Depth (cm)							0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10
Analyte	CAS No.	SMS Marine SCO ⁽¹⁾	SMS Marine CSL ⁽¹⁾	SMS Marine AET SCO ⁽¹⁾	SMS Marine AET CSL ⁽¹⁾	Unit								
Semivolatile Organic Compounds—TOC-Normalized (cont.)														
Benzo(g,h,i)perylene	191-24-2	31	78	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U
Chrysene	218-01-9	110	460	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U
Dibenzo(a,h)anthracene	53-70-3	12	33	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U
Fluoranthene	206-44-0	160	1,200	--	--	mg/kg-OC	1.5 U	0.44	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U
Indeno(1,2,3-c,d)pyrene	193-39-5	34	88	--	--	mg/kg-OC	1.5 U	0.40 U	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U
Pyrene	129-00-0	1,000	1,400	--	--	mg/kg-OC	1.5 U	0.44	3.1 U	0.40 U	5.7 U	1.1 U	0.31 U	0.27 U
Polychlorinated Biphenyls (PCBs)—Dry Weight														
Aroclor 1016	12674-11-2	--	--	--	--	mg/kg	0.012 U ⁽⁴⁾	0.022 U ⁽⁴⁾	0.014 U ⁽⁴⁾	0.018 U ⁽⁴⁾	0.012 U ⁽⁴⁾	0.011 U ⁽⁴⁾	0.016 U ⁽⁴⁾	0.018 U ⁽⁴⁾
Aroclor 1221	11104-28-2	--	--	--	--	mg/kg	0.024 U ⁽⁴⁾	0.044 U ⁽⁴⁾	0.028 U ⁽⁴⁾	0.036 U ⁽⁴⁾	0.024 U ⁽⁴⁾	0.022 U ⁽⁴⁾	0.031 U ⁽⁴⁾	0.036 U ⁽⁴⁾
Aroclor 1232	11141-16-5	--	--	--	--	mg/kg	0.012 U ⁽⁴⁾	0.022 U ⁽⁴⁾	0.014 U ⁽⁴⁾	0.018 U ⁽⁴⁾	0.012 U ⁽⁴⁾	0.011 U ⁽⁴⁾	0.016 U ⁽⁴⁾	0.018 U ⁽⁴⁾
Aroclor 1242	53469-21-9	--	--	--	--	mg/kg	0.012 U ⁽⁴⁾	0.022 U ⁽⁴⁾	0.014 U ⁽⁴⁾	0.018 U ⁽⁴⁾	0.012 U ⁽⁴⁾	0.011 U ⁽⁴⁾	0.016 U ⁽⁴⁾	0.018 U ⁽⁴⁾
Aroclor 1248	12672-29-6	--	--	--	--	mg/kg	0.012 U ⁽⁴⁾	0.022 U ⁽⁴⁾	0.014 U ⁽⁴⁾	0.018 U ⁽⁴⁾	0.012 U ⁽⁴⁾	0.011 U ⁽⁴⁾	0.016 U ⁽⁴⁾	0.018 U ⁽⁴⁾
Aroclor 1254	11097-69-1	--	--	--	--	mg/kg	0.012 U ⁽⁴⁾	0.022 U ⁽⁴⁾	0.014 U ⁽⁴⁾	0.018 U ⁽⁴⁾	0.012 U ⁽⁴⁾	0.011 U ⁽⁴⁾	0.016 U ⁽⁴⁾	0.018 U ⁽⁴⁾
Aroclor 1260	11096-82-5	--	--	--	--	mg/kg	0.012 U ⁽⁴⁾	0.022 U ⁽⁴⁾	0.014 U ⁽⁴⁾	0.018 U ⁽⁴⁾	0.012 U ⁽⁴⁾	0.011 U ⁽⁴⁾	0.016 U ⁽⁴⁾	0.018 U ⁽⁴⁾
Total PCB Aroclors (U=0)	T_PCB (U=0)	--	--	0.13	1	mg/kg	0.024 U ⁽⁴⁾	0.044 U ⁽⁴⁾	0.028 U ⁽⁴⁾	0.036 U ⁽⁴⁾	0.024 U ⁽⁴⁾	0.022 U ⁽⁴⁾	0.031 U ⁽⁴⁾	0.036 U ⁽⁴⁾
Total PCB Aroclors (U=1/2)	T_PCB (U=1/2)	--	--	0.13	1	mg/kg	0.024 U ⁽⁴⁾	0.044 U ⁽⁴⁾	0.028 U ⁽⁴⁾	0.036 U ⁽⁴⁾	0.024 U ⁽⁴⁾	0.022 U ⁽⁴⁾	0.031 U ⁽⁴⁾	0.036 U ⁽⁴⁾
Polychlorinated Biphenyls (PCBs)—TOC-Normalized														
Total PCB Aroclors (U=0)	T_PCB (U=0)	12	65	--	--	mg/kg-OC	0.81 U	1.7 U	1.2 U	6.2 U	3.8 U	0.72 U	0.93 U	8.8 U
Total PCB Aroclors (U=1/2)	T_PCB (U=1/2)	12	65	--	--	mg/kg-OC	0.81 U	1.7 U	1.2 U	6.2 U	3.8 U	0.72 U	0.93 U	8.8 U
Dioxins/Furans														
2,3,7,8-TCDD	1746-01-6	--	--	--	--	ng/kg	0.210	2.15	1.49	1.77	0.201	0.204	1.57	1.33
1,2,3,7,8-PeCDD	40321-76-4	--	--	--	--	ng/kg	0.226	2.81	2.19	2.05	0.276	0.226	1.53	1.54
1,2,3,4,7,8-HxCDD	39227-28-6	--	--	--	--	ng/kg	0.0634	1.00	0.768	0.499	0.0913	0.0835	0.260 U	0.293
1,2,3,6,7,8-HxCDD	57653-85-7	--	--	--	--	ng/kg	0.204	3.56	2.00	1.37	0.265	0.222	1.05	1.15
1,2,3,7,8,9-HxCDD	19408-74-3	--	--	--	--	ng/kg	0.610	8.33	5.98	5.99	0.652	0.609	5.09	4.96
1,2,3,4,6,7,8-HpCDD	35822-46-9	--	--	--	--	ng/kg	2.71	56.0	30.2	15.0	3.48	3.36	9.81	10.4
OCDD	3268-87-9	--	--	--	--	ng/kg	17.3	381	176	66.1	23.0	24.1	45.2	53.4

Table 3.5
Previous Investigations Sediment Data—Outfall 002 NPDES Sediment Monitoring (2017)

Location Area							Upstream of Outfall 002	Downstream of Outfall 002						
Location Name							CSF-002-U1	CSF-002-1	CSF-002-2	CSF-002-3	CSF-002-4	CSF-002-5	CSF-002-6	
Sample Name							CSF-002-U1	CSF-002-1	CSF-002-2	CSF-002-3	CSF-002-4	CSF-002-5	CSF-002-6	CSF-002-6-DUP
Sample Date							8/28/2017	8/28/2017	8/28/2017	8/28/2017	8/28/2017	8/28/2017	8/28/2017	8/28/2017
Sample Depth (cm)							0–10	0–10	0–10	0–10	0–10	0–10	0–10	0–10
Analyte	CAS No.	SMS Marine SCO ⁽¹⁾	SMS Marine CSL ⁽¹⁾	SMS Marine AET SCO ⁽¹⁾	SMS Marine AET CSL ⁽¹⁾	Unit								
Dioxins/Furans (cont.)														
2,3,7,8-TCDF	51207-31-9	--	--	--	--	ng/kg	0.140	1.18	1.89	0.170	0.107	0.0902	0.0809	0.0856
1,2,3,7,8-PeCDF	57117-41-6	--	--	--	--	ng/kg	0.0150 U	0.293	1.16	0.0660 U	0.0578	0.0454	0.0536	0.0440 U
2,3,4,7,8-PeCDF	57117-31-4	--	--	--	--	ng/kg	0.0490 U	0.693	1.69	0.0930 U	0.0682	0.0663	0.0302	0.0350 U
1,2,3,4,7,8-HxCDF	70648-26-9	--	--	--	--	ng/kg	0.0480 U	0.754	1.77	0.130 U	0.0650 U	0.0600 U	0.0340 U	0.0280 U
1,2,3,6,7,8-HxCDF	57117-44-9	--	--	--	--	ng/kg	0.0480 U	0.620	1.72	0.113	0.0651	0.0669	0.0400	0.0290 U
1,2,3,7,8,9-HxCDF	72918-21-9	--	--	--	--	ng/kg	0.0350 U	0.120 U	0.160 U	0.0490 U	0.0390 U	0.0399	0.0540 U	0.0437
2,3,4,6,7,8-HxCDF	60851-34-5	--	--	--	--	ng/kg	0.0775	0.995	1.94	0.150 U	0.0773	0.0730 U	0.0460 U	0.0335
1,2,3,4,6,7,8-HpCDF	67562-39-4	--	--	--	--	ng/kg	1.29	19.5	13.1	1.94	1.35	1.21	0.748	0.789
1,2,3,4,7,8,9-HpCDF	55673-89-7	--	--	--	--	ng/kg	0.0621	0.683	0.760 U	0.0960 U	0.0550 U	0.0608	0.0224	0.0200 U
OCDF	39001-02-0	--	--	--	--	ng/kg	1.30	27.0	12.2	2.30	1.72	1.88	0.880	1.09
Dioxin/Furans (MTCA TEQ-ZeroND)	DF_TEQ (U=0)	--	--	--	--	ng/kg	0.592	7.70	6.32	4.82	0.681	0.617	3.86	3.65
Dioxin/Furans (MTCA TEQ-HalfND)	DF_TEQ (U=1/2)	--	--	--	--	ng/kg	0.606	7.71	6.33	4.86	0.686	0.623	3.88	3.66

Notes:

All results are rounded to two significant figures, except for metals and dioxins/furans, which are rounded to three, and TOC, which is presented to two decimal places.

-- Not established.

Italic Analyte was not detected at a reporting limit greater than applicable criterion.

RED/BOLD Analyte was detected at a concentration greater than the applicable SMS Marine SCO and CSL.

1 The SMS marine chemical criteria are TOC-normalized for nonpolar organics and dry-weight values are used for metals and polar organics. Data are screened to the SMS marine chemical criteria (TOC-normalized and dry-weight values) and also the marine sediment dry-weight AETs.

2 When TOC is outside the range of 0.5% to 3.5%, results may be compared to both the TOC-normalized criteria and the dry-weight AET values.

3 One sample in the vicinity of Outfall 002 had a detected exceedance of bis(2-ethylhexyl)phthalate. Phthalates are commonly associated with anthropogenic plastics and there are no indications that phthalates are a Site COI.

4 Results presented in the original report tables had inconsistent notes explaining units. Dry-weight results were reported in mg/kg but were inferred to be in µg/kg based on TOC-normalized results and context from other PCB results in the same event. Results in this table are reported in mg/kg.

Abbreviations:			
AET	Apparent Effects Threshold	MTCA	Model Toxics Control Act
CAS	Chemical Abstracts Service	ng/kg	Nanograms per kilogram
cm	Centimeters	NPDES	National Pollutant Discharge Elimination System
COI	Contaminant of interest	OCDD	Octachlorodibenzo-p-dioxin
cPAH	Carcinogenic polycyclic aromatic hydrocarbon	OCDF	Octachlorodibenzofuran
CSL	Cleanup screening level	PAH	Polycyclic aromatic hydrocarbon
HPAH	High molecular weight polycyclic aromatic hydrocarbon	PeCDD	Pentachlorodibenzo-p-dioxin
HpCDD	Heptachlorodibenzo-p-dioxin	PeCDF	Pentachlorodibenzofuran
HpCDF	Heptachlorodibenzofuran	SCO	Sediment Cleanup Objective
HxCDD	Hexachlorodibenzo-p-dioxin	Site	Cosmo Specialty Fibers, Inc., Site
HxCDF	Hexachlorodibenzofuran	SMS	Sediment Management Standards
LPAH	Low molecular weight polycyclic aromatic hydrocarbon	TCDD	Tetrachlorodibenzo-p-dioxin
µg/kg	Micrograms per kilogram	TCDF	Tetrachlorodibenzofuran
mg/kg	Milligrams per kilogram	TEQ	Toxic equivalent
mg/kg-OC	Milligrams per kilogram organic carbon-normalized	TOC	Total organic carbon

Qualifier:

U Analyte was not detected at the associated reporting limit.

Table 6.1
Phase 1 Data Quality Objectives and RI Approach

DQO-ID	DQO Description	Summary of Proposed Field Activities ⁽¹⁾
Media-Specific DQOs		
Soil		
1	Refine understanding of Site stratigraphy, including key geologic units, the fill–native soil interface, and the depths to key soil horizons (vadose zone, capillary fringe, and saturated zone) to support evaluation of potential contaminant migration pathways and groundwater flow.	- Collect soil samples from surface and subsurface soils via a direct-push rig, hollow-stem auger, sonic drill rig, or hand tools (e.g., hand auger) in key source areas. Conduct continuous geologic logging in the Main Mill Complex, Waste and Fill Areas, Sloughs and Drains, Wood Stave Pipe Corridor, and Westport Ponds Area. - Maximum depths of soil borings are dependent on the source area and are summarized in the SAP.
2	Evaluate soil chemistry data relative to applicable screening levels to identify presence or absence of contamination and potential COIs and to support RI development of the CSM, including relationships between potential sources and contaminant migration pathways.	Analyze soil samples for Site COIs at key soil horizons.
3	Identify potential source areas in locations lacking prior environmental data through soil and groundwater sampling and analysis.	Analyze collocated saturated soil and groundwater samples for Site COIs.
4	Refine the vertical distribution of contamination in fill areas, including evaluation of impacts at the fill–native soil interface and underlying soil.	- Complete a subset of borings as monitoring wells and well points in the Main Mill Complex, Waste and Fill Areas, Sloughs and Drains, Wood Stave Pipe Corridor, and Westport Ponds Area. - Complete a subset of borings as monitoring wells and well points adjacent to the Chehalis River and Site surface water bodies. - Conduct semiannual groundwater sampling at monitoring wells during the RI for up to 2 years (two total events, targeting wet season and dry season).
5	Evaluate the potential for contaminant migration from soil to groundwater based on soil chemistry, stratigraphy, and hydrogeologic conditions.	- Conduct Site-wide 1-day groundwater snapshots prior to each groundwater sampling event. - Conduct a wet season and dry season minimum 72-hour tidal study coinciding with groundwater monitoring events. - Install pressure transducers to record long-term groundwater level fluctuations adjacent to Site freshwater bodies.
Groundwater		
6	Refine understanding of hydrostratigraphy, groundwater elevations, and the influence of tidal fluctuations to support development of the hydrogeologic CSM.	- Conduct Site-wide 1-day groundwater snapshots prior to each groundwater sampling event. - Conduct a wet season and dry season minimum 72-hour tidal study coinciding with groundwater monitoring events. - Install pressure transducers to record long-term groundwater level fluctuations adjacent to Site freshwater bodies.
7	Evaluate groundwater chemistry data relative to applicable criteria to identify the presence or absence of contamination and potential COIs and to support development of the RI CSM.	Analyze collocated saturated soil and groundwater samples for Site COIs.

Table 6.1
Phase 1 Data Quality Objectives and RI Approach

DQO-ID	DQO Description	Summary of Proposed Field Activities ⁽¹⁾
Media-Specific DQOs (cont.)		
Groundwater (cont.)		
8	Evaluate groundwater chemistry data to assess contaminant distribution and the potential for migration within and beyond the Site, including downgradient transport and potential migration toward surface water features.	- Complete a subset of borings as monitoring wells and well points in the Main Mill Complex, Waste and Fill Areas, Sloughs and Drains, Wood Stave Pipe Corridor, and Westport Ponds Area. - Complete a subset of borings as monitoring wells and well points adjacent to the Chehalis River and Site surface water bodies. - Collect groundwater samples from temporary monitoring wells from select borings. - Conduct semiannual groundwater sampling at monitoring wells during the RI until Phase 2 (two total events, targeting wet season and dry season).
9	Evaluate groundwater–surface water interactions in areas where hydraulic connectivity is anticipated, to assess the potential for exchange between groundwater and surface water and associated contaminant transport.	Analyze collocated groundwater and surface water samples for Site COIs.
Surface Water and Sediment		
10	Evaluate surface water and sediment chemistry data relative to applicable screening criteria to identify the presence or absence of contamination and potential COIs and to support development of the RI CSM.	Analyze collocated surface water and sediment samples for Site COIs.
11	Evaluate surface water and sediment data to assess whether contaminants from upland source areas may be migrating to on-site surface water features.	Analyze collocated groundwater, surface water, and sediment samples for Site COIs.

Table 6.1
Phase 1 Data Quality Objectives and RI Approach

Area of Potential Concern	Summary of Proposed Field Activities ⁽¹⁾
Areas of Potential Concern Approach	
Main Mill Complex—Primary Operations Area	
Caustic Storage AST Area Groundwater DQOs: 6, 7, 8	- Install well points for semiannual groundwater sampling adjacent to and downgradient of the caustic storage AST. - Conduct a targeted seep survey on the adjacent riverbank at lowest low tide to confirm the presence of the historic seep and identify whether additional seeps are present.
Chip Storage, Chip Plant, and Receiving Areas - Soil DQOs: 1, 2, 3, 5 - Groundwater DQOs: 6, 7, 8	Advance soil borings and install monitoring wells for semiannual groundwater sampling within and downgradient of the chip storage, chip plant, and receiving areas.
Former Log Storage and Hog Fuel Piles - Soil DQOs: 1, 2, 3, 5 - Groundwater DQOs: 6, 7, 8	Advance soil borings and install monitoring wells for semiannual groundwater sampling within and downgradient of the former log storage and hog fuel piles.
Jet Fuel ASTs - Soil DQOs: 1, 2, 3, 5 - Groundwater DQOs: 6, 7, 8	Advance soil borings and install monitoring wells for semiannual groundwater sampling within and downgradient of the former jet fuel AST.
Power House ASTs - Soil DQOs: 1, 2, 3, 5 - Groundwater DQOs: 6, 7, 8	Advance soil borings and install monitoring wells for semiannual groundwater sampling within and downgradient of the power house ASTs.
Forestry Storage Building - Soil DQOs: 1, 2, 3, 5 - Groundwater DQOs: 6, 7, 8	Advance soil borings immediately adjacent to building.
Main Mill Complex—Eastern Operations Area	
Wastewater Treatment System Ponds Area - Soil DQOs: 1, 2, 3, 5 - Groundwater DQOs: 6, 7, 8	- Advance soil borings and install monitoring wells for semiannual groundwater sampling downgradient of the bioponds and storage pond to determine if leachate is impacting soil and groundwater. - Install a background monitoring well for semiannual groundwater sampling.
Mill Slough, Sweet Sewer Slough, and Woodyard Riverside Drain - Groundwater DQOs: 6, 7, 8, 9 - Surface Water and Sediment DQOs: 10 and 11	- Collect collocated surface water and sediment samples during a one-time low-flow sampling event from the Mill Slough, Sweet Sewer Slough, the Woodyard Riverside Drain. - At a subset of the collocated surface water and sediment samples, install collocated well points for sampling during the surface water/sediment sampling event and subsequently during semiannual monitoring. - Collect transducer and static groundwater levels during groundwater monitoring to identify hydraulic gradients and groundwater–surface water interactions to the freshwater bodies.
Ash Pad Areas - Soil DQOs: 1, 2, 3, 5 - Groundwater DQOs: 6, 7, 8	- Advance soil borings in the Ash Pad Areas to characterize dioxins/furans in surface soil (0 to 2 feet bgs) and subsurface soil above presumable aquitard. - Install monitoring wells for semiannual groundwater sampling downgradient of the Ash Pad Areas.

Table 6.1
Phase 1 Data Quality Objectives and RI Approach

Area of Potential Concern	Summary of Proposed Field Activities ⁽¹⁾
Areas of Potential Concern Approach (cont.)	
Main Mill Complex—Waste and Fill Areas	
Northwest Fill Area - Soil DQOs: 2, 3, 4, 5 - Groundwater DQOs: 6, 7, 8	- Advance hand auger locations up to approximate depths of 10 feet bgs to delineate the extent of fill. - Install a monitoring well and well points for semiannual groundwater sampling downgradient of the Ash Pad Areas.
North and South Fill Areas Soil DQOs: 2, 3, 4, 5	Advance hand auger locations up to approximate depths of 10 feet bgs to delineate the extent of fill.
Woodwaste (Knots) Landfill and Rejects Area - Soil DQOs: 2, 3, 4, 5 - Groundwater DQOs: 6, 7, 8	- Collect samples at the fill–native interface from a subset of hand auger locations within the Waste and Fill Areas. - Install a background monitoring well and well points, where feasible, for semiannual groundwater sampling downgradient of the Woodwaste (Knots) Landfill. - Collect transducer and static groundwater levels during groundwater monitoring to identify hydraulic gradients and groundwater–surface water interactions from Waste and Fill Areas to freshwater sloughs and drains.
Wood Stave Pipe Corridor	
Wood Stave Pipe Corridor - Soil DQOs: 1, 2, 3, 5 - Groundwater DQO: 7 ⁽²⁾	- Advance soil borings adjacent to the Wood Stave Pipe and known leak areas along the Wood Stave Pipe Corridor. - Install temporary monitoring wells in select soil borings for the collection of grab groundwater samples.
Westport Ponds Area	
Westport Ponds Area - Soil DQOs: 1, 2, 3, 4, 5 - Groundwater DQOs: 6, 7, 8,	- Advance soil borings and hand auger locations adjacent to the potentially PCB-containing transformers and ASTs upgradient of the Westport Ponds. - Install monitoring wells on the Westport Pond berms and near the East and West Ponds and sample new and existing wells during semiannual groundwater events. - Collect transducer and static groundwater levels during groundwater monitoring to identify hydraulic gradients and groundwater–surface water interactions to the Chehalis River.

Notes:

- 1 Detailed field investigation protocols and approach are detailed in the SAP. Analytical methods and analytes are specified in the QAPP.
- 2 The groundwater data collected from these temporary monitoring wells will not be compared to regulatory criteria in the RI because the samples are likely to be turbid; instead, these data will be used to evaluate presence or absence of COIs in groundwater.

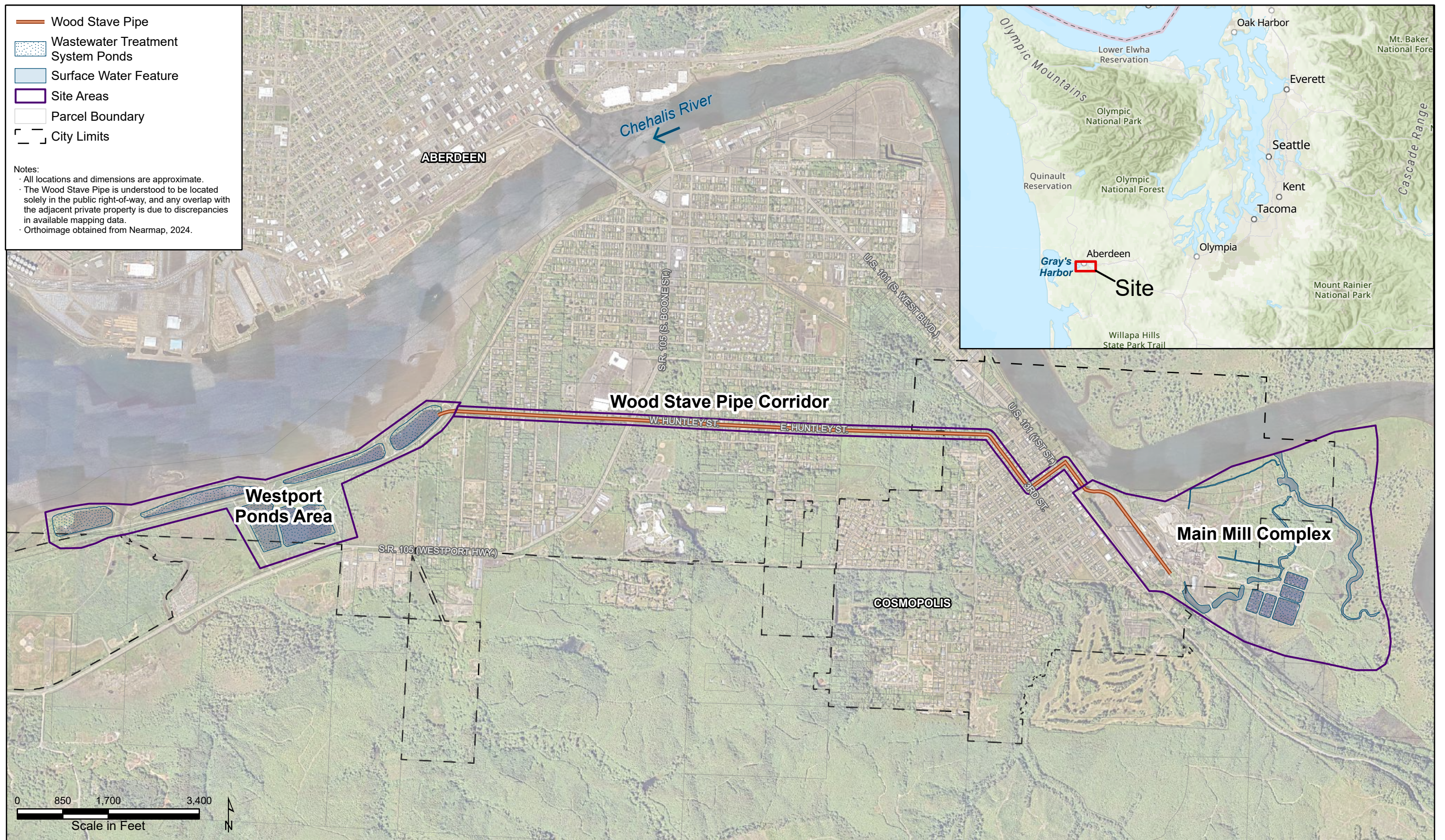
Abbreviations:

AST	Aboveground storage tank	PCB	Polychlorinated biphenyl
bgs	Below ground surface	QAPP	Quality Assurance Project Plan
biopond	Biological pond	RI	Remedial Investigation
COI	Contaminant of interest	SAP	Sampling and Analysis Plan
CSM	Conceptual site model	Site	Cosmo Specialty Fibers, Inc., Site
DQO	Data quality objective		

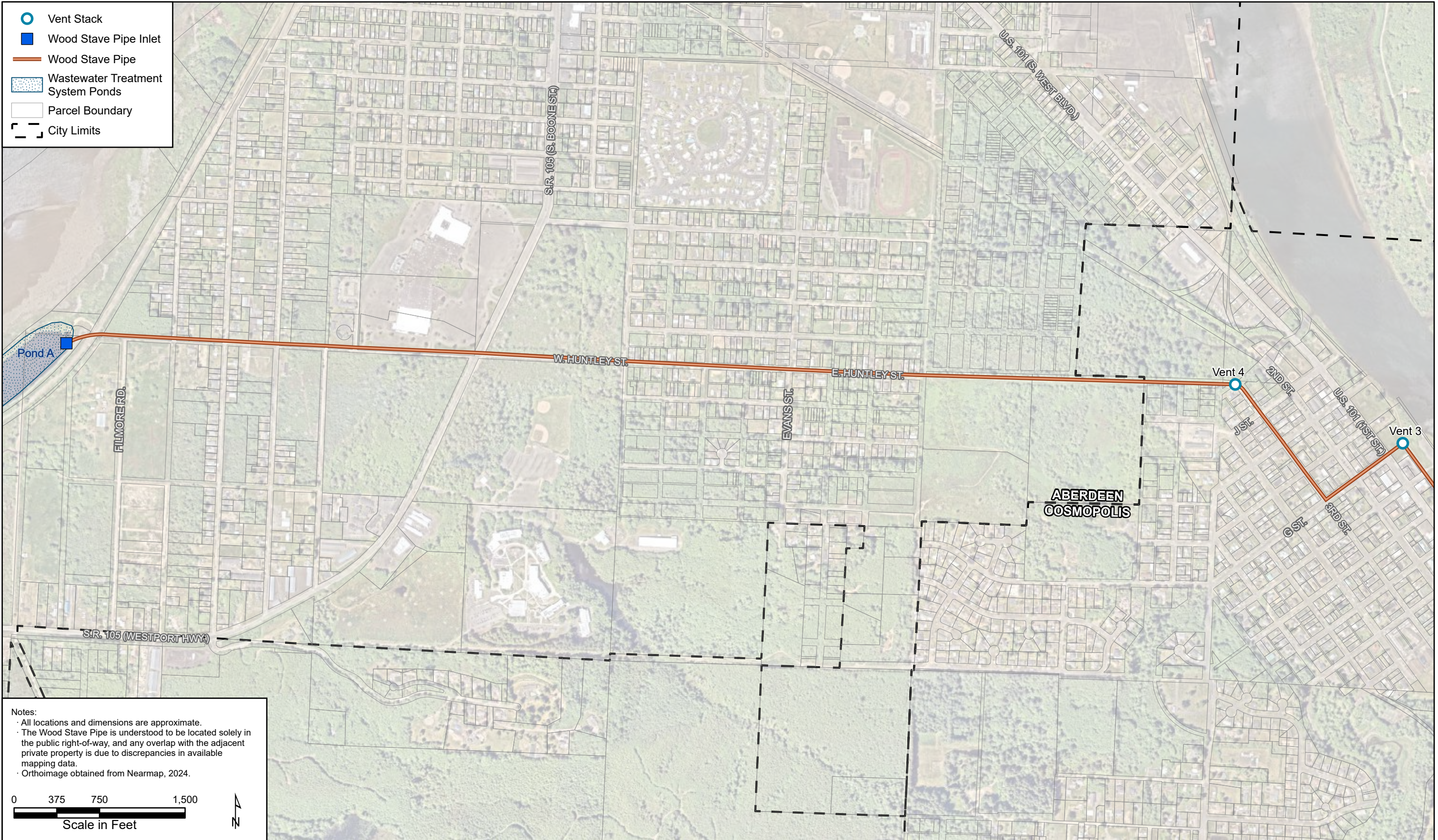
Phase 1 Remedial Investigation Work Plan

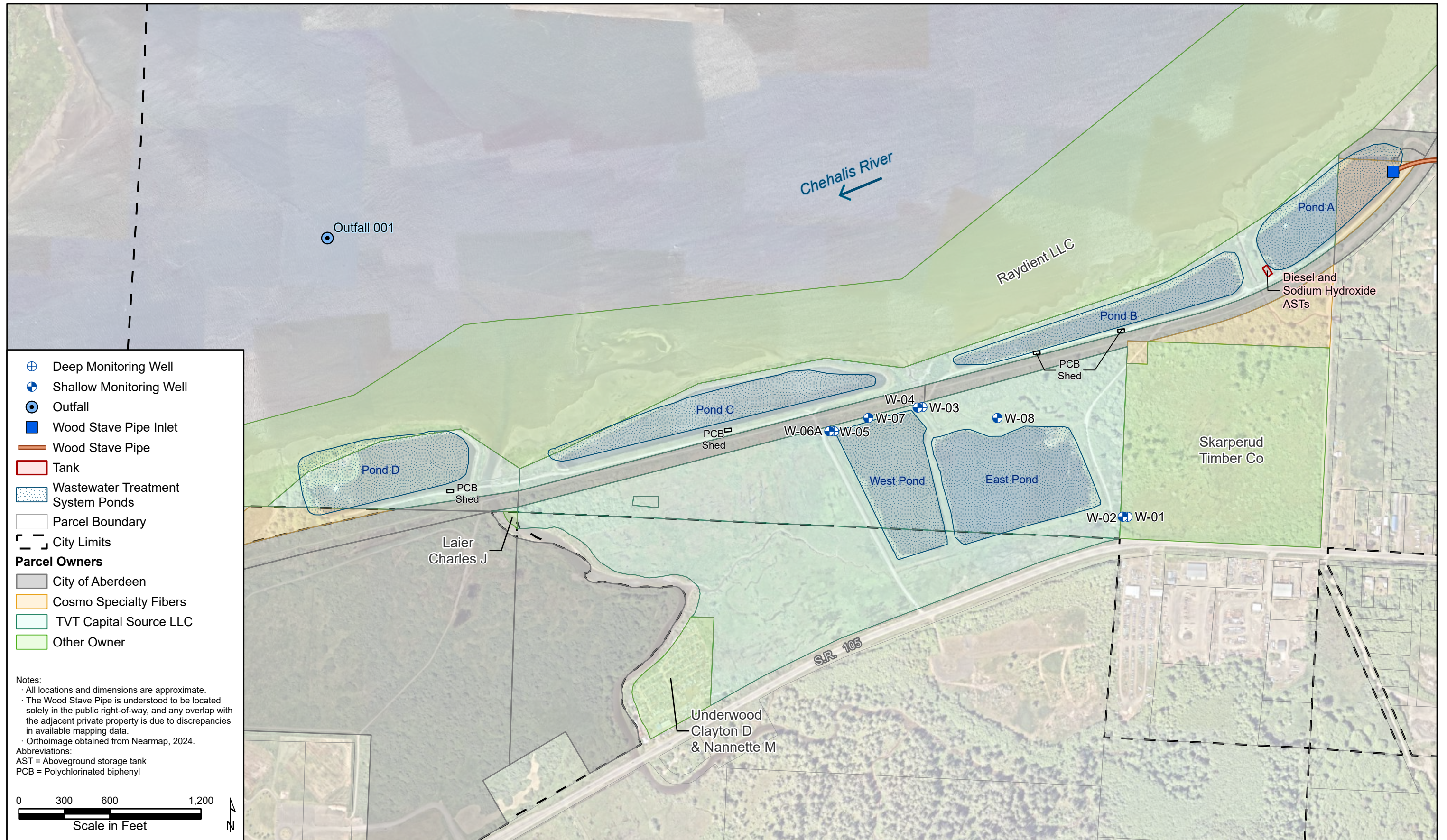
Cosmo Specialty Fibers Site

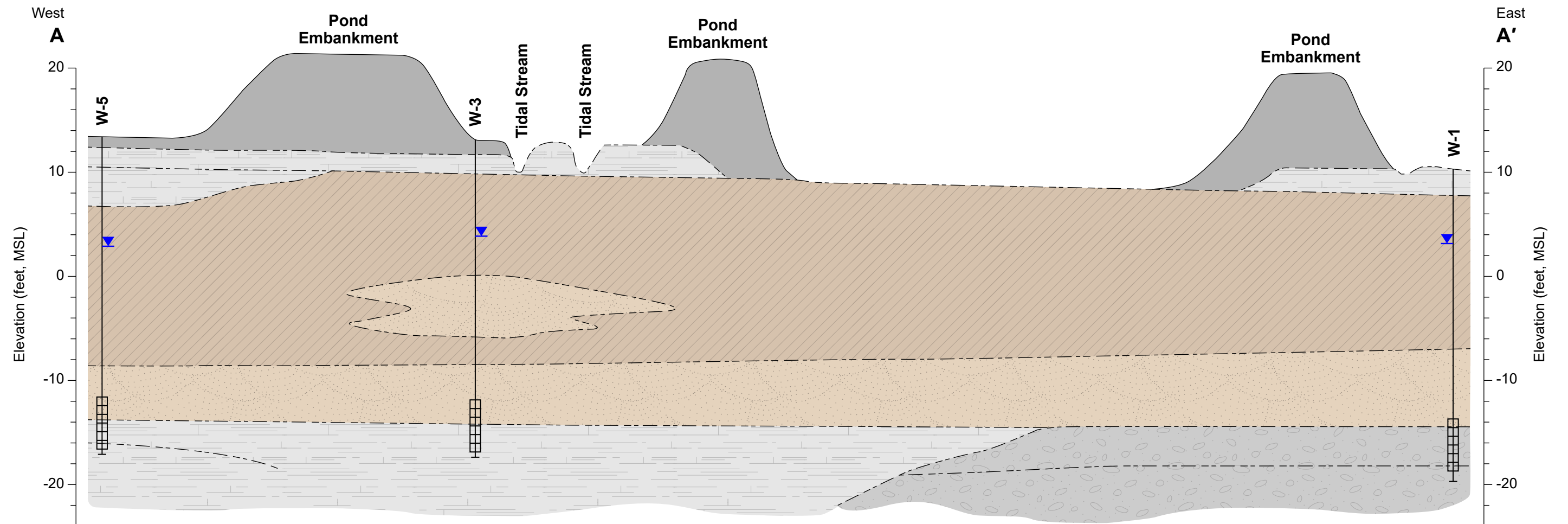
Figures



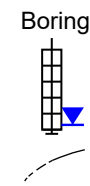
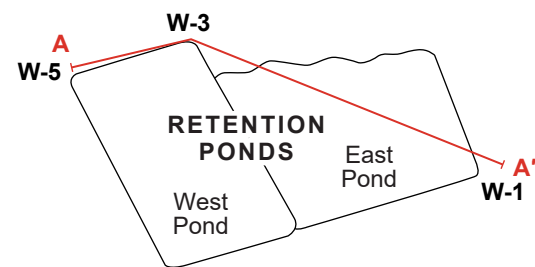








Cross Section Location



Identifier (bolded)

Well Screen Interval

Groundwater Elevation (collected by Antea Group in December 2025)

Contact Boundary Between Lithologies (dashed where inferred)

Soil Descriptions

	Embankment/Road Base
	Clay
	Silt
	Sand
	Gravel

Abbreviation: MSL = Mean sea level

Note: Figure is reproduced from Figure 3 of the 1988 Weyerhaeuser Sludge Pond Facility Report by Sweet-Edward/EMCON, Inc.

Horizontal Scale in Feet

0 80 160

0 5 10

Vertical Scale in Feet

Vertical Exaggeration = 16x

FLOYD | SNIDER

strategy • science • engineering

Phase 1 Remedial Investigation Work Plan

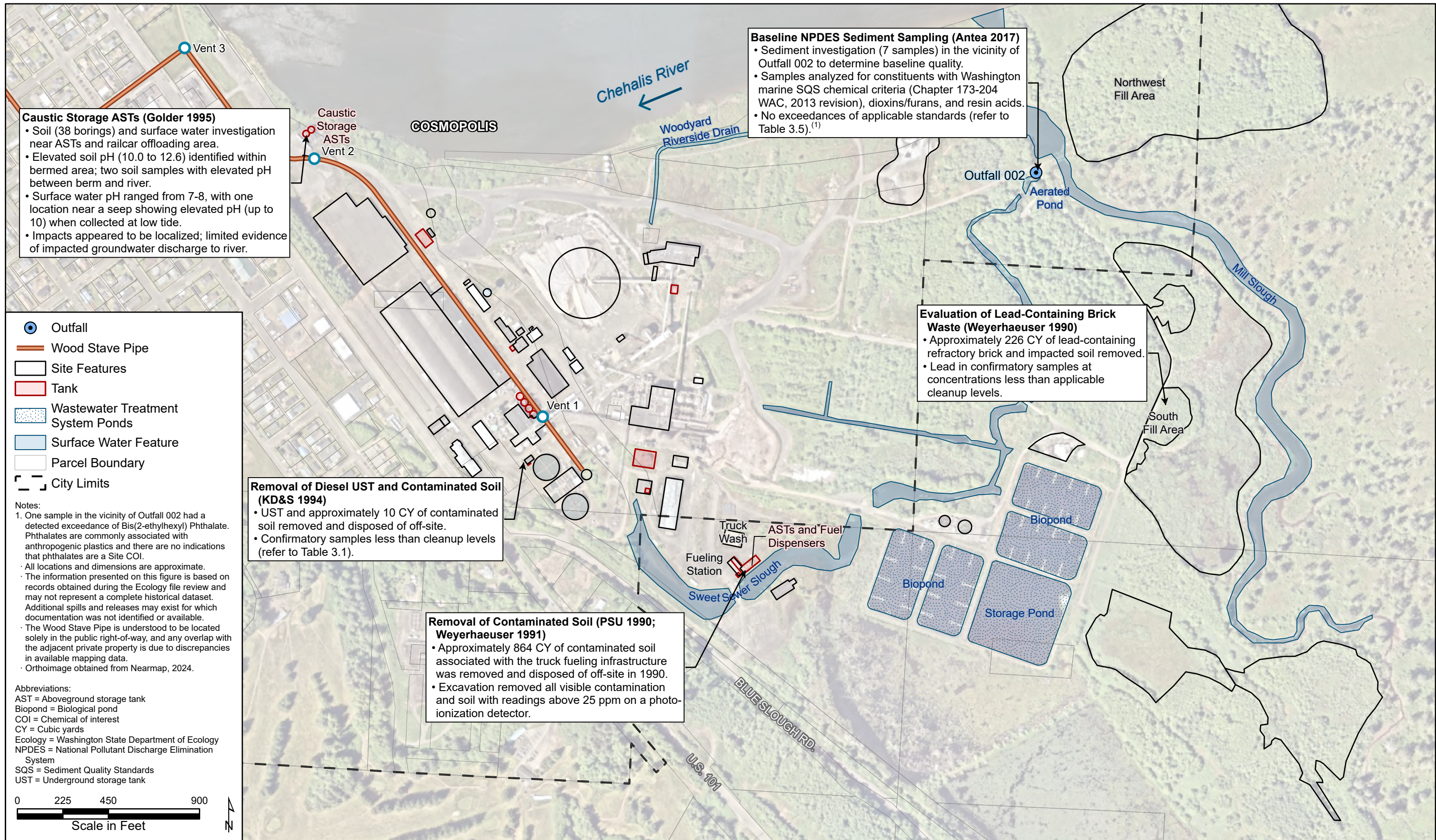
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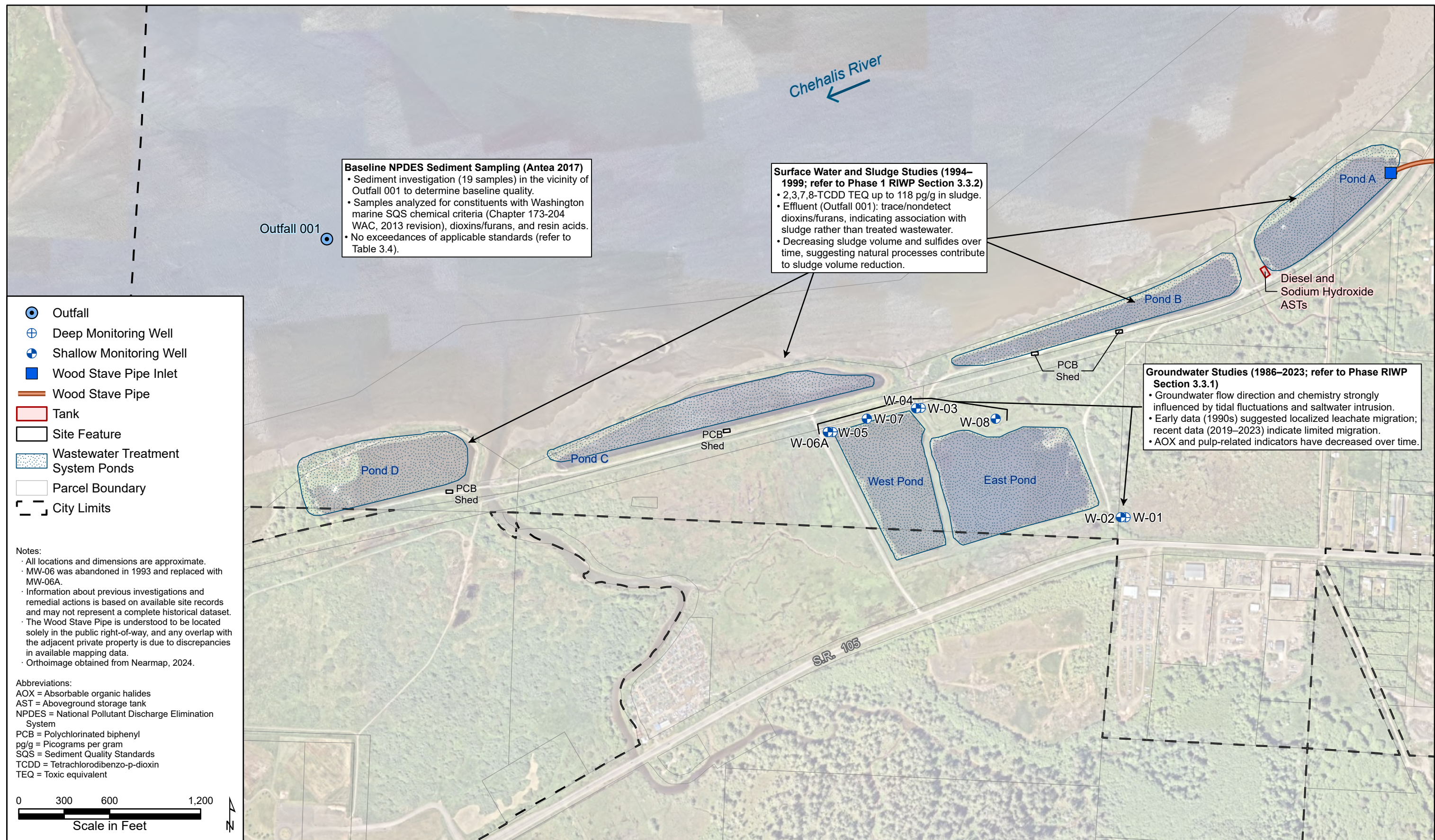
Cosmopolis, Washington

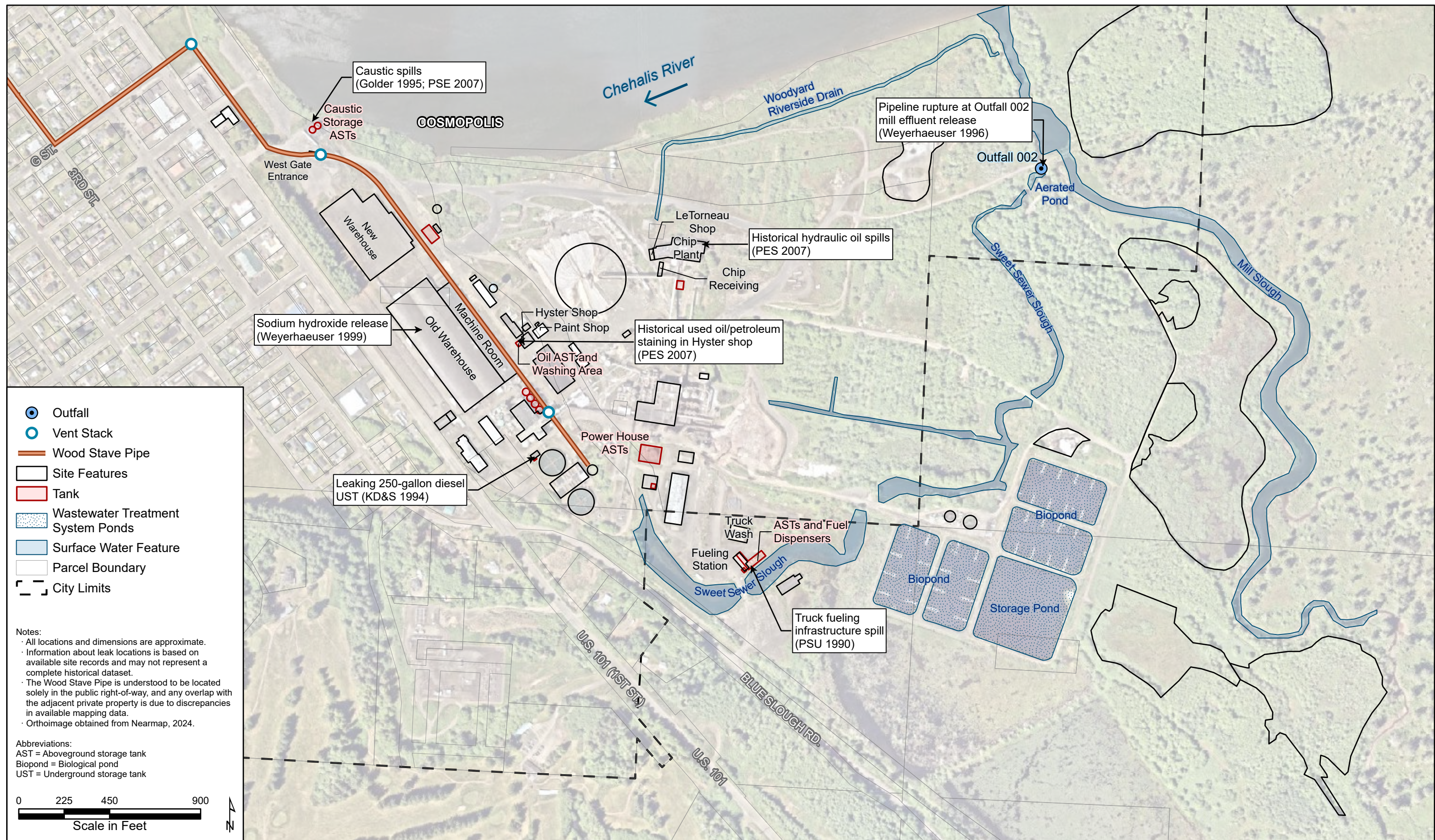
Figure 2.4

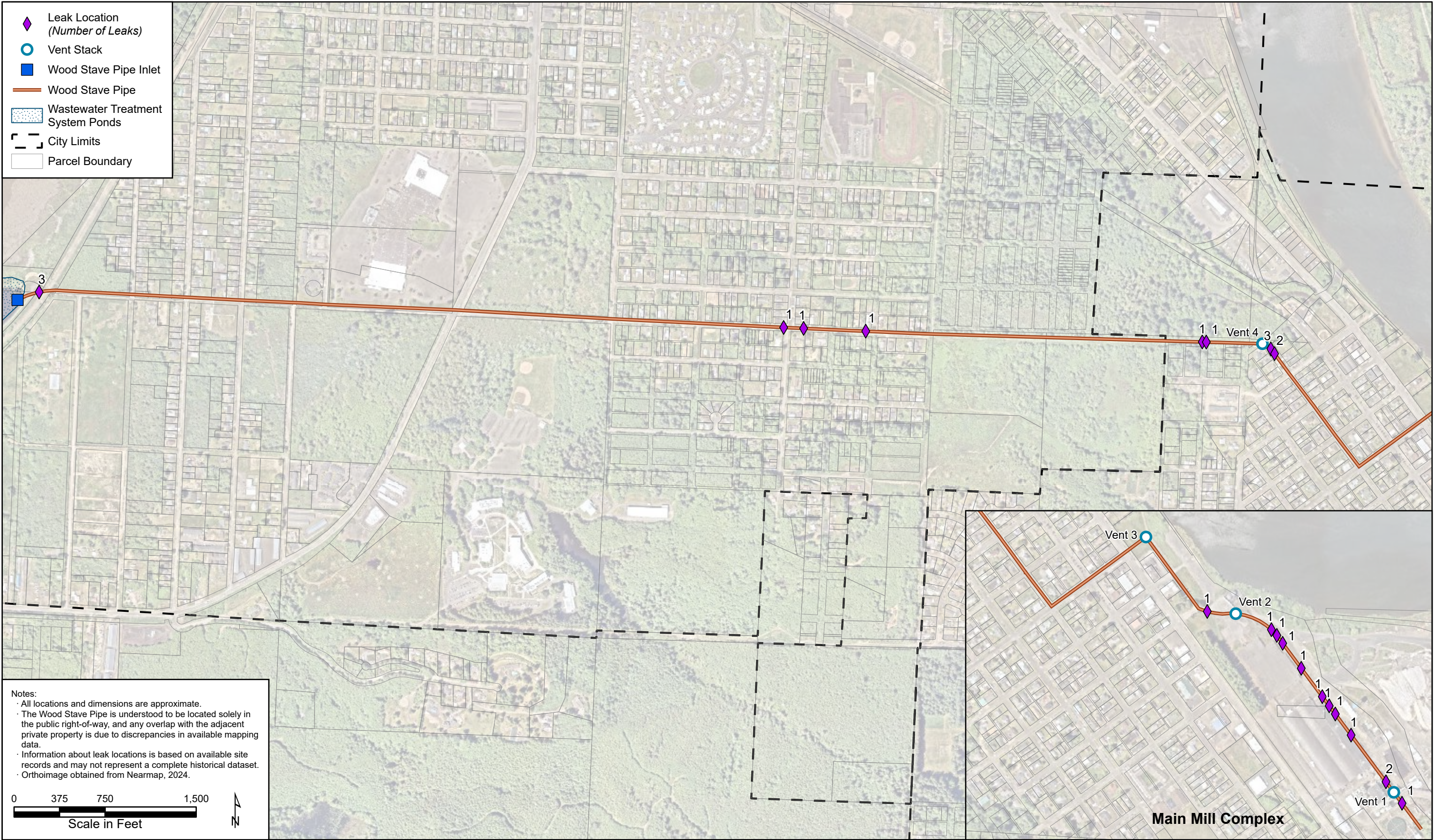
Schematic Site Hydrogeology Cross-Section—

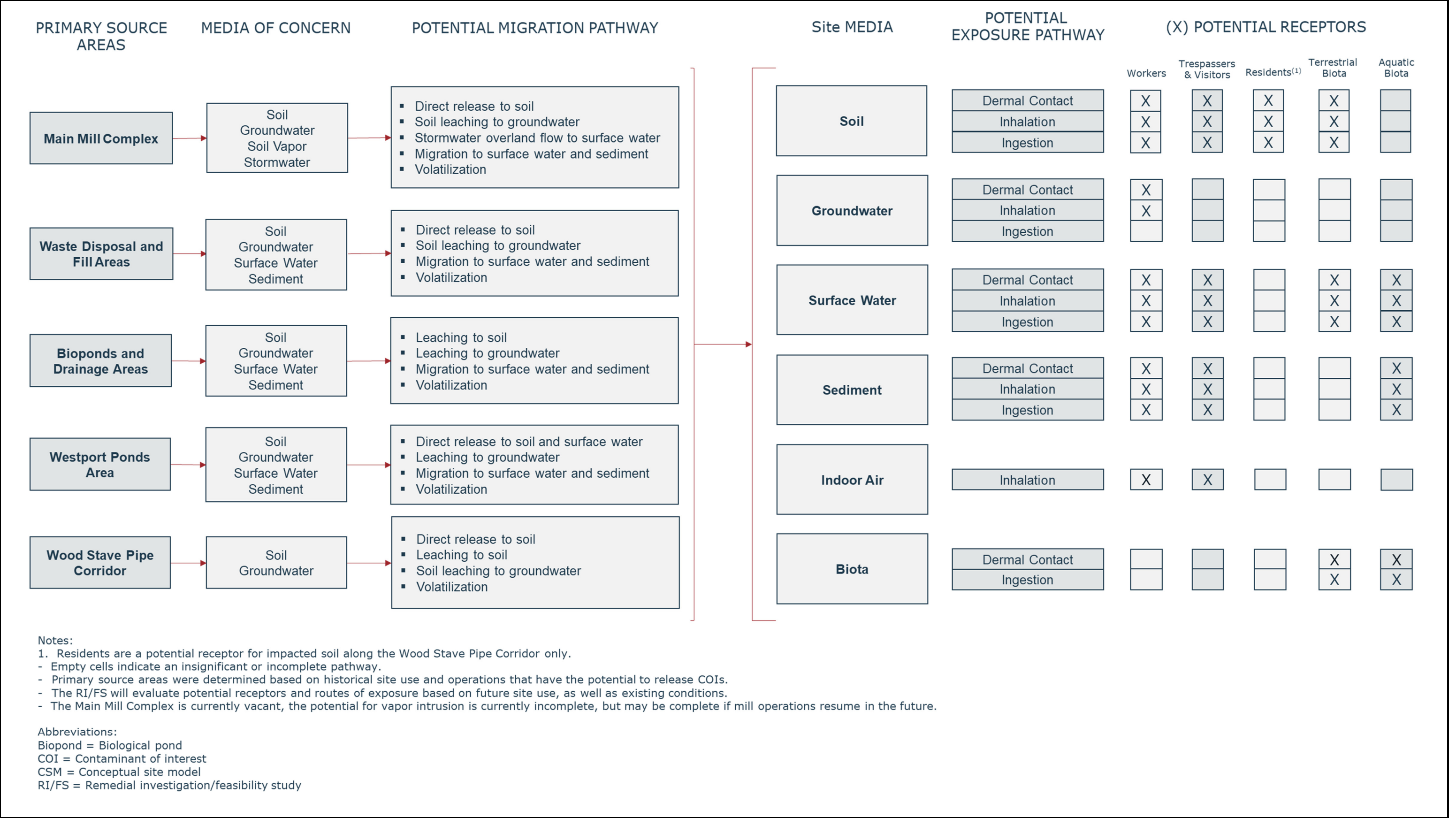
Westport Ponds Area



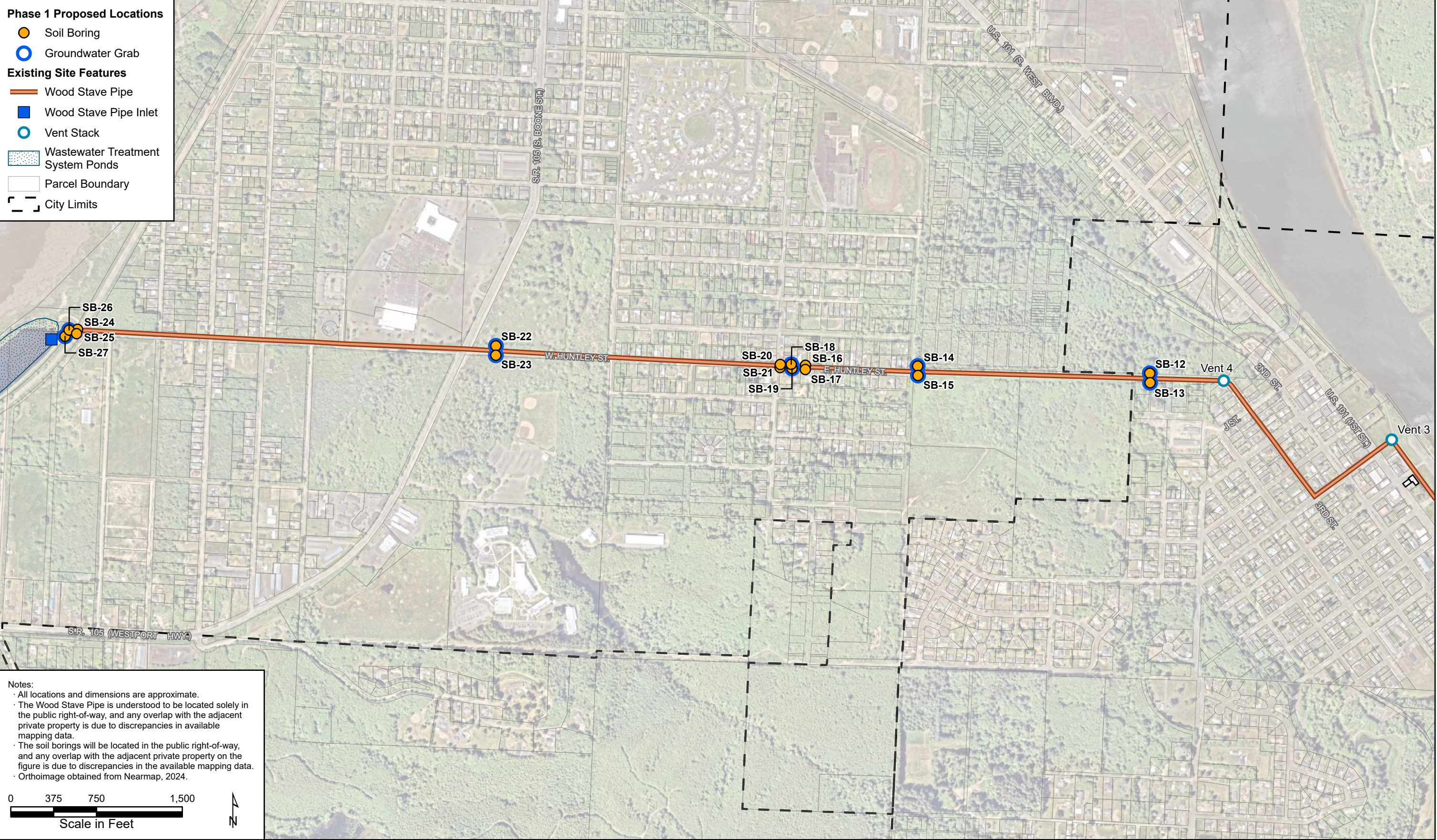


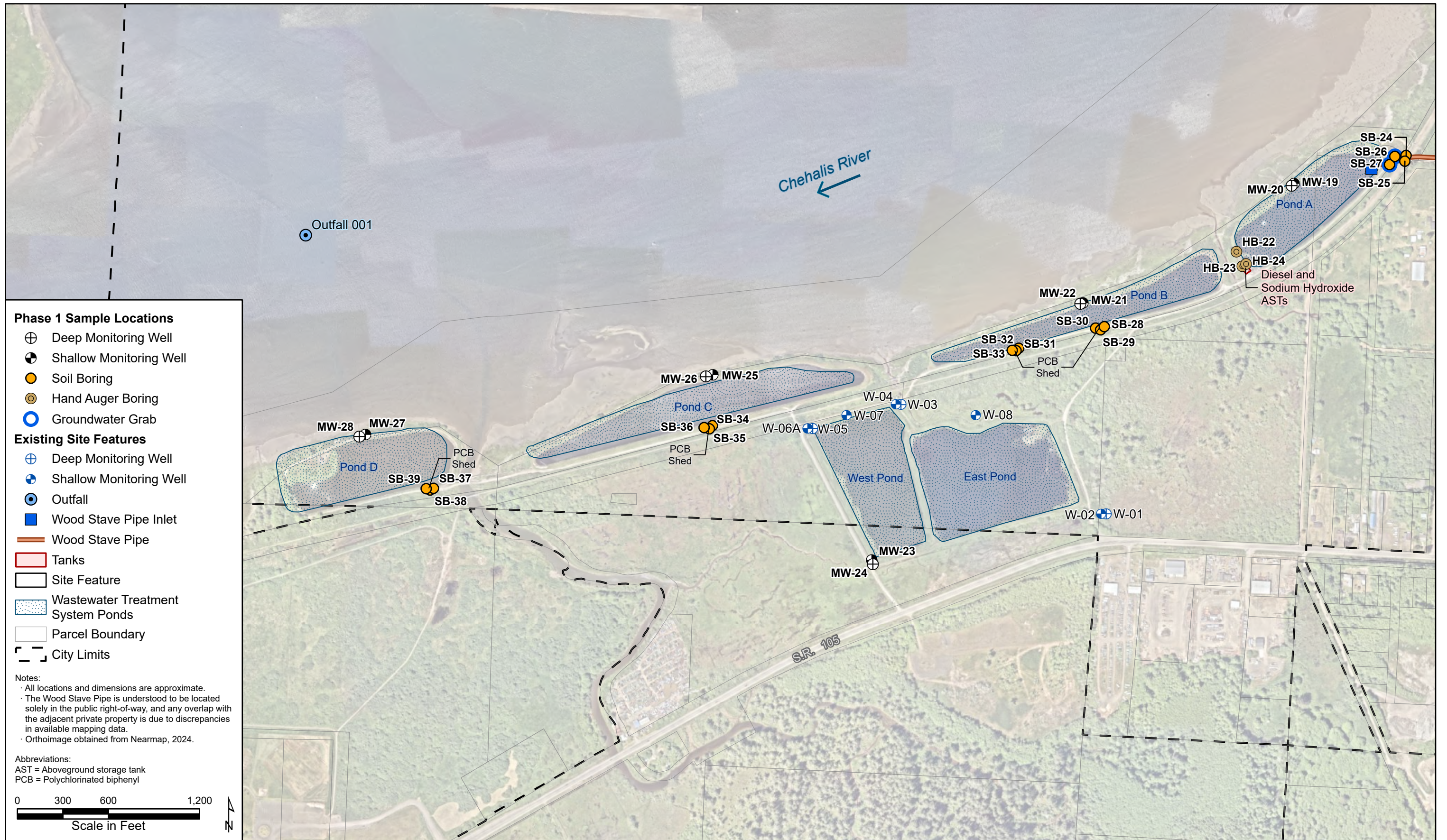












Phase 1 Remedial Investigation Work Plan

Cosmo Specialty Fibers Site

Appendix A Historical Boring Logs

PROJECT COSMOPOLIS RETENTION PONDSPage 1 of 1Location S.E. CORNERBoring No. W-1

Surface Elevation _____

Drilling Method 6 1/2 IN. HOLLOW STEM AUGERTotal Depth 30FTDrilled By GEO TECHDate Completed OCTOBER 12, 1987Logged By J. COOPER

WELL DETAILS	PENE- TRATION TIME/ RATE	DEPTH (FEET)	SAMPLE		PERME- ABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
			NO.	TYPE				
			1	GRAB		ML	SILT, trace fine gravel & sand, abundant organics, brown to dark brown, dry.	
		5	2	SS			CLAY, micaceous, organics, grey, damp.	
		10	3	SS		CL	trace to some silt minor organics, root holes.	
		15	4	SS			trace fine-grained sand.	
		20	5	SS		SP	SAND, interbedded fine- and medium-grained, clean, dark grey, wet.	
		25	6	SS				
			7	SS				
			8	SS		GP	Gravel, fine to coarse grained, trace sand to sandy, trace to some silt, wet.	
			9	SS				
		30	10	SS		GM	GRAVEL, fine to coarse and fine-grained. SAND, some silt.	
							Bottom of Boring 30ft *SS = split spoon	



PROJECT COSMOPOLIS RETENTION PONDS

Page 1 of 1

Location S.E. CORNER - 10FT NORTH OF W-1

Boring No. W-2

Surface Elevation _____

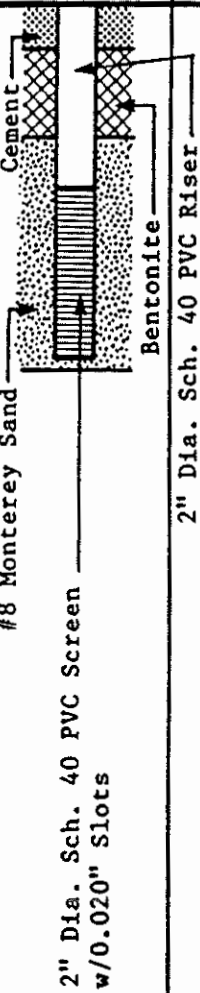
Drilling Method 6 1/2 INCH HOLLOW STEM AUGER

Total Depth 10 1/2 FT

Drilled By GEO TECH

Date Completed OCTOBER 13, 1987

Logged By J. COOPER

WELL DETAILS	PENE- TRATION TIME/ RATE	DEPTH (FEET)	SAMPLE		PERME- ABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
			NO.	TYPE				
 #8 Monterey Sand 2" Dia. Sch. 40 PVC Screen w/0.020" Slots 2" Dia. Sch. 40 PVC Riser Bentonite Cement			1	GRAB		ML	SILT, some sand and gravel, dark brown, some organics, wet.	
		5	2	SS			CLAY, grey, organics, damp.	
		10	3	SS		CL	trace to some silt, slightly micaceous.	
							Bottom of Boring 10 1/2 ft *SS = split spoon	



PROJECT COSMOPOLIS RETENTION PONDS

Page 1 of 1

Location EAST POND DIKE ROAD, ADJACENT
TO NAVIGATIONAL MARKER

Boring No. W-3

Surface Elevation

Drilling Method 6 1/2 INCH HOLLOW STEM AUGER

Total Depth 30 1/2 FT

Drilled By GEO TECH

Date Completed OCTOBER 13, 1987

Logged By J. COOPER

WELL DETAILS	PENE- TRATION TIME/ RATE	DEPTH (FEET)	SAMPLE		PERME- ABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
			NO.	TYPE				
			1	GRAB		GM	Road Base	
						ML	SILT, some fine-grained sand some gravel, brown to yellow brown, organics, dry.	
		5	2	SS		CL	CLAY, trace to some silt, grey brown with abundant iron staining, micaceous, some organics, damp.	
		10	3	SS			- no iron staining, damp to wet.	
		15	4	SS		SP	SAND, fine-grained, clean to trace silt, damp.	
		20	5	SS		CL	CLAY, some silt, grey to blue grey, micaceous, damp.	
		25	6	SS		SP	SAND, fine-grained, clean to trace silt, grey to grey brown, damp to wet.	
		30	7	SS		ML	SILT, trace to some fine-grained sand, grey to dark grey, micaceous, occasional organics, damp to wet.	
							Bottom of Boring 30 1/2 ft *SS = split spoon	

PROJECT COSMOPOLIS RETENTION PONDSPage 1 of 1Location EAST POND DIKE ROAD, ADJACENT TO
NAVIGATION MARKERBoring No. W-4

Surface Elevation _____

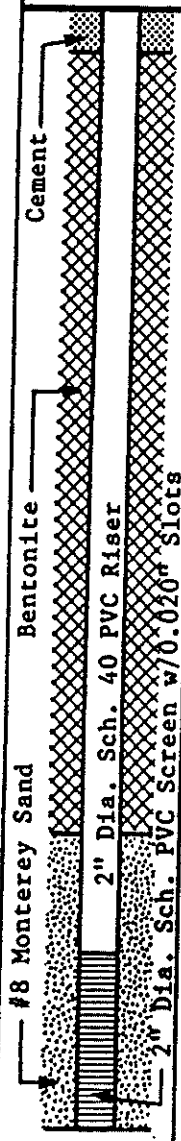
Drilling Method 6 1/2 IN. HOLLOW STEM AUGERTotal Depth 10 1/2 FTDrilled By GEO TECHDate Completed OCTOBER 13, 1987Logged By J. COOPER

WELL DETAILS	PENE- TRATION TIME/ RATE	DEPTH (FEET)	SAMPLE		PERME- ABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
			NO.	TYPE				
			1	GRAB		GM	Road Base	
						ML	SILT, some gravel, brown, roots, dry.	
		5	2	SS		CL	CLAY, some silt, grey brown with abundant iron staining, micaceous, minor organics slightly damp to occasional wet.	
		10	3	SS			grey to dark grey, occasional blue grey mottling, frequent organics.	
							Bottom of Boring 10 1/2 ft *SS - split spoon	

PROJECT COSMOPOLIS RETENTION PONDSPage 1 of 1Location JUNCTION OF ROADS WEST AND NORTH
OF WEST PONDBoring No. W-5

Surface Elevation _____

Drilling Method 6 1/2 INCH HOLLOW STEM AUGERTotal Depth 30 1/2 FTDrilled By GEO TECHDate Completed OCTOBER 13, 1987Logged By J. COOPER

WELL DETAILS	PENE- TRATION TIME/ RATE	DEPTH (FEET)	SAMPLE		PERME- ABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
			NO.	TYPE				
			1	GRAB		GM	Road Base	
						ML	SILT, some fine-grained sand, and gravel, brown to yellow brown, organics, dry.	
		5	2	SS		ML	SILT, some clay, grey to dark grey with occasional iron staining, micaceous-occasional organics, damp to wet.	
		10	3	SS			CLAY, some silt, grey, organics, wet.	
		15	4	SS		CL	buried log	
		20	5	SS				
		25	6	SS		SM	SAND, fine-grained, occasional medium sand, some silt to occasionally silty, grey, damp.	
		30	7	SS		ML	SILT, some fine-grained sand to sandy, some fine gravel, micaceous, grey, damp.	
			8	SS		ML	SILT, sandy, micaceous, yellow brown to light grey.	
							Bottom of Boring 30 1/2 ft *SS = split spoon	



PROJECT COSMOPOLIS RETENTION PONDS

Page 1 of 1

Location JUNCTION OF ROADS WEST AND NORTH
OF WEST POND

Surface Elevation _____

Total Depth 10 1/2 FT

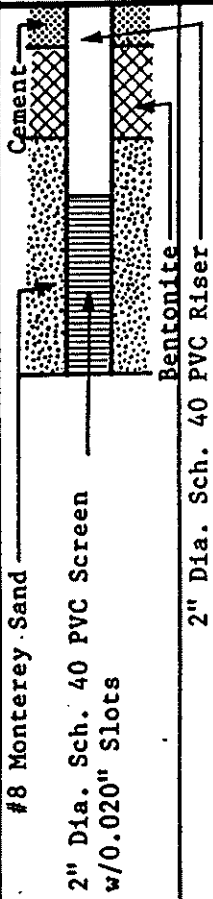
Date Completed OCTOBER 13, 1987

Boring No. W-6

Drilling Method 6 1/2 INCH HOLLOW STEM AUGER

Drilled By GEO TECH

Logged By J. COOPER

WELL DETAILS	PENE- TRATION TIME/ RATE	DEPTH (FEET)	SAMPLE		PERME- ABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
			NO.	TYPE				
			1	GRAB		GM	Road Base	
						ML-SM	SILT, and fine-grained sand trace to some gravel, brown to yellow brown, some organics, dry.	
		5	2	SS		ML	SILT, some clay, grey to grey to grey brown, micaceous, some organics, damp.	
		10	3	SS		CL	CLAY, some silt, grey to grey brown, micaceous, some organics, damp.	
							Bottom of Boring 10 1/2 ft *SS = split spoon	



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BORING LOG

PROJECT COSMOPOLIS RETENTION PONDS

Page 1 of 1

Location NORTH OF WEST POND

Boring No. W-7

Surface Elevation 13.4 FT

Drilling Method 4-IN. HOLLOW STEM AUGER

Total Depth 15 FT

Drilled By SOIL SAMPLING SERVICE, INC.

Date Completed OCTOBER 18, 1988

Logged By KGL

WELL DETAILS	PENE- TRATION TIME/ RATE	DEPTH (FEET)	SAMPLE		PERME- ABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
			NO.	TYPE				
		0				GM	Gravel Road Base	
		5	1	SS		ML	SILT: brown; some organics; soft; moist	
		10	2	SS		ML/CL	SILTY CLAY: grey; some organics; low plasticity; soft; moist wet at approximately 8 feet	
		15	3	SS		ML/SM	SANDY SILT: gray; v. fine sand; trace clay; trace organics; low plasticity; soft; moist	
							Drill and sample to 16.5 ft Sound boring at 14.7 ft	



Sweet-Edwards / EMCON, Inc.

BORING LOG

PROJECT COSMOPOLIS RETENTION PONDS

Page 1 of 1

Location NORTH OF EAST POND

Boring No. W-8

Surface Elevation 9.6 FT

Drilling Method 4-IN. HOLLOW STEM AUGER

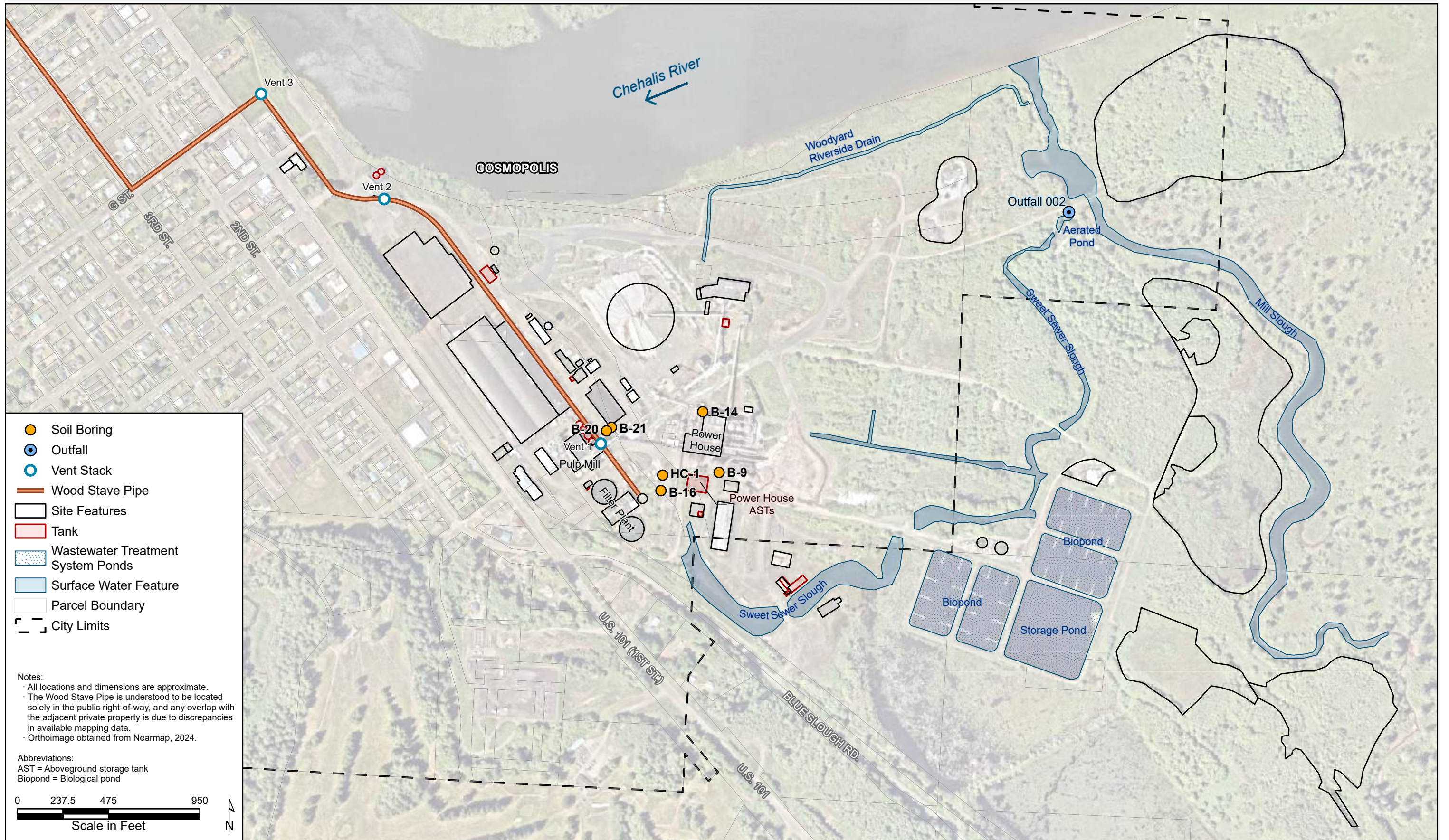
Total Depth 15 FT

Drilled By SOIL SAMPLING SERVICE, INC.

Date Completed OCTOBER 18, 1988

Logged By KGL

WELL DETAILS	PENE- TRATION TIME/ RATE	DEPTH (FEET)	SAMPLE		PERME- ABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
			NO.	TYPE				
		+5						
		0				ML	CLAYEY SILT: light brown; some organics; low plasticity; soft; moist	
		5	1	SS		ML / CL	SILTY CLAY: grey; abundant organics; med. plasticity; soft; moist to wet, v. soft	
		10	2	SS		ML	CLAYEY SILT: light grey to bluish grey; low plasticity; soft; moist	
		15	3	SS		ML / SH	CLAYEY SILT to SANDY SILT with thin sand interbeds: light grey; v. fine sand; soft; moist	
							Drill and sample to 16.5 ft. Sound boring at 15 ft	



Phase 1 Remedial Investigation Work Plan

Cosmo Specialty Fibers Site

Appendix B Sampling and Analysis Plan

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List of Attachments

Attachment B.1 Floyd|Snider Standard Guidelines and Field Forms

List of Abbreviations

Abbreviation	Definition
AO	Agreed Order
AOPC	Area of potential concern
bgs	Below ground surface
COI	Contaminant of interest
D/F	Dioxin/furan
DO	Dissolved oxygen
DQO	Data quality objective
DRO	Diesel-range organics
Ecology	Washington State Department of Ecology
EPH	Extractable petroleum hydrocarbons
GRO	Gasoline-range organics
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSA	Hollow-stem auger
HSO	Health and Safety Officer
MS/MSD	Matrix spike/matrix spike duplicate
MTCA	Model Toxics Control Act
NTU	Nephelometric turbidity units
ORO	Oil-range organics
ORP	Oxidation–reduction potential
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
Phase 1 RIWP	Phase 1 Remedial Investigation Work Plan
PID	Photoionization detector
PLP	Potentially Liable Person

Abbreviation	Definition
PM	Project manager
PPE	Personal protective equipment
PVC	Polyvinyl chloride
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
RI	Remedial investigation
SAP	Sampling and Analysis Plan
Site	Cosmo Specialty Fibers, Inc., Site
SMS	Sediment management standards
sonic	Rotosonic
SVOC	Semivolatile organic compound
TOC	Total organic carbon
TPH	Total petroleum hydrocarbons
USCS	Unified Soil Classification System
VOC	Volatile organic compound
VPH	Volatile petroleum hydrocarbons
Weyerhaeuser	Weyerhaeuser NR Company

1.0 Introduction

This Sampling and Analysis Plan (SAP) presents the procedures for Phase 1 remedial investigation (RI) field activities at the Cosmo Specialty Fibers, Inc., Site (Site) in Cosmopolis, Washington. This SAP has been prepared as an appendix to the Phase 1 Remedial Investigation Work Plan (Phase 1 RIWP), which was prepared on behalf of Weyerhaeuser NR Company (Weyerhaeuser). The Phase 1 RIWP describes the overall proposed RI activities, the phased approach, schedules, and project management strategies. Quality assurance (QA) and quality control (QC) procedures applicable to the SAP field activities are described in the Quality Assurance Project Plan (QAPP), provided as Appendix C to the Phase 1 RIWP, and health and safety requirements are described in the site-specific Health and Safety Plan (HASP), provided as Appendix D to the Phase 1 RIWP. The work described in the SAP, QAPP, HASP, and Phase 1 RIWP is being conducted pursuant to Agreed Order (AO) No. 23839 between Weyerhaeuser and the Washington State Department of Ecology (Ecology), which was executed on October 29, 2025. Weyerhaeuser is named as a Potentially Liable Person (PLP) under AO No. 23839, and Cosmo Specialty Fibers, Inc. is named as a PLP under a separate AO No. 23840 for the Site. Additionally, Ecology has also determined The Gores Group LLC to be a PLP at the Site (Ecology 2025).

The Site includes three primary operational areas: the Main Mill Complex, the Wood Stave Pipe Corridor, and the Westport Ponds Area. The purpose of the Phase 1 field investigation is to conduct a screening-level evaluation across the Site to establish preliminary information on the nature and extent of contamination, identify potential contaminants of interest (COIs), and improve understanding of potential contaminant migration pathways outside the core mill operations area including the areas associated with the Wood Stave Pipe Corridor and Westport Ponds Area. The investigation emphasizes characterization of perimeter and downgradient groundwater conditions, targeted evaluation of areas of potential concern (AOPCs), and soil sampling along the Wood Stave Pipe Corridor to evaluate potential releases. Limited surface water and sediment sampling within facility surface water features (i.e., drains and sloughs) will also be conducted to evaluate potential contaminant migration from upland areas to on-site aquatic environments.

The Phase 1 RI activities will be conducted after Phase 1 RIWP approval from Ecology, and Ecology will be provided with 7 days' notice prior to beginning sampling. In accordance with the AO, Ecology may obtain split samples. Subsequent RI phases will be developed after reviewing the results from the Phase 1 RI activities.

The objective of the subsequent RI/Feasibility Study for this Site is to complete a comprehensive Site-wide assessment that will support the evaluation of remedial alternatives and recommendation of a cleanup alternative that will meet Model Toxics Control Act (MTCA) criteria and is consistent with reasonably anticipated future Site use. The facility is currently inactive and has not been mothballed, and the current owner has indicated that future resumption of Site operations is under consideration. The property is currently zoned for industrial/manufacturing use, with industrial waterfront-related land use designations along the Chehalis River, and it is assumed that future site use will remain zoned as industrial.

This SAP is organized into the following sections:

- Section 2.0—Project Organization and Responsibilities
- Section 3.0—Sample Collection and Handling Procedures
- Section 4.0—Documentation and Oversight
- Section 5.0—References

2.0 Project Organization and Responsibilities

2.1 PROJECT TEAM RESPONSIBILITIES

The following sections describe the responsibilities of project team members for fulfillment of the SAP. The contact information for key project team members is provided in Table B.1.

2.2 MANAGEMENT RESPONSIBILITIES

2.2.1 Luke Thies—Weyerhaeuser Project Manager

Luke Thies is the project manager (PM) for Weyerhaeuser, the PLP named under the AO. Mr. Thies will perform the following:

- Provide support in defining project objectives
- Authorize field activities to be performed
- Ensure AO compliance, maintaining project implementation responsibility on behalf of Weyerhaeuser
- Communicate with Ecology
- Review and approve all deliverables before submission to Ecology

2.2.2 Jessi Massingale—Floyd|Snider Principal in Charge

The Floyd|Snider principal in charge will have responsibility for project implementation, working closely with the Floyd|Snider PM to ensure QA on work products and project oversight. She will perform the following:

- Provide senior-level review of the documents submitted to the client and regulators
- Monitor project activity and quality
- Provide senior-level support to the Floyd|Snider PM
- Provide technical review of findings during conference calls or meetings with the PLP Group

2.2.3 Kara Hitchko—Floyd|Snider Project Manager

The Floyd|Snider PM will be involved in all aspects of this project, including monitoring project activity and quality, providing overview of field activities to Weyerhaeuser and Ecology, and reviewing deliverables and is responsible for technical QC and project oversight. She will perform the following:

- Approve the Phase 1 RIWP, SAP, and QAPP
- Monitor project activity and quality

- Develop a project schedule
- Provide overview of field activities to the client and regulators
- Prepare and review the draft investigation findings report

2.2.4 Chell Black—Floyd|Snider Quality Assurance Manager

The Floyd|Snider QA manager reports directly to the Floyd|Snider PM and will be responsible for ensuring that all QA/QC procedures for this project are being performed in accordance with the QAPP. The QA manager will be responsible for laboratory coordination and managing data validation of all sample results from the analytical laboratories. Additional responsibilities include the following:

- Review laboratory reports and enter data into the Floyd|Snider database
- Advise on corrective action procedures
- Manage database and queries
- Prepare data validation reports
- Load analytical data to Ecology's Environmental Information Management database

2.3 FIELD RESPONSIBILITIES

2.3.1 Manique Talaia-Murray—Floyd|Snider Field QA Officer

The Floyd|Snider field QA officer will be responsible for implementation of the day-to-day activities and field data collection program, including sample handling and custody documentation. The field QA officer will work closely with the PM to ensure that the required sample collection and laboratory analyses are completed. The field QA officer will also be responsible for ensuring that all field activities are performed in accordance with the health and safety procedures outlined in the HASP (Appendix D of the Phase 1 RIWP). Specific responsibilities include the following:

- Develop and implement work plans and setting the field schedule
- Adhere to work schedule
- Coordinate and manage field staff
- Review technical data provided by the field staff, including field measurement data
- Coordinate and oversee subcontractors
- Identify problems, resolve difficulties in consultation with the Floyd|Snider PM, and implement and document corrective action procedures

2.3.2 Amy Booth—Floyd|Snider Health and Safety Officer

The Floyd|Snider Health and Safety Officer (HSO) will be responsible for ensuring that the HASP is properly implemented and will work closely with the field QA officer to conduct site inspections and make health and safety decisions based on site conditions. The HSO will coordinate with field staff, address any additional hazards not covered in the HASP, and revise the HASP, if appropriate.

2.4 SPECIAL TRAINING/CERTIFICATIONS

The Floyd|Snider field QA officer and all field personnel will be 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER)-certified, consistent with Occupational Safety and Health Administration 29 CFR 1910.120, and be trained in groundwater, surface water, soil, and sediment sample collection methods described in the following sections. The field QA officer will be responsible for ensuring that field staff and contractors have the necessary training and that field staff are up to date on the annual 8-hour HAZWOPER refresher course.

2.5 LABORATORY RESPONSIBILITIES

The analytical laboratory selected for this project will either be Eurofins Environmental Testing, based in Tacoma, Washington, or Analytical Resources, LLC, based in Tukwila, Washington. Both laboratories are Ecology-accredited and are capable of performing all analytical services in support of the Phase 1 RI activities and have current environmental laboratory accreditation from Ecology as established in WAC 173-50 for the analytical methods to be used.

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3.0 Sample Collection and Handling Procedures

3.1 SAMPLING DESIGN AND APPROACH

The Phase 1 field investigation, and any additional investigation phases, will be completed to prepare a comprehensive RI for the Site. The ultimate objective of the Phase 1 field investigation is to conduct a screening-level evaluation across the Site to establish preliminary information on the nature and extent of contamination, identify potential COIs, and improve understanding of potential contaminant migration pathways outside the core mill operations area including the areas associated with the Wood Stave Pipe Corridor and Westport Ponds. The investigation emphasizes characterization of perimeter and downgradient groundwater conditions, targeted evaluation of AOPCs, and soil sampling along the Wood Stave Pipe Corridor to evaluate potential releases. Refer to Section 6.0 and Table 6.1 of the Phase 1 RIWP for additional details on data quality objectives (DQOs) and investigation approach.

The Phase 1 field investigation will include the collection of soil, groundwater, surface water, and sediment samples for laboratory analysis, as described in the Phase 1 RIWP DQOs. The scope of the Phase 1 investigation in the mill operations area is intentionally limited due to uncertainty regarding future Site use and the potential for mill operations to resume during or after the RI. Although the Site is not currently operational, it has not been mothballed. A restart of operations could introduce new releases or alter Site conditions, potentially affecting the representativeness of investigation results, particularly in the mill operations area and wastewater treatment system ponds (including the bioponds, storage pond, and Westport Ponds). In addition, health and safety considerations associated with deteriorating infrastructure (e.g., leaking tanks, damaged equipment, and loose metal sheeting) may constrain investigation activities. Therefore, sampling locations may be adjusted in the field if safety or access concerns are identified. Additional sampling for Phase 2 RI in the mill operations area will be considered as conditions allow.

Sampling procedures, including field methodology, sample nomenclature, sample handling, and custody documentation are described in the following sections. Detailed information for each proposed sampling location, including location coordinates, anticipated soil sample intervals, target sample depths, and sample analyses for soil, groundwater, and surface water and sediment are presented in Tables B.2 through B.4. Refer to Tables C.7 and C.8 in the QAPP for a summary of container types, preservation methods, and holding times for all sample analyses.

3.1.1 Utility Locate

Prior to beginning any exploration activities, underground utilities must be located and marked by public and private utility locators. At least 48 hours prior to drilling activities, the Washington Utility Notification Center will be contacted, which will in turn notify the various utilities in the area to mark any underground installations in the vicinity of the Site. Exploration locations will be marked in white paint and adjusted, if necessary, to avoid any underground utilities that are identified.

In addition to marking out the location of utilities on the surface by a utility locator, the first 5 feet below ground surface (bgs) of soil near the Wood Stave Pipe Corridor must be cleared using hand tools or a vacuum truck to identify potential utilities or the Wood Stave Pipe.

3.2 MONITORING WELL INSTALLATION AND DEVELOPMENT

Monitoring well construction and development will be performed in accordance with the Floyd|Snider monitoring well construction and development standard guidelines (included in Attachment B.1). A total of 28 new monitoring wells will be installed across the Site (18 at the Main Mill Complex and 10 at the Westport Ponds Area). Wells will be installed using a combination direct-push (Geoprobe) and hollow-stem auger (HSA) or rotosonic (sonic) drilling methods with an outer auger diameter of at least 6 inches. A 2-inch-diameter Schedule 40 polyvinyl chloride (PVC) well with a 5- to 10-foot-long, 0.010-inch screen will be installed at the direction of the field geologist and set to intercept the water table. At the Westport Ponds Area, the shallow water-bearing zone is expected to be encountered within a thin silt with sand and gravel layer that is present in the top 2 to 6 feet and overlies an impermeable thick clay layer that is between 7 and 15 feet thick. Groundwater depths for existing wells screened within the shallow water-bearing zone was measured between 2.5 and 6.5 feet bgs; the existing wells were screened at depths between 5 and 14 feet bgs within the shallow water-bearing zone. A deeper alluvial water-bearing zone is also present in the Westport Ponds Area. The deeper water-bearing zone is present within fine to medium sand and gravel layers that is encountered between 12 to 22 feet bgs and underlies the clay layer. Groundwater depths in the existing deep monitoring wells was measured between 4.5 and 10 feet bgs. The existing monitoring wells were screened at depths between 24 and 30 feet bgs across the deep water-bearing zone, which indicate that the deeper water-bearing zone may be confined or partially confined. Paired shallow and deep monitoring wells will be installed at the Westport Ponds to target both water-bearing zones; the shallow wells will be screened across the shallow water-bearing zone and the deep wells will be screened across the deeper water-bearing zone within the sand and gravel layers underlying the silty clay. The screen intervals will be based on field observations and lithology. The shallow monitoring wells next to Ponds A-D will also be installed to intercept the bottom of the ponds, along with the top of groundwater, and the screens will be placed at least 3 feet below the clay pond liner, if encountered. At the Main Mill Complex, groundwater in historical borings was encountered between approximately 1 and 7 feet bgs. Well screens for the Main Mill Complex are expected to be placed approximately 5 to 10 feet bgs; however, screen intervals will be based on lithology and field descriptions.

Borings to be completed as a monitoring well will be advanced up to depths of 30 feet bgs at the Westport Ponds and up to depths of 20 feet bgs at the Main Mill Complex. The placement and length of the screened interval will be based on field conditions and lithology observations at the direction of the field geologist. Wells will be constructed of 0.010-inch slotted PVC, unless the field geologist indicates otherwise based on the grain size of material encountered in the subsurface. If the clay pond liner is observed during drilling around the Westport Ponds, the driller will place at least 2 feet of bentonite above and below the liner to preserve the integrity of the pond liner. Wells will be fitted with watertight caps and completed with flush-mounted or stick-up monuments and bollards.

A Washington-licensed professional geologist, or a person working under the direct supervision of a Washington-licensed professional geologist or hydrogeologist, will oversee well installations and document well construction. During borehole advancement, the geologist will log borehole cuttings using standard geologic methods (i.e., soil type, Unified Soil Classification System [USCS] group name, particle size information, gradation, shape, color, consistency, moisture content, plasticity, cementation, and presence of foreign material) and complete a borehole log and well completion diagram. The geologist will be responsible for determining borehole depth and well screen placement using existing site information and field observations as described previously.

After installation, new and existing monitoring wells will be developed to remove fine-grained material by purging with a submersible pump and surging with the pump or a surge block to move water through the sand pack and surrounding soil formation. Monitoring wells will be developed until the purge water achieves visual clarity. Purged groundwater will be collected in 55-gallon drums for profiling and off-site disposal.

3.2.1 Well Point Installation and Development

A total of eight well points will be installed at the Main Mill Complex. Four of these well points will be collocated with surface water and sediment samples in the Mill Slough. Well points will be installed and developed in accordance with the standard operating procedure for operating drive point piezometers in Attachment B.1. Temporary well points will be installed by directly driving the well screen and casing to approximately 2 to 3 feet below the top of groundwater (approximately 6 to 10 feet bgs) using a slide hammer and/or gas-powered post driver. The well point will be constructed with ¾-inch inner diameter, 3-foot-long stainless-steel casing, and a 6-inch-long stainless-steel screen.

Well points will be developed using a peristaltic pump to purge water. Well points will be developed until the purge water achieves visual clarity. Purged groundwater will be collected in 55-gallon drums for profiling and off-site disposal.

3.2.2 Well Survey

The newly installed monitoring wells and well points will be field located by taking field measurements from permanent features at the Site or in the vicinity. All new and existing monitoring wells and well points will be surveyed for horizontal positioning and elevation by a licensed surveyor. Horizontal positioning of all exploration locations will be reported to the nearest 0.1 feet; top-of-casing elevations will be reported to the nearest 0.01 feet.

3.3 SOIL SAMPLE COLLECTION

3.3.1 Soil Borings Using a Drill Rig

Across all three primary operational areas within the Site, a total of 67 soil borings will be advanced, using a drill rig, with 28 of these borings to be completed as permanent monitoring wells. Soil samples from borings will be collected using Geoprobe and HSA or sonic drilling

methods for classification and laboratory analysis. Soil borings for monitoring well installation will be advanced up to 30 feet bgs, and Geoprobe or sonic borings will be advanced up to 20 feet bgs, unless the field geologist indicates otherwise based on field observations. If field screening (i.e., sheen, staining, or elevated photoionization detector [PID] readings) indicates that contamination may be present at depth, borings will be advanced until the vertical extent of contamination has been delineated. The vertical extent of contamination is considered delineated after at least two successive soil vapor head space sample readings collected over a 5-foot vertical depth range indicate that PID readings have returned to background concentrations and that no odor or other indication of contamination is noted. Soil cores from Geoprobe borings will be continuously collected using a 4- or 5-foot-long lined sampler. Soil samples from the HSA will be collected using an 18-inch-long split spoon. At soil boring locations where the upper 5 feet bgs is cleared using hand tools or a vacuum truck, samples will be collected using hand tools at the desired depth. A sonic drill rig may also be used instead of HSA, depending on the project needs.

Representative samples will be collected from each soil type or unit observed, with vertical thicknesses of 2 to 3 feet or less, depending on the COI, or unless poor sample recovery is encountered or additional volume is needed for laboratory analysis. Two sampling methods will be conducted depending on the AOPC.

All AOPCs (except the Ash Pads): Representative samples will be collected from each soil type or unit observed, with vertical thickness of 2 feet or less unless poor sample recovery is encountered or additional volume is needed for laboratory analysis. Samples are anticipated to be collected from surface soil (upper 2 feet bgs) and native or fill soil (if present) in the vadose zone, the capillary fringe overlying the water table, and within the saturated soil intervals below the water table. For soil borings to be completed as monitoring wells, a soil sample will be collected from within the well screen intervals. Soil samples are anticipated to be collected only from the deep paired monitoring wells, because the conditions are assumed to be representative of the shallow wells. Anticipated sample intervals are shown in Table B.2 but will be based on field observations and determined in the field. Smaller sample intervals may additionally be analyzed to target field indications of contamination or changes in soil stratigraphy. Additional soil samples may be collected to delineate the vertical extent of contamination if observed. Sample containers will be packed in iced shipping containers (coolers) with chain-of-custody documentation (as described in Section 4.1.1) and delivered or shipped to the laboratory

Ash Pads (SB-01, SB-02, and MW-6): Dioxins/furans (D/Fs) are the primary COI associated with the ash pad areas. These contaminants are unlikely to partition to groundwater; therefore, they will be analyzed only as a composite sample within the top 2 feet (surface soil). In potential source areas associated with these COIs, deeper composite sample intervals will be collected and archived. The deeper sample interval will be determined in the field, and a composite will either be collected between 2 and 5 feet or between 2 feet and the top of the impermeable aquitard layer (if encountered), whichever is shallower. Soil samples to be analyzed for all other COIs around the ash pads are anticipated to be collected from the vadose zone, the capillary fringe overlying the water table, and within the saturated soil intervals below the water table using the

same approach as in the other AOPCs. Anticipated sample intervals are further described in Table B.2. Smaller sample intervals may additionally be analyzed to target field indications of contamination or changes in soil stratigraphy. Additional soil samples may be collected to delineate the vertical extent of contamination if observed, which will be determined in the field and based on field observations and lithology. Sample containers will be packed in iced shipping containers (coolers) with chain-of-custody documentation (as described in Section 4.1.1) and delivered or shipped to the laboratory.

All soil sampling will be observed by a field geologist or field technician, logged, classified according to the USCS, and photographed. Soil sampling field forms are included in Attachment B.1. Any changes in soil composition will be noted, as will the presence of debris such as anthropogenic materials. Soils will additionally be screened for field indications of contamination such as odor, sheen, staining, or elevated volatiles concentrations measured with a PID.

Soil samples will be transferred to a decontaminated stainless-steel bowl and homogenized until uniform in color and texture before being placed into laboratory-provided sample containers. Aliquots collected for volatile organic compound (VOC) analysis will be collected before homogenization and will be based on field observations including PID readings. Soil cuttings will be collected in 55-gallon drums for profiling and disposal.

3.3.2 Hand Auger Borings

In areas not accessible with a drill rig or excavator (i.e., the Northwest Fill Area, the North and South Fill Areas, the Woodwaste (Knots) Landfill and Rejects Area, and the diesel and sodium hydroxide ASTs area at the Westport Ponds Area), soil samples will be collected with a hand auger and other hand tools. Up to 24 hand auger borings will be completed across the Site within the Main Mill Complex and Westport Ponds Area with the primary objective of delineating the extent of fill and presence of COIs in the potential source areas. Within each of the potential source areas, field personnel will advance the hand augers and conduct PID field screening at approximately 2-foot intervals, or as unique soil or fill types are encountered. Soil samples will be collected from each location from the upper 2 feet of the fill unit and from within the uppermost native material, if encountered. If the fill unit is not encountered, then samples will be collected from surface soil (upper 2 feet bgs) and capillary fringe, if encountered.

Samples will be collected using a decontaminated hand trowel, shovel, or hand auger as necessitated by soil types encountered, target sample depth, and presence of obstructions. A digging bar may be used to assist in clearing obstructions such as rocks in the path of the sampler. The soil sample material will be transferred from the sampling device into a disposable aluminum tray, onto plastic sheeting, or into a decontaminated stainless-steel bowl as sampling progresses such that a uniform volume of material is collected across each depth interval. Hand auger borings will be advanced to a maximum depth of 10 feet bgs, or if groundwater infiltrates into the borehole, or refusal is encountered. Soil samples will be transferred to a decontaminated stainless-steel bowl and homogenized until uniform in color and texture before being placed into

laboratory-provided sample containers. Aliquots collected for VOC analysis will be collected before homogenization.

All hand auger borings will be observed by a field geologist or field technician, logged, classified according to the USCS, and photographed. If refusal is encountered and cannot be cleared, the field crew will re-attempt sampling at alternate locations identified by the Floyd|Snider PM or field QA officer. Additionally, reasonable measures will be taken to reach sample locations. If a sample location is inaccessible due to terrain, vegetation, or other obstacles, an alternative location may be identified in coordination with the Floyd|Snider PM and/or field QA officer. The sample material from the first successful sample, or the sample with greatest total depth if repeated refusal is encountered, will be accepted.

3.3.3 Soil Sample Nomenclature

Soil samples will be identified by their location and depth using a standardized format that combines location ID and depth increment. For example, a soil sample collected from MW-27 in the 3- to 6-foot-bgs interval would be labeled “MW-27-03-06,” or a soil sample taken from a soil boring SB-6 in the 1- to 2-foot bgs interval would be labeled “SB-06-01-02.”

QA/QC samples, such as field duplicates, will be named in accordance with QA/QC labeling procedures described in Section 3.10.

3.3.4 Archiving Soil Samples

A subset of soil samples and soil aliquots will be archived for potential future analysis, depending on preliminary analytical results. Soil samples that will be archived will meet one or more of the following criteria:

- **Subsurface aliquots collected in D/F investigation areas.** D/Fs will not be analyzed immediately in subsurface soil samples, unless specified otherwise in the SAP. The analytical laboratory will be directed by the field team to analyze additional soil aliquots for D/Fs, depending on the results of the surface soil samples.
- **Subsurface samples collected in saturated soil deeper than targeted soil horizons specified in the SAP.** The entire volume of these samples will be archived for future analysis, depending on the preliminary results of samples collected from shallower soil horizons.
- **Other samples, as specified on the chain of custody.** Field personnel should note that additional samples or volume will be archived on the chain-of-custody form.

The project team will work with the analytical laboratory to ensure the proper storage of archived samples to maximize hold times.

3.4 GROUNDWATER SAMPLING

Groundwater sampling will be performed a minimum of 1 week after development and will be conducted semiannually, during the dry and wet seasons, at new and existing monitoring wells until Phase 2 field activities begin. All wells will be purged and sampled using low-flow stabilization and sample collection procedures in accordance with the Floyd|Snider low-flow groundwater sample collection standard guideline included in Attachment B.1.

Prior to purging, static groundwater levels and total depth measurements will be collected using a decontaminated water level meter. During purging, water chemistry data (i.e., pH, temperature, specific conductivity, turbidity, dissolved oxygen [DO], and oxidation–reduction potential [ORP]) will be collected. Care will be taken to collect samples that are representative of dissolved-phase analyte concentrations, with the goal of purging to achieve sample turbidity of less than 5 nephelometric turbidity units (NTU). Groundwater samples to be analyzed for dissolved metals will be field-filtered with a 0.45-micrometer disposable water filter.

Additional groundwater grab samples will be collected from temporary wells screens installed at select soil borings in accordance with the Floyd|Snider standard guideline for groundwater sampling collection with a drill rig (Attachment B.1). Groundwater grab samples will be collected from discrete intervals during drilling to evaluate if COIs are present in groundwater. Groundwater grab sample depths will be determined in the field based on soil stratigraphy observations and field screening observations. When a boring encounters groundwater, drilling will continue 2 to 5 feet below the water level and then cease. A new PVC or decontaminated stainless-steel casing and screen will be temporarily installed in the borehole by the driller. New polyethylene or polytetrafluoroethylene tubing will be placed down the temporary casing and a peristaltic pump will be used to purge and collect groundwater grab samples. Purging will continue until the groundwater is visually clear (if achievable) or at least 3 well volumes have been removed. After the well has been purged, water quality parameters will be collected in accordance with the standard guidelines, and a groundwater grab sample will be collected directly from the borehole using low-flow sampling techniques. Prior to setting the screen and any groundwater sample collection and purging, field staff will measure and record the depth to water using an electronic water-level meter.

3.4.1 Groundwater Sample Nomenclature

Groundwater samples should be labeled with the sample location followed by “GW” and the date of sample collection (e.g., “MW-1-GW-081526”). If there are multiple wells clustered at a location at different depths, a depth designation indicating the deep well (D) should be added to the sample designation. For example, a groundwater sample could be labeled “MW-1D-GW-081526,” meaning the sample was collected on August 15, 2026, from sample location MW-1 from the deep water-bearing zone. Groundwater samples collected from well points will be labeled according to the well point location name followed by the date of sample collection (e.g., “TWP-01-081526” or “MS-02-TWP-081526”).

QA/QC samples, such as field duplicates, will be named in accordance with QA/QC labeling procedures described in Section 3.10.

3.5 SURFACE WATER SAMPLING

A total of 13 surface water grab samples will be collected from the Mill Slough, the Sweet Sewer, and the Woodyard Riverside Drain. Surface water samples will be collocated and collected as close as possible to a corresponding surface sediment sample location and/or well point. Surface water samples will be collected in accordance with Floyd|Snider sample collection methodologies (Attachment B.1).

Wading into the water to collect surface water samples is not recommended due to the potential for sample contamination from sediment disturbance, and locations within the same water body should be sampled starting at downgradient locations and moving to upgradient locations, if feasible. Prior to surface water sample collection, water chemistry data (i.e., pH, temperature, specific conductivity, turbidity, DO, and ORP) should be collected. Care should be taken to avoid disturbing sediment if placing the water quality probes directly in the surface water. If sediment is disturbed, allow the sediment to settle and relocate the water quality probes upstream of the disturbed sediment for new measurements. Water chemistry data can also be collected from the shore utilizing a water quality meter flow-through cell attached to the tubing. If it is not feasible or safe to collect water chemistry data directly from the water body, water chemistry data may be collected from the surface water sample. Surface water samples to be analyzed for dissolved metals will be field-filtered with a 0.45-micrometer disposable water filter.

Surface water samples will be collected via continuous-flow sampling using a peristaltic pump to pump the water sample to the shore through clean, unused low-density polyethylene tubing. Sample tubing will be placed in an extendable pole to facilitate surface water collection from well-mixed, flowing water at a point approximately mid-channel.

3.5.1 Surface Water Sample Nomenclature

Surface water samples will be labeled according to the location name (e.g., MS-01-SW) followed by the date of sample collection (e.g., "MS-01-SW-081526").

QA/QC samples, such as field duplicates, will be named in accordance with QA/QC labeling procedures described in Section 3.10.

3.6 SEEP SAMPLING

One seep has been previously identified at the Site near the caustic storage ASTs within the Main Mill Complex. To identify other potential seep locations at the Site within the immediate area of the caustic ASTs, field staff will conduct a visual survey for additional seeps. If an additional seep is discovered, detailed observations will be recorded throughout the sampling event. The position of any noted seeps will be recorded using a GPS and will be photographed from multiple angles. Seeps will be tracked to their origin to the extent practical. After reviewing

Phase 1 groundwater and surface water results, a visual survey for additional seeps in other areas of the Site, such as along the Mill Slough, may be conducted.

Before collecting a seep sample, the sampler will assess and record observations, if possible, including but not limited to the following:

- Spatial extent of the seep-impacted ground surface or pool, if present (i.e., length, width, depth)
- The approximate rate of flow from the seep calculated using a measuring cup and stopwatch (typically measured in milliliters per minute)
- Odors, sheens, or non-aqueous phase liquids

Seeps commonly produce little water and can require a considerable length of time to collect a representative sample, and they can be seasonal; often they stop flowing when low groundwater conditions are present (i.e., dry summer/drought conditions). General methodologies for seep sampling include the following:

Direct Collection: If the seeps produce sufficient water to collect groundwater samples directly from the flow emerging at the surface, seeps will be sampled by filling the laboratory-supplied bottle with the water emerging from the ground. Care should be taken to prevent any contact between the bottle and the ground surface to avoid collecting any soil from the ground surface into the sample. For VOC collection, a disposable plastic syringe may be used.

Dam Construction: If direct collection is not feasible due to insufficient flow of the seep, but the seep discharge emerges as a relatively large surface area, producing a thin sheet of flowing water, a dam can be constructed at the periphery of the seep to allow water to accumulate so samples can be collected. A dam can be constructed using clean plastic sheeting as dam material. Then the sample can be collected using low-flow sample collection methodologies in accordance with the Floyd|Snider Low-Flow Groundwater Sample Collection standard guideline (Attachment B.1) instead of the direct collection method described above.

Prior to sample collection, field parameters (pH, DO, ORP, specific conductivity, and temperature) will be recorded using a multiparameter water quality meter. Turbidity will be recorded using a turbidimeter. Water from the dam will be pumped through new polyethylene tubing and samples will be collected by directly filling the laboratory-provided bottles from the pump discharge line.

3.6.1 Seep Sample Nomenclature

Seep samples will be labeled according to the seep location name (e.g., SP-01) followed by the sample collection date (e.g., "SP-01-081526"). Any new seeps identified during seep surveys will be provided with a unique numerical identifier and will be numbered sequentially. If a seep appears to express itself at multiple locations within the same general area, individual seep samples may be collected at multiple locations to characterize this seep. Each sample collected for a seep within a general area will be labeled with the seep location name followed by a unique

letter starting with the letter “A” and proceeding alphabetically. For example, if seep SP-01 appears to be expressing at the ground surface at three locations within the same general area, the three individual seep samples from this area collected on August 15, 2026, would be labeled “SP-01-A-081526,” “SP-01-B-081526,” and “SP-01-C-081526.”

QA/QC samples, such as field duplicates, will be named in accordance with QA/QC labeling procedures described in Section 3.10.

3.7 SURFACE SEDIMENT SAMPLING

A total of 13 sediment samples will be collected from the Mill Slough, the Sweet Sewer, and the Woodyard Riverside Drain. Sediment samples will be collocated with a surface water sample as described in Section 3.5. Surface sediment grab samples will be collected from the top 10 centimeters of sediment using hand tools (e.g., trowel or shovel). Five grabs will be collected per location and composited for laboratory analysis.

3.7.1 Surface Sediment Sample Nomenclature

Surface sediment grab samples will be labeled according to the location name and the date the sample was collected (e.g., “MS-01-SS-081526” for the sediment sample collected at location MS-01-SS on August 15, 2026).

QA/QC samples, such as field duplicates, will be named in accordance with QA/QC labeling procedures described in Section 3.10.

3.8 GROUNDWATER FLOW STUDIES

3.8.1 Groundwater Snapshot

Prior to sampling during each groundwater monitoring event, the field team will conduct a groundwater snapshot to record static depths to water for all monitoring wells at the Site. Each monitoring well will be opened, and if the well cap is pressurized upon removal, the well will be allowed to equilibrate for up to 5 minutes prior to measuring static water level. The measurement date and time and static depth to water (feet below top of inner casing) will be recorded to the nearest 1/100 of an inch. All water level measurements must be collected on the same day. Field teams will note the weather and tidal conditions as the groundwater snapshot is conducted.

3.8.2 Tidal Study

Two tidal studies will be conducted at select shoreline wells during one wet season and one dry season groundwater monitoring event to evaluate tidal influence on groundwater elevations and groundwater–surface water interactions.

Proposed monitoring wells in the Main Mill Complex will be screened within the upper water-bearing zone, and proposed monitoring wells in the Westport Ponds Area will be screened in the upper and lower water-bearing zones, which are separated by a presumably continuous confining

layer. Pressure transducers with internal data loggers will be placed in wells to target these water-bearing zones, at increasing horizontal distances from tidally influenced water bodies. Transducers will be installed in the following monitoring wells in both areas, at minimum:

- Main Mill Complex
 - MW-01, MW-09, MW-08, MW-12, MW-13, MW-14, MW-15, and MW-16
- Westport Ponds Area
 - Shallow wells: MW-19, MW-21, MW-23, and W-4
 - Deep wells: MW-20D, MW-22D, W-3, MW-24D.

These locations are subject to change and will be informed by field observations and conditions encountered during the Phase 1 investigation.

During the tidal studies, transducers will be programmed to record water levels in 15-minute intervals for the duration of the groundwater monitoring event (minimum 72 hours). After reviewing the results from the first tidal study event, the 15-minute interval may be shortened for better resolution, if needed.

After completion of each tidal study, manual water level measurements will be collected using an electronic water level meter. Transducers will then be retrieved, and the water level data will be downloaded to a computer. The transducers will then be reprogrammed to log water levels in 1-hour intervals to record water level fluctuations until the next tidal study.

Additional locations will be selected for long-term transducer monitoring to evaluate groundwater level fluctuations and groundwater–surface water interactions adjacent to Site surface water bodies. In addition to the wells listed above, transducers will be placed in the following wells within the Main Mill Complex to monitor long-term groundwater levels: MW-02, MW-03, MW-07, and MW-10.

Transducers will be programed and installed in accordance with the Floyd|Snider pressure transducer installation and monitoring standard guideline included in Attachment B.1. The datalogger will be programmed to automatically convert pressure changes to water levels. If possible, a vented transducer that internally corrects for fluctuations in atmospheric pressure will be used. Transducers will be rated to a minimum of 15 pounds per square inch and be capable of measuring a water level change of as much as 23 feet with a resolution of 0.01 feet.

At the end of the monitoring period, the transducers will be removed from the wells, and the water level data will be uploaded to a computer. All field observations and comments—including manual water level measurements and times, as well as weather—should be recorded in a field notebook.

3.8.3 Wet and Dry Season Groundwater Evaluation

After installation, development, and surveying of the monitoring wells, groundwater elevation measurements will be collected, at a minimum, during both the wet and dry seasons during each groundwater monitoring event. The wet weather season (winter/spring), associated with higher groundwater elevations, is assumed to be approximately between November through May, and the dry season (summer/fall), associated with lower groundwater tables, is June through October. Groundwater depth measurements will be collected manually from the new and existing monitoring wells using a decontaminated water level meter.

3.9 DECONTAMINATION

Decontamination of nondisposable equipment will be completed between each sample station. Decontamination will consist of a site water or tap water rinse to remove visible particles, followed by scrubbing with phosphate-free detergent and rinsing with distilled water.

3.10 FIELD QUALITY CONTROL SAMPLES

Field QC is evaluated through the analysis of field duplicates, matrix spike/matrix spike duplicates (MS/MSDs), equipment blanks, and trip blanks. Field duplicates are used to assess proper homogenization in the field, reproducibility of the sample preparation and analysis, and heterogeneity of the matrix. MS/MSD samples are collected to provide the analytical laboratory with Site-specific samples for laboratory QC. Equipment blank samples are used to evaluate potential field cross contamination. Trip blank samples are used to evaluate potential cross contamination from volatile compounds from ambient conditions or from other samples during sample handling and transport.

Field QC samples will be collected and labeled as follows:

- Field duplicate samples will be collected at a rate of 1 per 20 investigation samples. Field duplicates will be labeled with a fictitious sample location by adding 100 to the sample location. For example, a field duplicate collected from monitoring well MW-01 on December 1, 2026, would be named "MW-101-120126."
- MS/MSD samples will be collected at a rate of 1 per 20 investigation samples per medium. The laboratory will specify whether duplicate or triplicate volume will be collected to provide sufficient volume for analysis. MS/MSD samples will have the same name as the parent sample. MS/MSD samples will be noted on the chain-of-custody form.
- Equipment blanks will be collected once per field event for each type of nondedicated sampling equipment used for each sampled media. Equipment blanks will be collected by pouring laboratory-provided distilled water over decontaminated, nondedicated field equipment. Equipment blanks will be labeled using the following format: "EB"- "Date." For example, an equipment blank collected on December 1, 2026, would be named "EB-120126."

- One trip blank will be included in the cooler with samples to be analyzed for gasoline-range organics (GRO) and/or VOCs. Trip blanks will be provided by the laboratory and will be labeled using the following format: "TB"- "Date." For example, a trip blank accompanying field samples on December 1, 2026, would be named "TB-120126."

Laboratory QA/QC criteria for evaluating field QC samples are presented in Table C.4 of the QAPP, and laboratory and field QC sample frequency for solid media and water samples are presented in Tables C.5 and C.6, respectively.

3.11 SAMPLE HANDLING AND TRANSPORT PROCEDURES

Sample custody and handling must be traceable from the time of collection through delivery to the laboratory and subsequent analysis.

Samples are considered to be in custody if they are (1) in the custodian's possession or view; (2) in a secured place (under lock) with restricted access; or (3) in a container and secured with a custody seal such that the sample cannot be reached without breaking the seal. Chain-of-custody forms will accompany all samples, and each person who has custody of the samples will sign the chain-of-custody form and ensure that the samples are not left unattended unless properly secured. Information on chain-of-custody forms will include at a minimum the following:

- Sampling location, project name, and unique sample ID
- Sample collection date and time
- Any special notations on sample characteristics or problems
- Name of the person who initially collected the sample
- Date sample was sent to the laboratory
- Shipping company name and waybill number (if applicable)

The field QA officer or qualified designee will be responsible for all sample tracking and custody procedures. They will also be responsible for final sample inventory and will maintain sample custody documentation. The field QA officer or designee will complete chain-of-custody forms prior to transporting samples. Information on the sample labels will be checked against sample collection forms and chain-of-custody forms, and sample containers will be recounted prior to transporting samples. Copies of all chain-of-custody forms will be retained and included as appendices to the data reports. Another copy will be retained and placed in the project files after review by the Floyd|Snider PM.

Sample custody procedures will be followed to provide a record that can accompany a sample as it passes from collection through analysis. A sample is considered to be in custody if it meets at least one of the following conditions:

- It is in the custodian's physical possession or view
- It is secured to prevent tampering (i.e., custody seals)
- It is locked or secured in an area restricted to authorized personnel

The analytical laboratories will ensure that chain-of-custody forms are properly signed upon receipt of the samples and will note any questions or observations concerning sample integrity on the chain-of-custody forms. The analytical laboratories will contact the field QA officer and project QA/QC coordinator immediately if discrepancies are discovered between the chain-of-custody forms and the sample shipment upon receipt.

3.11.1 Sample Containers and Preservation Requirements

Sample volumes will be placed in laboratory-provided certified, precleaned sample containers and preserved in accordance with the requirements presented in Tables C.7 and C.8. The laboratory will maintain manufacturer documents certifying the cleanliness of containers and/or purity of preservatives provided. The field QA officer or a designee will also inspect containers for cleanliness, for signs of damage or tampering, and for presence of preservative if pre-preserved containers will be used. Individual containers with evidence of damage or tampering will be discarded.

Prior to shipping or transporting samples, containers will be securely packed inside a cooler with ice packs or wet ice and bubble wrap. The original signed chain-of-custody forms will be placed in a sealed plastic bag and taped to the inside lid of the cooler. If third-party shipping (e.g., shipping with FedEx rather than a laboratory courier), each cooler will be sealed with a custody seal.

3.12 INVESTIGATION-DERIVED WASTE

Investigation-derived waste will include purged groundwater from the collection of groundwater samples, excess soil and sediment from the collection and processing of soil and sediment grabs and cores, and disposable materials used during fieldwork (e.g., disposable personal protective equipment [PPE], plastic sheeting, paper towels). All disposable sampling materials and PPE used in sample processing will be placed in heavy-duty garbage bags or other appropriate containers and disposed of as trash in the municipal collection system.

Any groundwater, soil, or sediment remaining after processing and decontamination, including intervals not sampled, will be collected in U.S. Department of Transportation-approved 55-gallon steel drums and stored on-site until it has been sufficiently characterized for disposal.

3.13 SAMPLE ANALYSIS

This section summarizes the soil, groundwater, surface water, and sediment analytical program. The analysis program has been developed to meet the DQOs described in the Phase 1 RIWP. Laboratory analyses for each sample, along with sample location information, sample depth intervals, and well construction details, are presented in Tables B.2 through B.4. The QA/QC objectives and methods for the analytical program are described in the QAPP (Appendix C of the Phase 1 RIWP). The analytes and methods, containers, and additional laboratory sample handling requirements for each medium are summarized in Tables C.1, C.2, C.3, C.7, and C.8 of the QAPP.

3.13.1 Soil Analysis

Depending on the AOPC and sample location, soil samples will be analyzed for the following COIs (refer to Table B.2):

- Metals by USEPA 6020B
- Mercury by USEPA 7471B
- Diesel-range organics (DRO) and oil-range organics (ORO) by NWPTH-Dx (with and without silica gel cleanup)
- GRO by NWTPH-Gx
- Semivolatile organic compounds (SVOCs; including polycyclic aromatic hydrocarbons [PAHs]) by USEPA 8270E
- VOCs by USEPA 8260D
- Polychlorinated biphenyl (PCB) Aroclors by USEPA 8082A
- D/Fs by USEPA 1613B
- Select herbicides by USEPA 8321B
- Total organic carbon (TOC) by USEPA 9060 modified
- pH by USEPA 9045D

In AOPCs that have or had petroleum sources, additional analyses will be conducted on select soil samples if petroleum impacts to soil are encountered, based on field screening observations. Additional analyses include the following:

- DRO and ORO by NWPTH-Dx and GRO by NWTPH-Gx, if not already being analyzed
- VOCs, such as benzene, toluene, ethylbenzene, and xylenes and fuel additives (methyl *tert*-butyl ether, hexane, ethylene dibromide [1,2-Dibromoethane], and ethylene dichloride [1,1-Dichloroethane] by USEPA 8260D, if not already being analyzed)
- Carcinogenic PAHs and naphthalenes by USEPA 8270E-SIM, if not already being analyzed
- Extractable petroleum hydrocarbons (EPH) and volatile petroleum hydrocarbons (VPH) by NWEPH and NWVPH

The results from these additional analyses can be used to calculate Site-specific MTCA Method B or Method C cleanup levels for total petroleum hydrocarbons (TPH).

3.13.2 Groundwater and Surface Water Analysis

Depending on the location, groundwater, including seep samples, and surface water will be analyzed for the following COIs (refer to Tables B.3 and B.4):

- Total and dissolved metals by USEPA 6020B
- Total and dissolved mercury by USEPA 7470A
- TPH by NWTPH-Dx (including with and without silica gel cleanup) and NWTPH-Gx
- SVOCs by USEPA 8270E
- VOCs by USEPA 8260D
- PCB Aroclors by USEPA 8082
- D/Fs by USEPA 1613B
- TOC by USEPA 9060A
- Total suspended solids by SM 2540D
- Total dissolved solids by SM 2540C
- Hardness by SM 2340B
- Alkalinity by SM 2310
- Ammonia, total nitrogen, and total sulfides by SM 4500 and USEPA 300.0

Surface water samples that are collocated with temporary well points will include TPH analyses, whereas surface water samples that are not collocated with temporary well points will not include TPH analyses.

3.13.3 Sediment Analysis

Sediment samples will be analyzed following Ecology's Sediment Management Standards (SMS; WAC 173-204-563). Analytes include the following COIs:

- SMS Metals by USEPA 6020B
- TPH by NWTPH-Dx
- SVOCs by USEPA 8270E
- VOCs by USEPA 8260D
- PCB Aroclors by USEPA 8082A
- D/Fs by USEPA 1613B
- TOC by USEPA 9060 modified
- Grain size by PSEP 1986
- Ammonia and total sulfides by SM 4500

4.0 Documentation and Oversight

4.1 FIELD DOCUMENTS AND FORMS

Documents and records generated in the field should be considered controlled documents that become part of the project file. Floyd|Snider field staff will keep a daily record of significant events, observations, and measurements on forms specific to the field activity.

All field activities will be recorded in a field logbook maintained by the field QA officer or designated field leads. The field logbook will provide a description of all sampling activities, communication between the field team and Ecology field oversight personnel, weather conditions, and any modifications to the procedures and plans identified in this SAP, the QAPP, or the HASP. Photographs taken of the soil and sediment samples will provide additional documentation of soil and sediment collection activities.

Field sampling forms are provided in Attachment B.1 and will be maintained by the field staff for each sampling location. All sampling forms will include at a minimum the following information:

- Project name
- Field staff on-site
- Field observations
- Sample collection date and time
- Sample method and/or description of field activities
- Instruments or equipment used
- Location ID and Sample ID
- Sample analysis
- Deviations from the Phase 1 RIWP or this SAP

Additional observations and documentation specific to sample collection will be recorded in accordance with the procedures presented in this SAP and the Floyd|Snider standard guidelines (Attachment B.1).

4.1.1 Chain-of-Custody Procedures

Chain-of-custody forms will be used to document the collection, custody, and transfer of samples from their initial collection location to the laboratory. Each sample will be entered on the chain-of-custody form after it is collected.

A chain-of-custody form will be completed in the field as samples are packaged. At a minimum, the information on the chain-of-custody form will include the information listed in Section 3.11. A copy of the chain-of-custody form will be placed in the cooler with its respective samples before

the container is sealed for delivery to the laboratory. Another copy will be retained and placed in the project files after review by the Floyd|Snider PM. Custody seals will be placed on each cooler containing samples so the package cannot be opened without breaking the seals.

4.2 FIELD CHANGE MANAGEMENT

Deviations from this SAP or the Floyd|Snider standard guidelines, such as abandonment of a sample location, will be coordinated in the field with the Floyd|Snider PM and Weyerhaeuser PM and evaluated in consultation with Ecology.

4.3 FIELD QUALITY ASSURANCE AND OVERSIGHT

The project field activities will be overseen by the Floyd|Snider PM and laboratory activities will be overseen by the laboratory PM. Specific procedures described in this SAP will be followed to meet the DQOs defined in the Phase 1 RIWP and QAPP. Laboratory oversight and corrective actions are described in Section 4.1 of the QAPP.

The field QA officer or designated field leads will be responsible for correcting equipment malfunctions during the field sampling effort. The field QA officer will be responsible for primary field oversight to identify situations in the field that may result in noncompliance with the SAP or QAPP.

4.4 INADVERTENT DISCOVERY PLAN

All ground-disturbing activities associated with the project will be conducted in accordance with the approved Inadvertent Discovery Plan provided in Appendix E of the Phase 1 RIWP. Ecology will provide notification of field activities to affected Tribes and will offer opportunities for Tribal participation in monitoring, as appropriate.

5.0 References

Washington State Department of Ecology (Ecology). 2025. Preliminary Determination of Liability for Release of Hazardous Substances at the Following Contaminated Sites: COSMO SPECIALTY FIBERS. Letter from Ha Tran, Washington State Department of Ecology, to Alec E. Gores, The Gores Group, LLC. 22 December.

Phase 1 Remedial Investigation Work Plan

Cosmo Specialty Fibers Site

Appendix B

Tables

Table B.1
Key Project Contacts

Title	Name	Phone	Email	Address
Weyerhaeuser PM	Luke Thies	(406) 897-8010	Luke.Thies@wy.com	105 Mills Drive, Columbia Falls, MT 59912
Ecology PM	Ha Tran	(360) 790-6276	Htra461@ecy.wa.gov	POB 47600 Olympia, WA 7600
Floyd Snider PIC	Jessi Messingale	(206) 292-2078	Jessi.Massingale@FloydSnider.com	601 Union St, Suite 600 Seattle, WA 98101
Floyd Snider PM	Kara Hitchko	(206) 292-2078	Kara.Hitchko@FloydSnider.com	601 Union St, Suite 600 Seattle, WA 98101
Floyd Snider QA/QC Coordinator	Cheronne Oreiro	(206) 292-2078	Cheronne.Oreiro@FloydSnider.com	601 Union St, Suite 600 Seattle, WA 98101
Floyd Snider Field QA Officer	Manique Talaia-Murray	(206) 292-2078	Manique.Talaia-Murray@FloydSnider.com	601 Union St, Suite 600 Seattle, WA 98101
Floyd Snider HSO	Amy Booth	(206) 292-2078	Amy.Booth@FloydSnider.com	601 Union St, Suite 600 Seattle, WA 98101
Laboratory PM	TBD	TBD	TBD	TBD

Abbreviations:

HSO Health and safety officer
PM Project manager
PIC Principal in charge
QA Quality assurance
QC Quality control

Table B.2
Proposed Soil Sampling Locations, Depth Intervals, and Laboratory Analyses

Location Name	X Coordinate	Y Coordinate	Parcel Number	Media	Sample Collection Approach ⁽¹⁾	Approximate Sample Depth ⁽²⁾ (feet bgs)	Soil Horizon ⁽³⁾	Sample Analysis										
								Metals ⁽⁴⁾	TPH			SVOCs	VOCs	PCBs	Dioxins/Furans	Herbicides	Other	
									Total DRO + ORO	GRO	EPH/VPH						pH	TOC
Main Mill Complex: Primary Operations Area																		
Former Log Storage and Hog Fuel Area																		
MW-08	826650.88	607310.39	417091442001	Soil	Monitoring Well	0–2	Upper Vadose	x				x						
						2–5	Lower Vadose	x	x	x	A	x	x					
						5–10	Capillary Fringe	x	x	x	A	x	x					
						10–15	Saturated	x	x	x	A	x	x					
MW-09	826412.90	607715.87	417091442001	Soil	Monitoring Well	0–2	Upper Vadose	x				x						
						2–5	Lower Vadose	x	x	x	A	x	x					
						5–10	Capillary Fringe	x	x	x	A	x	x					
						10–15	Saturated	x	x	x	A	x	x					
MW-10	826618.30	608338.23	417091442001	Soil	Monitoring Well	0–2	Upper Vadose	x				x						
						2–5	Lower Vadose	x	x	x	A	x	x					
						5–10	Capillary Fringe	x	x	x	A	x	x					
						10–15	Saturated	x	x	x	A	x	x					
Chip Storage, Chip Plant, and Receiving Areas																		
SB-05	826042.75	608104.13	417091442001	Soil	Soil Boring	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x	A	x	x	x				
						5–10	Capillary Fringe	x	x	x	A	x	x	x				
						10–15	Saturated	x	x	x	A	x	x					
SB-06	826040.78	608007.98	417091442001	Soil	Soil Boring	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x	A	x	x	x				
						5–10	Capillary Fringe	x	x	x	A	x	x	x				
						10–15	Saturated	x	x	x	A	x	x					
MW-13	826203.15	608771.06	417091442001	Soil	Monitoring Well	0–2	Upper Vadose	x				x			x			
						2–5	Lower Vadose	x	x	x	A	x	x					
						5–10	Capillary Fringe	x	x	x	A	x	x		A			
						10–15	Saturated	x	x	x	A	x	x					
MW-14	826239.30	608338.92	417091442001	Soil	Monitoring Well	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x	A	x	x	x				
						5–10	Capillary Fringe	x	x	x	A	x	x	x				
						10–15	Saturated	x	x	x	A	x	x					
MW-15	825632.02	608544.77	417091442001	Soil	Monitoring Well	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x	A	x	x	x				
						5–10	Capillary Fringe	x	x	x	A	x	x	x				
						10–15	Saturated	x	x	x	A	x	x					
Power House ASTs Area																		
SB-07	825937.00	607184.92	417091442001	Soil	Soil Boring	0–2	Upper Vadose	x				x		x		x		
						2–5	Lower Vadose	x	x	x	A	x	x	x			x	
						5–10	Capillary Fringe	x	x	x	A	x	x	x			x	
						10–15	Saturated	x	x	x	A	x	x					
SB-08	825841.68	607149.44	35503400000	Soil	Soil Boring	0–2	Upper Vadose	x				x		x		x		
						2–5	Lower Vadose	x	x	x	A	x	x	x			x	
						5–10	Capillary Fringe	x	x	x	A	x	x	x			x	
						10–15	Saturated	x	x	x	A	x	x					

Table B.2
Proposed Soil Sampling Locations, Depth Intervals, and Laboratory Analyses

Location Name	X Coordinate	Y Coordinate	Parcel Number	Media	Sample Collection Approach ⁽¹⁾	Approximate Sample Depth ⁽²⁾ (feet bgs)	Soil Horizon ⁽³⁾	Sample Analysis										
								Metals ⁽⁴⁾	TPH			SVOCs	VOCs	PCBs	Dioxins/Furans	Herbicides	Other	
									Total DRO + ORO	GRO	EPH/VPH						pH	TOC
Main Mill Complex: Primary Operations Area (cont.)																		
Former Jet Fuel AST																		
SB-09	824831.35	608249.19	417091431003	Soil	Soil Boring	0–2	Upper Vadose	x				x						
						2–5	Lower Vadose	x	x	x	A	x	x					
						5–10	Capillary Fringe	x	x	x	A	x	x					
						10–15	Saturated	x	x	x	A	x	x					
SB-10	824745.15	608369.04	417091431003	Soil	Soil Boring	0–2	Upper Vadose	x				x						
						2–5	Lower Vadose	x	x	x	A	x	x					
						5–10	Capillary Fringe	x	x	x	A	x	x					
						10–15	Saturated	x	x	x	A	x	x					
MW-16	825024.81	608580.61	417091442001	Soil	Monitoring Well	0–2	Upper Vadose	x				x						
						2–5	Lower Vadose	x	x	x	A	x	x					
						5–10	Capillary Fringe	x	x	x	A	x	x					
						10–15	Saturated	x	x	x	A	x	x					
MW-17	824657.97	608633.57	417091431003	Soil	Monitoring Well	0–2	Upper Vadose	x				x						
						2–5	Lower Vadose	x	x	x	A	x	x					
						5–10	Capillary Fringe	x	x	x	A	x	x					
						10–15	Saturated	x	x	x	A	x	x					
MW-18	824403.63	608731.99	417091431003	Soil	Monitoring Well	0–2	Upper Vadose	x				x						
						2–5	Lower Vadose	x	x	x	A	x	x					
						5–10	Capillary Fringe	x	x	x	A	x	x					
						10–15	Saturated	x	x	x	A	x	x					
Forestry Storage Building Area																		
SB-03	826584	606523.2	170923110010	Soil	Soil Boring	0–2	Upper Vadose	x				x	x			x		
						2–5	Lower Vadose	x				x	x			x		
						5–10	Capillary Fringe	x				x	x			x		
						10–15	Saturated	x				x	x			x		
SB-04	826472	606516.9	170923110010	Soil	Soil Boring	0–2	Upper Vadose	x				x	x			x		
						2–5	Lower Vadose	x				x	x			x		
						5–10	Capillary Fringe	x				x	x			x		
						10–15	Saturated	x				x	x			x		
Main Mill Complex: Eastern Operations Area																		
Wastewater Treatment System Ponds Area																		
MW-03	828205.30	607019.23	1701913330000	Soil	Monitoring Well	0–2	Upper Vadose	x				x						
						2–5	Lower Vadose	x				x	x					x
						5–10	Capillary Fringe	x				x	x					x
						10–15	Saturated	x				x	x					x
MW-05	827853.05	606206.96	170924220010	Soil	Monitoring Well	0–2	Upper Vadose	x				x						
						2–5	Lower Vadose	x				x	x					x
						5–10	Capillary Fringe	x				x	x					x
						10–15	Saturated	x				x	x					x

Table B.2
Proposed Soil Sampling Locations, Depth Intervals, and Laboratory Analyses

Location Name	X Coordinate	Y Coordinate	Parcel Number	Media	Sample Collection Approach ⁽¹⁾	Approximate Sample Depth ⁽²⁾ (feet bgs)	Soil Horizon ⁽³⁾	Sample Analysis										
								Metals ⁽⁴⁾	TPH			SVOCs	VOCs	PCBs	Dioxins/Furans	Herbicides	Other	
									Total DRO + ORO	GRO	EPH/VPH						pH	TOC
Main Mill Complex: Eastern Operations Area (cont.)																		
ASTs and Chemical Storage Area																		
MW-07	827494.37	606940.04	1701913330000	Soil	Monitoring Well	0–2	Upper Vadose	x				x						
						2–5	Lower Vadose	x				x	x					x
						5–10	Capillary Fringe	x				x	x					x
						10–15	Saturated	x				x	x					x
Ash Pad Areas ⁽⁵⁾																		
SB-01	827900.04	607276.20	1701913330000	Soil	Soil Boring	0–2	Upper Vadose	x				x			x			
						2–5	Lower Vadose	x				x	x		A			
						5–10	Capillary Fringe	x				x	x		A			
						10–15	Saturated	x				x	x					
SB-02	827199.49	608834.16	417091442001	Soil	Soil Boring	0–2	Upper Vadose	x				x			x			
						2–5	Lower Vadose	x				x	x		A			
						5–10	Capillary Fringe	x				x	x		A			
						10–15	Saturated	x				x	x					
MW-06	828005.33	607413.49	1701913330000	Soil	Monitoring Well	0–2	Upper Vadose	x				x			x			
						2–5	Lower Vadose	x				x	x		A			
						5–10	Capillary Fringe	x				x	x		A			
						10–15	Saturated	x				x	x					
Woodyard Riverside Drain																		
MW-11	827208.32	609067.35	417091442001	Soil	Monitoring Well	0–2	Upper Vadose	x				x			x			
						2–5	Lower Vadose	x				x	x		A			
						5–10	Capillary Fringe	x				x	x		A			
						10–15	Saturated	x				x	x					
MW-12	826861.50	608982.98	417091442001	Soil	Monitoring Well	0–2	Upper Vadose	x				x			x			
						2–5	Lower Vadose	x				x	x		A			
						5–10	Capillary Fringe	x				x	x		A			
						10–15	Saturated	x				x	x					
Main Mill Complex: Waste and Fill Areas																		
Northwest Fill Area																		
HB-01	828798.64	609382.11	1701913330000	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
HB-02	828925.88	609021.36	1701913330000	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
HB-03	828527.25	609160.64	417091332001	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
HB-04	828270.98	609200.74	417091332001	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
HB-05	828412.92	608871.45	417091332001	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
MW-01	828716.98	609535.04	1701913330000	Soil	Monitoring Well	0–2	Upper Vadose	x				x			x			
						2–5	Lower Vadose	x				x	x					x
						5–10	Capillary Fringe	x				x	x		A			x
						10–15	Saturated	x				x	x					x

Table B.2
Proposed Soil Sampling Locations, Depth Intervals, and Laboratory Analyses

Location Name	X Coordinate	Y Coordinate	Parcel Number	Media	Sample Collection Approach ⁽¹⁾	Approximate Sample Depth ⁽²⁾ (feet bgs)	Soil Horizon ⁽³⁾	Sample Analysis										
								Metals ⁽⁴⁾	TPH			SVOCs	VOCs	PCBs	Dioxins/Furans	Herbicides	Other	
									Total DRO + ORO	GRO	EPH/VPH						pH	TOC
Main Mill Complex: Waste and Fill Areas (cont.)																		
North and South Fill Areas																		
HB-06	828442.64	608032.22	1701913330000	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
HB-07	828557.79	607963.32	1701913330000	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
HB-08	828480.19	607902.37	1701913330000	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
HB-09	828443.65	607504.24	1701913330000	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
HB-10	828509.92	607387.89	1701913330000	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
HB-11	828367.57	607317.58	1701913330000	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
Woodwaste (Knots) Landfill and Rejects Area																		
HB-12	829372.42	606127.97	170924130000	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
HB-13	829389.34	605985.59	170924130000	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
HB-14	829321.85	605811.93	170924130000	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
HB-15	829242.57	606230.90	170924130000	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
HB-16	829271.79	605963.70	170924130000	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
HB-17	829166.77	606148.48	170924130000	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
HB-18	828981.05	606132.07	170924130000	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
HB-19	829049.83	606011.61	170924130000	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
HB-20	829031.11	605882.72	170924130000	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
HB-21	829160.85	605777.12	170924130000	Soil	Hand Auger Boring	--	Fill	x				x	x		x			
						--	Native	x				x	x		A			x
MW-02	828586.11	606411.12	170924130000	Soil	Monitoring Well	0–2	Upper Vadose	x				x			x			
						2–5	Lower Vadose	x				x	x					x
						5–10	Capillary Fringe	x				x	x		A			x
						10–15	Saturated	x				x	x					x
MW-04	828059.23	606510.38	170924130000	Soil	Monitoring Well	0–2	Upper Vadose	x				x			x			
						2–5	Lower Vadose	x				x	x					x
						5–10	Capillary Fringe	x				x	x		A			x
						10–15	Saturated	x				x	x					x

Table B.2
Proposed Soil Sampling Locations, Depth Intervals, and Laboratory Analyses

Location Name	X Coordinate	Y Coordinate	Parcel Number	Media	Sample Collection Approach ⁽¹⁾	Approximate Sample Depth ⁽²⁾ (feet bgs)	Soil Horizon ⁽³⁾	Sample Analysis										
								Metals ⁽⁴⁾	TPH			SVOCs	VOCs	PCBs	Dioxins/Furans	Herbicides	Other	
									Total DRO + ORO	GRO	EPH/VPH						pH	TOC
Wood Stave Pipe Corridor																		
SB-11	824031.24	608734.74	417091431003	Soil	Soil Boring	15	Vadose	x				x	x		x		x	
							Capillary Fringe	x				x	x		A		x	x
							Saturated	x				x	x				x	x
SB-12	821479.57	609823.98	ROW	Soil	Soil Boring	15	Vadose	x				x			x		x	x
							Capillary Fringe	x				x	x		A		x	x
							Saturated	x				x	x					x
				Groundwater	Grab		--	x				x	x		A		x	
SB-13	821482.19	609741.60	ROW	Soil	Soil Boring	15	Vadose	x				x			x		x	x
							Capillary Fringe	x				x	x		A			x
							Saturated	x				x	x					x
				Groundwater	Grab		--	x				x	x		A		x	
SB-14	819449.75	609887.17	ROW	Soil	Soil Boring	15	Vadose	x				x			x		x	x
							Capillary Fringe	x				x	x		A		x	x
							Saturated	x				x	x					x
				Groundwater	Grab		--	x				x	x		A		x	
SB-15	819452.36	609804.79	ROW	Soil	Soil Boring	15	Vadose	x				x			x		x	x
							Capillary Fringe	x				x	x		A		x	x
							Saturated	x				x	x					x
				Groundwater	Grab		--	x				x	x		A		x	
SB-16	818468.66	609894.05	ROW	Soil	Soil Boring	15	Vadose	x				x			x		x	x
							Capillary Fringe	x				x	x		A		x	x
							Saturated	x				x	x					x
SB-17	818467.12	609857.36	ROW	Soil	Soil Boring	15	Vadose	x				x	x		x		x	x
							Capillary Fringe	x				x			A		x	x
							Saturated	x				x	x					x
SB-18	818343.55	609902.62	ROW	Soil	Soil Boring	15	Vadose	x				x	x		x		x	x
							Capillary Fringe	x				x	x		A		x	x
							Saturated	x				x						x
				Groundwater	Grab		--	x				x	x		A		x	
SB-19	818350.63	609866.23	ROW	Soil	Soil Boring	15	Vadose	x				x	x		x		x	x
							Capillary Fringe	x				x	x		A		x	x
							Saturated	x				x						x
				Groundwater	Grab		--	x				x	x		A		x	
SB-20	818248.35	609901.02	ROW	Soil	Soil Boring	15	Vadose	x				x	x		x		x	x
							Capillary Fringe	x				x	x		A		x	x
							Saturated	x				x						x
SB-21	818246.20	609874.83	ROW	Soil	Soil Boring	15	Vadose	x				x	x		x		x	x
							Capillary Fringe	x				x	x		A		x	x
							Saturated	x				x	x					x
SB-22	815761.34	610064.12	ROW	Soil	Soil Boring	15	Vadose	x				x			x		x	x
							Capillary Fringe	x				x	x		A		x	x
							Saturated	x				x	x					x
				Groundwater	Grab		--	x				x	x		A		x	

Table B.2
Proposed Soil Sampling Locations, Depth Intervals, and Laboratory Analyses

Location Name	X Coordinate	Y Coordinate	Parcel Number	Media	Sample Collection Approach ⁽¹⁾	Approximate Sample Depth ⁽²⁾ (feet bgs)	Soil Horizon ⁽³⁾	Sample Analysis										
								Metals ⁽⁴⁾	TPH			SVOCs	VOCs	PCBs	Dioxins/Furans	Herbicides	Other	
									Total DRO + ORO	GRO	EPH/VPH						pH	TOC
Wood Stave Pipe Corridor (cont.)																		
SB-23	815760.81	609981.87	ROW	Soil	Soil Boring	15	Vadose	x				x			x		x	x
				Capillary Fringe	x					x	x		A		x	x		
				Saturated	x					x	x					x		
				Groundwater	Grab		--	x				x	x		A		x	
SB-24	812102.84	610208.20	317091623002	Soil	Soil Boring	15	Vadose	x				x			x		x	x
							Capillary Fringe	x				x	x		A		x	x
							Saturated	x				x	x					
SB-25	812094.55	610170.45	317091623002	Soil	Soil Boring	15	Vadose	x				x	x		x		x	x
							Capillary Fringe	x				x			A		x	x
							Saturated	x				x	x					
SB-26	812028.84	610201.95	317091621003	Soil	Soil Boring	15	Vadose	x				x	x		x		x	x
				Capillary Fringe	x					x	x		A		x	x		
				Saturated	x					x							x	
				Groundwater	Grab		--	x				x	x		A		x	
SB-27	811993.72	610147.97	317091632001	Soil	Soil Boring	15	Vadose	x				x	x		x		x	x
				Capillary Fringe	x					x	x		A		x	x		
				Saturated	x					x							x	
				Groundwater	Grab		--	x				x	x		A		x	
Westport Ponds Area																		
Ponds A-D																		
HB-22	810985.23	609573.98	317091733001	Soil	Hand Auger Boring	0–2	Fill	x				x		x			x	
						5–10	Native	x	x	x		x	x	x			x	
HB-23	811024.09	609478.11	317091733001	Soil	Hand Auger Boring	0–2	Fill	x				x		x			x	
						5–10	Native	x	x	x		x	x	x			x	
HB-24	811048.86	609493.11	317091733001	Soil	Hand Auger Boring	0–2	Fill	x				x		x			x	
						5–10	Native	x	x	x		x	x	x			x	
SB-28	810114.97	609080.27	317091733001	Soil	Soil Boring	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x		x		x				
						5–10	Capillary Fringe	x	x	x		x		x				
						10–15	Saturated	x	x	x		x						
SB-29	810090.62	609059.24	317091733001	Soil	Soil Boring	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x		x		x				
						5–10	Capillary Fringe	x	x	x		x		x				
						10–15	Saturated	x	x	x		x						
SB-30	810057.58	609070.66	317091733001	Soil	Soil Boring	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x		x		x				
						5–10	Capillary Fringe	x	x	x		x		x				
						10–15	Saturated	x	x	x		x						
SB-31	809551.51	608938.13	317091733001	Soil	Soil Boring	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x		x		x				
						5–10	Capillary Fringe	x	x	x		x		x				
						10–15	Saturated	x	x	x		x						

Table B.2
Proposed Soil Sampling Locations, Depth Intervals, and Laboratory Analyses

Location Name	X Coordinate	Y Coordinate	Parcel Number	Media	Sample Collection Approach ⁽¹⁾	Approximate Sample Depth ⁽²⁾ (feet bgs)	Soil Horizon ⁽³⁾	Sample Analysis										
								Metals ⁽⁴⁾	TPH			SVOCs	VOCs	PCBs	Dioxins/Furans	Herbicides	Other	
									Total DRO + ORO	GRO	EPH/VPH						pH	TOC
Westport Ponds Area (cont.)																		
Ponds A-D (cont.)																		
SB-32	809533.87	608922.17	317091733001	Soil	Soil Boring	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x		x		x				
						5–10	Capillary Fringe	x	x	x		x		x				
						10–15	Saturated	x	x	x		x						
SB-33	809508.39	608924.60	317091733001	Soil	Soil Boring	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x		x		x				
						5–10	Capillary Fringe	x	x	x		x		x				
						10–15	Saturated	x	x	x		x						
SB-34	807533.90	608427.92	317091733001	Soil	Soil Boring	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x		x		x				
						5–10	Capillary Fringe	x	x	x		x		x				
						10–15	Saturated	x	x	x		x						
SB-35	807513.57	608407.06	317091733001	Soil	Soil Boring	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x		x		x				
						5–10	Capillary Fringe	x	x	x		x		x				
						10–15	Saturated	x	x	x		x						
SB-36	807478.99	608415.26	317091733001	Soil	Soil Boring	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x		x		x				
						5–10	Capillary Fringe	x	x	x		x		x				
						10–15	Saturated	x	x	x		x						
SB-37	805696.53	608015.21	317091733001	Soil	Soil Boring	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x		x		x				
						5–10	Capillary Fringe	x	x	x		x		x				
						10–15	Saturated	x	x	x		x						
SB-38	805673.92	608003.81	317091733001	Soil	Soil Boring	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x		x		x				
						5–10	Capillary Fringe	x	x	x		x		x				
						10–15	Saturated	x	x	x		x						
SB-39	805648.42	608012.79	317091733001	Soil	Soil Boring	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x		x		x				
						5–10	Capillary Fringe	x	x	x		x		x				
						10–15	Saturated	x	x	x		x						
MW-19	811364.58	610023.15	317091733001	Soil	Monitoring Well	0–2	Upper Vadose	Refer to sample interval and analyses for paired deep well MW-20D.										
						2–5	Lower Vadose											
						5–10	Capillary Fringe											
MW-20D	811349.15	610009.39	317091733001	Soil	Deep Monitoring Well	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x		x		x				
						5–10	Capillary Fringe	x	x	x		x		x				
						10–15	Saturated	x	x	x		x						
						15–20	Saturated											
						20–25	Saturated											
						25–30	Saturated											

Table B.2
Proposed Soil Sampling Locations, Depth Intervals, and Laboratory Analyses

Location Name	X Coordinate	Y Coordinate	Parcel Number	Media	Sample Collection Approach ⁽¹⁾	Approximate Sample Depth ⁽²⁾ (feet bgs)	Soil Horizon ⁽³⁾	Sample Analysis										
								Metals ⁽⁴⁾	TPH			SVOCs	VOCs	PCBs	Dioxins/Furans	Herbicides	Other	
									Total DRO + ORO	GRO	EPH/VPH						pH	TOC
Westport Ponds Area (cont.)																		
Ponds A-D (cont.)																		
MW-21	809974.14	609236.37	317091733001	Soil	Monitoring Well	0–2	Upper Vadose	Refer to sample interval and analyses for paired deep well MW-22D.										
						2–5	Lower Vadose											
						5–10	Capillary Fringe											
MW-22D	809957.25	609231.71	317091733001	Soil	Deep Monitoring Well	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x		x		x				
						5–10	Capillary Fringe	x	x	x		x		x				
						10–15	Saturated	x	x	x		x						
						15–20	Saturated											
						20–25	Saturated											
						25–30	Saturated											
MW-23	808583.22	607542.44	170920120010	Soil	Monitoring Well	0–2	Upper Vadose	Refer to sample interval and analyses for paired deep well MW-24D.										
						2–5	Lower Vadose											
						5–10	Capillary Fringe											
MW-24D	808591.49	607516.03	170920120010	Soil	Deep Monitoring Well	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x		x		x				
						5–10	Capillary Fringe	x	x	x		x		x				
						10–15	Saturated	x	x	x		x						
						15–20	Saturated											
						20–25	Saturated											
						25–30	Saturated	x	x	x		x						
MW-25	807536.45	608763.19	317091733001	Soil	Monitoring Well	0–2	Upper Vadose	Refer to sample interval and analyses for paired deep well MW-26D.										
						2–5	Lower Vadose											
						5–10	Capillary Fringe											
MW-26D	807490.62	608751.88	317091733001	Soil	Deep Monitoring Well	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x		x		x				
						5–10	Capillary Fringe	x	x	x		x		x				
						10–15	Saturated	x	x	x		x						
						15–20	Saturated											
						20–25	Saturated											
						25–30	Saturated	x	x	x		x						
MW-27	805248.69	608369.69	029902100100	Soil	Monitoring Well	0–2	Upper Vadose	Refer to sample interval and analyses for paired deep well MW-28D.										
						2–5	Lower Vadose											
						5–10	Capillary Fringe											

Table B.2
Proposed Soil Sampling Locations, Depth Intervals, and Laboratory Analyses

Location Name	X Coordinate	Y Coordinate	Parcel Number	Media	Sample Collection Approach ⁽¹⁾	Approximate Sample Depth ⁽²⁾ (feet bgs)	Soil Horizon ⁽³⁾	Sample Analysis										
								Metals ⁽⁴⁾	TPH			SVOCs	VOCs	PCBs	Dioxins/Furans	Herbicides	Other	
									Total DRO + ORO	GRO	EPH/VPH						pH	TOC
Westport Ponds Area (cont.)																		
Ponds A-D (cont.)																		
MW-28D	805209.22	608357.36	029902100100	Soil	Deep Monitoring Well	0–2	Upper Vadose	x				x		x				
						2–5	Lower Vadose	x	x	x		x		x				
						5–10	Capillary Fringe	x	x	x		x		x				
						10–15	Saturated	x	x	x		x						
						15–20	Saturated											
						20–25	Saturated											
						25–30	Saturated	x	x	x		x						

Notes:

- Blank cells are intentional.
- Sample analyses indicated with an A will be archived at the laboratory pending the results of shallower sample intervals.
- Not available.
- 1 Groundwater grabs collected at select soil borings along the Wood Stave Pipe Corridor will be collected from temporary well screens during drilling.
- 2 Sample intervals may be adjusted as needed in the field based on observations and lithology and/or to target smaller intervals with field indications of contamination. Refer to Section 3.3 of the Sampling and Analysis Plan for additional details on target soil sample intervals.
- 3 Approximate depths for soil horizons are used to infer sample collection but depth intervals will be determined in the field and based on field observations.
- 4 Metals include the RCRA 8 metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) plus aluminum, copper, iron, manganese, and zinc.
- 5 The sampling approach for dioxins/furans at the Ash Pads is based on filed observations. The 0- to 2-foot interval will be sampled as one sample, even if the capillary fringe and saturated zone is encountered in the top 2 feet. The deeper sample interval will be determined in the field, and a composite will be collected from either between 2 and 5 feet or between 2 feet and the top of the impermeable aquitard layer (if encountered), whichever is shallower.

Abbreviations:

- AST Aboveground storage tank
- bgs Below ground surface
- DRO Diesel-range organics
- EPH Extractable petroleum hydrocarbons
- GRO Gasoline-range organics
- ORO Oil-range organics
- PCB Polychlorinated biphenyl
- RCRA Resource Conservation and Recovery Act
- SVOC Semivolatile organic compound
- TOC Total organic carbon
- TPH Total petroleum hydrocarbons
- VOC Volatile organic compound
- VPH Volatile petroleum hydrocarbons

Table B.3
Proposed Groundwater Sampling Locations, Well Construction Details, and Laboratory Analyses

Location Name	X Coordinate	Y Coordinate	Sample Collection Approach ⁽¹⁾	Estimated Well Total Depth (feet bgs)	Estimated Screened Interval (feet bgs)	Sample Analysis															Field Parameters ⁽⁴⁾
						Metals ⁽²⁾	TPH		SVOCs	VOCs	PCBs	Dioxins/Furans	Conventionals								
							Total DRO + ORO ⁽³⁾	GRO					TOC	Alkalinity	TDS	Ammonia	Hardness	Sulfates and Sulfites	Nitrates and Nitrites		
Main Mill Complex: Primary Operations Area																					
Caustic Storage AST Area																					
TWP-03	824362.46	608838.62	Temporary Well Point	10	--	x			x	x							x			x	
TWP-04	824314.79	608860.98	Temporary Well Point	10	--	x			x	x							x			x	
SP-01	824375.12	608897.47	Seep	--	--	x			x	x							x			x	
Former Log Storage and Hog Fuel Area																					
MW-08	826650.88	607310.39	Monitoring Well	15	5–10	x	x	x	x	x							x			x	
MW-09	826412.90	607715.87	Monitoring Well	15	5–10	x	x	x	x	x							x			x	
MW-10	826618.30	608338.23	Monitoring Well	15	5–10	x	x	x	x	x							x			x	
Chip Storage, Chip Plant, and Receiving Areas																					
MW-13	826203.15	608771.06	Monitoring Well	15	5–10	x	x	x	x	x	x						x			x	
MW-14	826239.30	608338.92	Monitoring Well	15	5–10	x	x	x	x	x	x						x			x	
MW-15	825632.02	608544.77	Monitoring Well	15	5–10	x	x	x	x	x	x						x			x	
Former Jet Fuel AST																					
MW-16	825024.81	608580.61	Monitoring Well	15	5–10	x	x	x	x	x							x			x	
MW-17	824657.97	608633.57	Monitoring Well	15	5–10	x	x	x	x	x							x			x	
MW-18	824403.63	608731.99	Monitoring Well	15	5–10	x	x	x	x	x							x			x	
Main Mill Complex: Eastern Operations Area																					
Wastewater Treatment System Ponds Area																					
MW-03	828205.30	607019.23	Monitoring Well	15	5–10	x			x	x			x	x	x	x	x	x	x	x	
MW-05	827853.05	606206.96	Monitoring Well	15	5–10	x			x	x			x	x	x	x	x	x	x	x	
MW-07	827494.37	606940.04	Monitoring Well	15	5–10	x			x	x			x	x	x	x	x	x	x	x	
Mill Slough																					
TWP-02	827536.51	609297.66	Temporary Well Point	10	--	x			x	x							x			x	
MS-02-TWP	828775.97	606300.36	Temporary Well Point	10	--	x			x	x							x			x	
MS-05-TWP	828914.04	607965.42	Temporary Well Point	10	--	x			x	x							x			x	
MS-07-TWP	827806.05	608676.52	Temporary Well Point	10	--	x			x	x							x			x	
MS-08-TWP	827874.45	609025.42	Temporary Well Point	10	--	x			x	x							x			x	
Ash Pile Areas																					
MW-06	828005.33	607413.49	Monitoring Well	15	5–10	x			x	x		x					x			x	
MW-11	827208.32	609067.35	Monitoring Well	15	5–10	x			x	x		x					x			x	
MW-12	826861.50	608982.98	Monitoring Well	15	5–10	x			x	x		x					x			x	
Main Mill Complex: Waste and Fill Areas																					
Northwest Fill Area																					
MW-01	828716.98	609535.04	Monitoring Well	15	5–10	x			x	x			x	x	x	x	x	x	x	x	
TWP-01	828199.58	609431.65	Temporary Well Point	10	--	x			x	x							x			x	
Woodwaste (Knots) Landfill and Rejects Area																					
MW-02	828586.11	606411.12	Monitoring Well	15	5–10	x			x	x							x			x	
MW-04	828059.23	606510.38	Monitoring Well	15	5–10	x			x	x							x			x	

Table B.3
Proposed Groundwater Sampling Locations, Well Construction Details, and Laboratory Analyses

Location Name	X Coordinate	Y Coordinate	Sample Collection Approach ⁽¹⁾	Estimated Well Total Depth (feet bgs)	Estimated Screened Interval (feet bgs)	Sample Analysis														Field Parameters ⁽⁴⁾
						Metals ⁽²⁾	TPH		SVOCs	VOCs	PCBs	Dioxins/Furans	Conventionals							
							Total DRO + ORO ⁽³⁾	GRO					TOC	Alkalinity	TDS	Ammonia	Hardness	Sulfates and Sulfites	Nitrates and Nitrites	
Westport Ponds Area																				
MW-19	811364.58	610023.15	Monitoring Well	15	5–15	x	x	x	x	x	x		x	x	x	x	x	x	x	x
MW-20D	811349.15	610009.39	Monitoring Well	30	25–30	x	x	x	x	x	x		x	x	x	x	x	x	x	x
MW-21	809974.14	609236.37	Monitoring Well	15	5–15	x	x	x	x	x	x		x	x	x	x	x	x	x	x
MW-22D	809957.25	609231.71	Monitoring Well	30	25–30	x	x	x	x	x	x		x	x	x	x	x	x	x	x
MW-25	807536.45	608763.19	Monitoring Well	15	5–15	x	x	x	x	x	x		x	x	x	x	x	x	x	x
MW-26D	807490.62	608751.88	Monitoring Well	30	25–30	x	x	x	x	x	x		x	x	x	x	x	x	x	x
MW-27	805248.69	608369.69	Monitoring Well	15	5–15	x	x	x	x	x	x		x	x	x	x	x	x	x	x
MW-28D	805209.22	608357.36	Monitoring Well	30	25–30	x	x	x	x	x	x		x	x	x	x	x	x	x	x
MW-23	808583.22	607542.44	Monitoring Well	10	5–10	x	x	x	x	x	x		x	x	x	x	x	x	x	x
MW-24	808591.49	607516.03	Monitoring Well	30	25–30	x	x	x	x	x	x		x	x	x	x	x	x	x	x
Existing Wells																				
W-1	810094.77	607846.31	Monitoring Well	30	24–29	x	x	x	x	x	x		x	x	x	x	x	x	x	x
W-2	810094.77	607846.31	Monitoring Well	10.5	4.5–9.5	x	x	x	x	x	x		x	x	x	x	x	x	x	x
W-3	808742.84	608567.63	Monitoring Well	30.5	25–30	x	x	x	x	x	x		x	x	x	x	x	x	x	x
W-4	808742.84	608567.63	Monitoring Well	10.5	5–10	x	x	x	x	x	x		x	x	x	x	x	x	x	x
W-5	808161.40	608410.32	Monitoring Well	30.5	25–30	x	x	x	x	x	x		x	x	x	x	x	x	x	x
W-6A	808161.40	608410.32	Monitoring Well	10	5–10	x	x	x	x	x	x		x	x	x	x	x	x	x	x
W-7	808418.23	608497.91	Monitoring Well	16.5	9–14	x	x	x	x	x	x		x	x	x	x	x	x	x	x
W-8	809268.26	608498.43	Monitoring Well	16.5	9–14	x	x	x	x	x	x		x	x	x	x	x	x	x	x

Notes:

- Blank cells are intentional.
- Screened intervals may change based on soil and groundwater conditions observed in the field.
- Not available.
- 1 Temporary well points MS-02-TWP, MS-05-TWP, MS-07-TWP, and MS-08-TWP will be sampled contemporaneously with collocated surface water/sediment locations. Refer to Table B.4.
- 2 Total and dissolved metals include the RCRA 8 metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) plus aluminum, copper, iron, manganese, and zinc.
- 3 DRO and ORO will be analyzed with and without silica gel cleanup.
- 4 Field parameters include pH, oxidation–reduction potential, specific conductivity, dissolved oxygen, temperature, and turbidity.

Abbreviations:

AST Aboveground storage tank	RCRA Resource Conservation and Recovery Act
bgs Below ground surface	SVOC Semivolatile organic compound
DRO Diesel-range organics	TDS Total dissolved solids
GRO Gasoline-range organics	TOC Total organic carbon
ORO Oil-range organics	TPH Total petroleum hydrocarbons
PCB Polychlorinated biphenyl	VOC Volatile organic compound

Table B.4
Proposed Surface Water and Sediment Sampling Locations, Depths Intervals, and Laboratory Analyses

Location	Location ID	X Coordinate	Y Coordinate	Media	Sample Collection Approach	Maximum Depth	Collocated Temporary Well Point ⁽¹⁾	Sample Analysis														Field Parameters ⁽³⁾
								SMS Metals ⁽²⁾	Total DRO + ORO	SVOCs	VOCs	PCBs	Dioxins/Furans	Other								
														TOC	Alkalinity	TSS/TDS	Hardness	Ammonia	Grain Size	Nitrates and Nitrites	Sulfates and Sulfites	
Main Mill Complex																						
Mill Slough																						
MS-01	MS-01-SW	829345.46	606335.58	Surface Water	Grab	1 feet	--	x		x	x				x	x	x			x		x
	MS-01-SS	829345.46	606335.58	Sediment	Composite	0–10 cm		x	x	x	x	x	x	x				x	x		x	
MS-02	MS-02-SW	828775.97	606300.36	Surface Water	Grab	1 feet	MS-02-TWP	x	x	x	x				x	x	x			x		x
	MS-02-SS	828775.97	606300.36	Sediment	Composite	0–10 cm		x	x	x	x	x	x	x				x	x		x	
MS-03	MS-03-SW	828847.18	606901.49	Surface Water	Grab	1 feet	--	x		x	x				x	x	x			x		x
	MS-03-SS	828847.18	606901.49	Sediment	Composite	0–10 cm		x	x	x	x	x	x	x				x	x		x	
MS-04	MS-04-SW	828915.05	607368.91	Surface Water	Grab	1 feet	--	x		x	x				x	x	x			x		x
	MS-04-SS	828915.05	607368.91	Sediment	Composite	0–10 cm		x	x	x	x	x	x	x				x	x		x	
MS-05	MS-05-SW	828914.04	607965.42	Surface Water	Grab	1 feet	MS-05-TWP	x	x	x	x				x	x	x			x		x
	MS-05-SS	828914.04	607965.42	Sediment	Composite	0–10 cm		x	x	x	x	x	x	x				x	x		x	
MS-06	MS-06-SW	828409.86	608345.74	Surface Water	Grab	1 feet	--	x		x	x				x	x	x			x		x
	MS-06-SS	828409.86	608345.74	Sediment	Composite	0–10 cm		x	x	x	x	x	x	x				x	x		x	
MS-07	MS-07-SW	827806.05	608676.52	Surface Water	Grab	1 feet	MS-07-TWP	x	x	x	x				x	x	x			x		x
	MS-07-SS	827806.05	608676.52	Sediment	Composite	0–10 cm		x	x	x	x	x	x	x				x	x		x	
MS-08	MS-08-SW	827874.45	609025.42	Surface Water	Grab	1 feet	MS-08-TWP	x	x	x	x				x	x	x			x		x
	MS-08-SS	827806.05	608676.52	Sediment	Composite	0–10 cm		x	x	x	x	x	x	x				x	x		x	
Sweet Sewer Slough																						
SS-01	SS-01-SW	826880.94	607393.54	Surface Water	Grab	1 feet	--	x		x	x				x	x	x			x		x
	SS-01-SS	826880.94	607393.54	Sediment	Composite	0–10 cm	--	x	x	x	x	x	x	x				x	x		x	
SS-02	SS-02-SW	827786.74	607541.79	Surface Water	Grab	1 feet	--	x		x	x				x	x	x			x		x
	SS-02-SS	827786.74	607541.79	Sediment	Composite	0–10 cm	--	x	x	x	x	x	x	x				x	x		x	
SS-03	SS-03-SW	827746.87	608475.69	Surface Water	Grab	1 feet	--	x		x	x				x	x	x			x		x
	SS-03-SS	827746.87	608475.69	Sediment	Composite	0–10 cm	--	x	x	x	x	x	x	x				x	x		x	
Woodyard Riverside Drain																						
WD-01	WD-01-SW	827183.14	609125.68	Surface Water	Grab	1 feet	--	x		x	x				x	x	x			x		x
	WD-01-SS	827183.14	609125.68	Sediment	Composite	0–10 cm	--	x	x	x	x	x	x	x				x	x		x	
WD-02	WD-02-SW	826553.73	608873.43	Surface Water	Grab	1 feet	--	x		x	x				x	x	x			x		x
	WD-02-SS	826553.73	608873.43	Sediment	Composite	0–10 cm	--	x	x	x	x	x	x	x				x	x		x	

Notes:

Blank cells are intentional.

Screened intervals and depths may change based on soil and groundwater conditions observed in the field.

-- Not available.

1 Collocated temporary well points will be sampled contemporaneously with associated surface water and sediment locations.

2 Washington State SMS criteria includes total and dissolved metals: arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc.

3 Field parameters include pH, oxidation–reduction potential, specific conductivity, dissolved oxygen, temperature, and turbidity.

Abbreviations:

cm Centimeters

DRO Diesel-range organics

ORO Oil-range organics

PCB Polychlorinated biphenyl

SMS Sediment Management Standards

SVOC Semivolatile organic compound

TDS Total dissolved solids

TOC Total organic carbon

TSS Total suspended solids

VOC Volatile organic compound

Phase 1 Remedial Investigation Work Plan

Cosmo Specialty Fibers Site

Appendix B

Attachment B.1 Floyd | Snider Standard Guidelines and Field Forms

F|S STANDARD GUIDELINE

Well Construction

DATE/LAST UPDATE: May 2015

These procedures should be considered standard guidelines and are intended to provide useful guidance when in the field, but are not intended to be step-by-step procedures, as some steps may not be applicable to all projects.

All field staff should be sufficiently trained in the standard guidelines and should review and understand these procedures prior to going in the field. It is the responsibility of the field staff to review the standard guidelines with the field manager or project manager and identify any deviations from these guidelines prior to field work. When possible, the project-specific Sampling and Analysis Plan should contain any expected deviations and should be referenced in conjunction with these standard guidelines.

1.0 Scope and Purpose

This standard guideline presents commonly used procedures for the installation of resource protection wells, in accordance with applicable sections of the Washington State Minimum Standards for Construction and Maintenance of Wells (Washington Administrative Code [WAC] 173-160, Part Two) and ASTM Standard Practice for Design and Installation of Groundwater Monitoring Wells (ASTM D5092-04[2010]e1). These wells may include groundwater monitoring wells, piezometers, groundwater extraction wells, injection wells, or vapor extraction wells. The guideline is intended to be used by field staff who are overseeing well drilling and construction.

2.0 Equipment and Supplies

Well Installation Equipment and Tools:

- Tape measure or measuring wheel
- Weighted tape or leadline
- Water level meter
- Hand-held Global Positioning System (GPS; optional)
- Camera
- Trash bags

- Well construction materials including polyvinyl chloric (PVC) screen and riser, sandpack, bentonite and well monument will be provided by the drilling subcontractor.

Paperwork:

- Work Plan and/or Sampling and Analysis Plan (SAP)/Quality Assurance Project Plan (QAPP)
- Health and Safety Plan (HASP)
- Copies of figures showing previous boring locations and boring logs from previous investigations and historical depth to water levels, if available
- Well installation forms (printed on Rite in the Rain paper)
- Permanent markers and pencils

Personal Equipment:

- Steel-toed boots
- Hard hat
- Safety vest
- Safety glasses
- Nitrile gloves
- Ear plugs
- Rain gear
- Work gloves

3.0 Standard Procedures

3.1 PREPARATION

First, before going into the field, it is important to discuss the project needs with the Project Manager (PM). These include the appropriate aquifer for well screening (especially if it is not the shallowest aquifer), soil sampling interval (if applicable to drilling method), screen length and placement (especially important at tidally influenced sites), well construction materials (i.e., screen slot size and grain size of the filter pack), surface completion of the wells, and any other important construction details. Any non-standard materials needed for well construction should also be communicated to the drilling firm when the work is scheduled, or a minimum of two weeks prior to the field event. Select a boring log template that is appropriate for the project needs.

Next, review the work plan and existing materials such as cross-sections, historical depth to water levels, or boring logs from previous investigations (if available) to familiarize yourself with the

site geology. In addition to site-specific information (or alternatively if other information is not available), a geologic map of the area from a reputable source such as the U.S. Geological Survey (USGS) may also be reviewed.

Finally, check the area of the site where drilling will occur for underground objects. A OneCall locate request should be made at least one week and no less than three days prior to commencement of drilling in order to give public utility locators time to mark known, buried utility lines. All planned boring locations should be marked on the ground with white spray paint prior to making a locate request. In almost all cases, site maintenance managers or equivalent should be consulted for site selection and a private utility locator should clear any underground objects using electromagnetic techniques from the drilling area. If drilling in close proximity to buried utilities, field staff may need to request authorization for use of an air knife or vacuum extraction to clear the borehole to a depth below the utility lines.

3.2 DRILLING

1. Mark the desired well location using coordinates pre-loaded into a handheld GPS, or by measuring from known Site features. It is best to use both methods, if possible.
2. Before drilling begins, record the following information on each log:
 - a. Operator's name and company, equipment make/model, equipment measurements (i.e., sampler length and diameter, hammer weight and stroke if using hollow stem auger, boring diameter).
 - b. Your name, date, project, boring name, and approximate descriptive location relative to existing site features. Include a description of the ground surface and whether or not concrete coring was necessary; if so, include core diameter, concrete thickness, and subcontractor information.
 - c. A small hand drawn map showing your location with measurements to a stationary reference point, or GPS coordinates (or ideally, both). This is also a good place to note if you have had to move a boring location because of underground utilities, access issues, etc. It is important to record the reason for relocation and the direction and distance moved (i.e., moved 10 feet to the north due to presence of subsurface water line).
3. If you are using a hollow stem auger, it is important to communicate to the driller how often you would like a split spoon sample collected. Typically this would be continuous or every 5 feet but may be different depending on the project needs. Usually this is established before the driller issues a quote. Any changes will affect the cost of the work and should be discussed with the PM.
 - a. Record any feedback from the driller about the drilling conditions. This may include difficult drilling or rig chatter (usually caused by hard materials), heaving sands (usually caused by hydrostatic pressure on the borehole), caving, or hole instability.

4. For split spoon samples, record the number of hammer blows (blow counts) necessary to drive the sampler each 6-inch increment, as reported by the driller. If more than 50 blows are needed, record the distance that the sampler was driven in 50 blows (i.e., 2-inches in 50 blows). This is referred to as the standard penetration test (SPT).
5. For all drilling methods, create a log of the soils encountered according to the Floyd|Snider Soil Logging Standard Guideline. Pay particular attention to the moisture content of the soils, making careful notation of the water table where free water is first encountered. After drilling has been completed to the desired depth, confirm the depth to the water table using a water level meter.

3.3 WELL DESIGN AND CONSTRUCTION

1. Determine the length and placement of the well screen based on the observed depth to the water table, the specifics of the work plan, and the observed lithology. The well screen is typically set across the water table of shallow aquifers for monitoring wells and piezometers. However, the screened interval may be fully submerged for groundwater extraction wells, sites with very shallow groundwater, or wells installed in deeper aquifers below confining units. If an area is tidally influenced, note the tide elevation during well completion; if the tide is at a high or low at the time of drilling the well screen may need to be lowered or raised accordingly so that the screen spans the water table when the tide is at zero. The hydraulic conductivity of the aquifer material will also factor into well screen placement. For example, wells screened in tight silts may not produce enough water to adequately develop and sample. In this case, it may be preferable to screen the well in a more transmissive unit. Include the length of any required bottom caps or sumps below the well casing when determining the total depth of the boring required to place the well screen at the desired interval. The Washington State minimum standards also require that the diameter of the well screen relative to the diameter of the borehole (annular space) be small enough to allow placement of a filter pack that is 4 inches in diameter larger than the screen. For example, a 2-inch diameter monitoring well should be completed within a borehole that has a minimum 6-inch diameter.
2. Determine the filter pack material. The purpose of the filter pack is to prevent fine-grained aquifer material from entering the well while still allowing groundwater to flow through. Filter pack is composed of clean, rounded, relatively uniform silica sand. The choice of sand for the filter pack will depend on the grain size range of the aquifer material, with emphasis on the finest aquifer material. Filter pack material should be approximately 10 to 15 times the grain size of the surrounding aquifer material. The particle size ranges of fine, medium, and coarse sand, and the particle size ranges of common filter pack materials are given in the two tables below. As indicated in these tables, suitable filter pack choices for an aquifer with appreciable fine sand would include a range from 20-40 to 10-20 sand. For aquifers where the smallest particle size is medium sand, a filter pack of 2-12 sand or similar may be appropriate. More precise filter pack designs are possible based on grain size curves (see Driscoll 1986, Blair 2006).

Unified Soil Classification System (USCS) Classification	U.S. Sieve Size	Grain Size (inches)	Grain Size (millimeters)
Fine Sand	40 to 200	.003 to 0.16	.074 to .42
Medium Sand	10 to 40	.016 to .06	.42 to 1.68
Coarse Sand	10 to 4	.06 to 0.19	1.68 to 4.76

Example Sand Pack Gradations (U.S. Sieve Sizes)	Grain Size (inches)	Grain Size (millimeters)
32-40	.016 to .02	.42 to .55
20-40	.016 to .03	.42 to .84
16-30	.05 to .02	.59 to 1.2
10-20	.03 to .08	.84 to 2
2-12	.06 to .3	1.7 to 8

3. Determine the screen slot diameter. The purpose of the well screen is to allow groundwater to flow into and through the well screen for sample collection. Monitoring well casings are typically constructed of PVC (Washington State minimum standards require Schedule 40 or thicker-walled PVC for borings up to 200 feet deep); however, materials such as stainless steel may be used for the purposes of longevity, heat, specific chemical resistance, or other site-specific concerns. The screened interval of the well consists of a series of slots that are commonly 0.01 inch or 0.02 inch in width. Similar to filter pack material, narrower slots allow less fine-grained material and also less groundwater to pass through them. The screen slot size should be selected to retain approximately 90% or greater of the filter pack material. The largest screen slot size practical should be selected.
4. Once the driller has assembled the well casing of the appropriate length, oversee placement of the casing and filter pack. The casing should be centered in the borehole and level. When using a hollow stem auger, the sand is typically poured from the surface while the augers are being lifted from the borehole. When using sonic drilling or other methods where the drill rods are removed prior to sand placement, it is preferable to use a Tremie tube lowered to the bottom of the borehole to deliver the sand, which helps to ensure that the sand has actually reached the bottom of the borehole. As the driller is pouring sand into the annular space, monitor the height of the sand in the borehole using a weighted tape or leadline to ensure that the space is being filled evenly. If possible, use a surge block to force water from the well out into the sand pack periodically to eliminate any bridges or gaps in the sand. The sand pack

placement is complete when it has reached a height minimum of 1 foot (but no more than 5 feet) above the top of the well screen.

5. A bentonite seal must be placed above the sand pack to isolate the screened interval of the aquifer and to prevent the annular space from acting as a preferential pathway for surface water, water above the screen zone, or other liquid (i.e., free product). The purpose of the bentonite plug is to prevent downward migration inside the borehole, which has the potential to cause groundwater contamination. Monitor the placement of the bentonite plug above the sand pack. The bentonite plug is typically composed of dehydrated bentonite chips, which are poured into the annular space from the surface; or a bentonite slurry, which is pumped into the space via a Tremie tube. A bentonite chip seal is still recommended (but not necessary) immediately above the sand pack when using bentonite slurry to minimize migration of the slurry into the sandpack. Pumping is preferable in situations where bentonite will be placed below the water table. The U.S. Environmental Protection Agency (USEPA) recommends that the bentonite seal consist of a minimum of 2 feet of bentonite placed above the sand pack. If using a bentonite chip seal, hydrate the chips with clean water so that they expand to seal the borehole.
6. Communicate the desired surface completion to the driller (i.e., an aboveground well monument or a monument flush with the ground surface) if you have not already done so. Verify that the well monument has been installed correctly. For flush-mounted wells, ensure that the well is level with the surrounding grade, especially in areas with pedestrian or vehicle traffic. In areas with frequent or heavy vehicle traffic, heavy-duty traffic-rated monuments or manholes should be used. For aboveground well monuments (i.e., stand pipes), ensure that the monument is level, anchored in a minimum of 2 feet of concrete, and protected by steel bollards, unless otherwise specified in the work plan. The concrete surrounding any well monument should seal the borehole at the ground surface.

4.0 Decontamination

All reusable equipment that comes into contact with soil and groundwater should be decontaminated as follows prior to moving to the next sampling location.

Split spoons, stainless steel bowls and spoons, the water level tape, and any other tools used for well drilling and installation must be decontaminated between boring locations. If collecting soils samples for chemical analysis, split spoons and any tools used for sample processing will be decontaminated between each sample; alternatively, disposable bowls and spoons may be used. Equipment decontamination will consist of a tap water rinse to remove soil particles, followed by scrubbing with brushes and an alconox (or similar)/clean water solution, and a final rinse with distilled or deionized water.

5.0 Investigation-Derived Waste

Unless otherwise specified in the project work plan, waste soils, liquids, and other drilling materials generated during well drilling and installation will be contained in accordance with applicable laws, and stored in a designated area until transported off-site for disposal.

The approach to handling and disposal of these materials is as follows. For investigation-derived waste (IDW) that is contained, such as waste soils, 55-gallon drums approved by the Washington State Department of Transportation (WSDOT) will be supplied by the driller and used for temporary storage pending profiling and disposal. Each container holding IDW will be sealed and labeled with its contents (e.g., “soil cuttings”), the date(s) on which the wastes were placed in the container, the owner’s name, contact information for the field person who generated the waste, and the site name.

IDW contained within drums will be characterized relative to applicable waste criteria using data from the sampling locations whenever possible. Material that is designated for off-site disposal will be transported to an off-site facility permitted to accept the waste. Manifests will be used as appropriate for disposal.

Disposable sampling materials and incidental trash such as paper towels and personal protective equipment (PPE) used in sample processing will be placed in heavy-duty garbage bags or other appropriate containers and disposed of as solid waste in the municipal collection system (i.e., site dumpster).

6.0 Field Documentation

All observations should be recorded on a soil boring/well completion form appropriate for the drilling method or in a bound field notebook. Field staff should record as much detail as possible in the field log (including well construction materials, Ecology well ID tag number, and surface completions) and note any anomalies or details that varied from the SAP. After the field work is complete, a set of final well construction logs (usually electronic) that serve as the record for the project will be completed in consultation with the project manager or field manager.

F|S STANDARD GUIDELINE

Well Development

DATE/LAST UPDATE: May 2015

These procedures should be considered standard guidelines and are intended to provide useful guidance when in the field, but are not intended to be step-by-step procedures, as some steps may not be applicable to all projects.

All field staff should be sufficiently trained in the standard guidelines and should review and understand these procedures prior to going in the field. It is the responsibility of the field staff to review the standard guidelines with the field manager or project manager and identify any deviations from these guidelines prior to field work. When possible, the project-specific Sampling and Analysis Plan should contain any expected deviations and should be referenced in conjunction with these standard guidelines.

1.0 Scope and Purpose

This Standard Guideline for Well Development presents commonly used procedures for monitoring well development for newly installed monitoring wells and/or existing wells that may require redevelopment. Monitoring well development restores hydraulic conductivity with the surrounding formations that were disturbed during the drilling process. Development removes residual fines from well filter pack materials and the borehole wall and reduces the turbidity of the water, which provides more representative groundwater samples. These wells may include groundwater monitoring wells, piezometers, or groundwater extraction wells. This guideline describes the purge and surge method of development and is intended to be used by field staff who are overseeing or completing well development. Often, the drilling subcontractors are asked to complete well development activities subsequent to new well installations, in which case, Floyd|Snider staff would oversee the development. Other development methods, such as jetting, are not described herein, but may be used if specified in the project-specific Work Plan or Sampling and Analysis Plan (SAP).

Well development shall be completed by continuous pumping at a steady rate using a portable pump and polyethylene tubing, with regular surging (e.g., using a surge block) to force water through the filter pack and surrounding formation. Wells should ideally be developed either

during installation (following sand placement but prior to sealing) or soon after installation, unless otherwise specified in the work plan, using the described methodologies or equivalents. For wells that are completed using a grout or concrete seal, if development does not take place prior to sealing, it should be completed within 48 hours following well installation in order allow for grout and concrete to cure.

2.0 Equipment and Supplies

Well Development Equipment and Tools:

- Appropriate high volume pump (centrifugal, submersible, etc.) and correct diameter tubing, or bailer
- Hose clamps (optional)
- Power source (generator, 12-volt battery, or car battery) and appropriate power adapter for pump
- Water quality meter or turbidity meter (if needed)
- 2-, 4-, or 6-inch surge block (typically provided by the driller)
- Water level meter
- Washington State Department of Transportation (WSDOT)-approved 55-gallon drums
- Equipment decontamination supplies including:
 - Scrub brushes
 - Alconox or other soap
 - Distilled or deionized water
 - Paper towels
- Trash bags
- Camera

Paperwork:

- Work Plan and/or SAP/Quality Assurance Project Plan (QAPP)
- Bound field notebook or appropriate field forms
- Well development form (printed on Rite in the Rain paper)
- Health and Safety Plan (HASP)
- Well installation forms (printed on Rite in the Rain paper)

Personal Equipment:

- Steel-toed boots
- Safety vest
- Safety glasses
- Nitrile gloves
- Rain gear
- Work gloves

3.0 Standard Procedures

3.1 OFFICE PREPARATION

Meet with the project manager to identify key information and goals of the well development, including how long after construction the wells should be developed. Determine if Floyd|Snider or the driller will be doing the development.

3.2 WELL DEVELOPMENT PROCEDURES

The following procedures are general guidelines for monitoring well development. These same procedures are also appropriate for extraction wells, injection wells, and/or piezometers. Specific instructions provided in individual work plans shall supersede these procedures in the event there are discrepancies.

Visually inspect all well development equipment for damage; repair as necessary.

1. Decontaminate all hoses, surge blocks, and/or submersible pump by scrubbing with brush and alconox or other soap solution and rinsing with deionized water.
2. Prior to development, use a water level meter to measure the depth in each well to the static water level and total depth to a reference mark on the top of the well casing.
3. Attach a length of clean or disposable tubing, approximately 5 feet longer than the well casing, to the outlet of the submersible pump.
4. Each well development cycle consists of surging followed by well evacuation (pumping). Surging may be accomplished with a surge block sized to fit snugly inside the well casing, or with the submersible pump. Surging using a pump increases the hydraulic gradient and velocity of groundwater near the well by drawing the water level down and moving more fine-grained soil particles into the well casing. Surging using a pump is only effective if the well produces enough water for continuous pumping and the pump is of a large enough diameter relative to the well casing. If

pumping must be stopped to allow the well to recharge, a surge block is preferable for surging. If using a surge block, connect polyvinyl chloride (PVC) pipe or other rods longer than the well casing to the surge block. Lower the surging device into the well to a depth within the screened interval. A bailer can be used to surge in situations when a surge block is not available and the well has insufficient recharge for the submersible pump.

5. During development, it is important to note the color and clarity of the water and any other visual or olfactory observations on the field form or in the field notebook. Note any significant changes as development progresses.
6. Surging should consist of a minimum of ten consecutive surges (i.e., quickly raise and lower surge block or pump in well) with an appropriately sized surge block or pump over the full length of the screen. For long well screens (greater than 10 feet), surging should be done in short intervals of 2 to 3 feet at a time. In cases where the screen extends to above the water table, clean water may have to be added to the well to develop the top of the filter pack.
7. After surging, water is purged from well until the pumped stream starts to run clear. At that point, stop pumping and initiate another surge cycle. If a well has more hydraulic head than the pump is able to overcome, or if an insufficient volume of water for pumping is present, a disposable bailer may also be used for purging.
8. Repeat this procedure until evacuated water is visibly clear and essentially free of sediment. Perform a minimum of three surge and pump cycles.
9. Well development will be terminated when the variation in the turbidity Nephelometric Turbidity Units (NTUs) readings is less than 10 percent or until the discharge is visibly clear and free of sediment after a minimum of three surge and purge cycles. As an alternative, periodic water samples can be collected for field measurements of temperature, specific conductivity, and pH; well development should continue until field parameters stabilize to within ± 5 percent on three consecutive measurements or 10 well volumes have been purged. If it is not possible reduce the turbidity further, the well should be purged up to a maximum of four hours or as determined sufficient by the field geologist or project manager.
10. Report field observations and volume of water removed on the standard well development form (attached). Take final water level measurements and record then on the field form or in the field notebook.
11. Contain the purged water and manage in accordance with the project-specific SAP or Section 5.0 below. Prior to developing the next well or after the completion of development activities, decontaminate all reusable equipment used in development in accordance with Section 4.0 below.
12. If feasible, it is best to wait at least two weeks after development to sample the wells. Wells can be sampled a minimum of 48 hours after the completion of development if

the project schedule requires a quick turnaround. However, the groundwater sample will be more representative of static conditions in the aquifer if allowed to stabilize for at least one to two weeks after development.

4.0 Decontamination

All reusable equipment that comes into contact with groundwater should be decontaminated as follows prior to moving to the next sampling location.

Water level meter and surge block: The water level indicator and tape will be decontaminated between sampling locations and at the end the day by spraying the entire length of tape that came in contact with groundwater with an Alconox (or similar)/clean water solution followed by a thorough rinse with distilled or deionized water. Surge block decontamination will consist of a tap water rinse to remove soil particles, followed by scrubbing with brushes and an alconox (or similar)/clean water solution and a final rinse with distilled or deionized water.

Submersible Pump: Decontaminating the pump requires running the pump in three progressively cleaner grades of water. Place the pump and the length of the power cord that was in contact with water into a bucket containing approximately four gallons of an Alconox (or similar)/clean water solution. Run the pump for approximately two minutes or until the volume of water in the bucket has been exhausted. Next, place the pump and cord into a second bucket containing approximately four gallons of clean water and run the pump for approximately two minutes or until the volume of water in the bucket is exhausted. Lastly, place the pump and power cord into a third bucket containing approximately four gallons of distilled or deionized water and run the pump for approximately two minutes or until the volume of water in the bucket is exhausted. The soap/water solution and rinse water may be re-used. When done for the day, dry the exterior of the pump and power cord with clean paper towels to the extent practical prior to storage. All decontamination water and rinse water (including soapy solution) should be managed in accordance with Section 5.0 below.

5.0 Investigation-Derived Waste

Unless otherwise specified in the project work plan, well development and decontamination water generated during development and any drilling materials will be contained and stored in a designated area until transported off-site for disposal in accordance with applicable laws.

The approach to handling and disposal of these materials is as follows. For investigation-derived waste (IDW) that is contained, such as well development water, WSDOT-approved 55-gallon drums will be supplied by the driller and used for temporary storage pending profiling and disposal. Each container holding IDW will be sealed and labeled as to its contents (e.g., “MW-1 Well development water”), the date(s) on which the wastes were placed in the container, the

owner's name, contact information for the field person who generated the waste, and the site name.

IDW contained within drums will be characterized relative to applicable waste criteria using data from the sampling locations whenever possible. Material that is designated for off-site disposal will be transported to an off-site facility permitted to accept the waste. Manifests will be used as appropriate for disposal.

Disposable sampling materials and incidental trash such as paper towels and personal protective equipment (PPE) used in sample processing will be placed in heavy duty garbage bags or other appropriate containers and disposed of as trash in the municipal collection system (i.e., site dumpster).

6.0 Field Documentation

Well development procedures will be documented on the well development field form (attached) or a bound field notebook. Information recorded will at a minimum include date, personnel present (including subcontractors), purpose of field event, weather conditions, depth of water, well construction details for the well(s) being developed (i.e., diameter, total depth, screen interval), water quality field measurements (if collected), amount of purged water generated, and any deviations from the SAP.

Enclosure: Well Development Field Form

FLOYD | SNIDER

Date: _____

Field Personnel: _____

Purge Data

Well ID:	Total Well Depth:	Well Condition/Damage Description:
Well Casing Type/Diameter/Screened Level:	One Casing Volume (gal):	
Method of Development (Circle): Surge Block Pump Surge Bailer	Equipment Used (type of pump, etc.):	

Begin Purge (time):	Volume of Schedule 40 PVC Pipe				
End Purge (time):					
Gallons Purged (time):	Diameter	O.D.	I.D.	Volume (Gal/Linear Ft.)	Weight of Water (Lbs/Linear Ft.)
Purge Water Disposal Method (circle):	1 ¼"	1.660"	1.380"	0.08	0.64
On-site Storage Tank On-site Treatment Drum Other:	2"	2.375"	2.067"	0.17	1.45
	3"	3.500"	3.068"	0.38	3.2
	4"	4.500"	4.026"	0.66	5.51
	6"	6.625"	6.065"	1.5	12.5

[illegible]

**STANDARD OPERATING PROCEDURE
ATTACHMENT A
OPERATING INSTRUCTIONS FOR SOLINST DRIVE POINT PIEZOMETERS**

DRIVE-POINT PROFILER

Operating Principles

The Drive-Point Profiler enables the collection of groundwater samples from multiple discrete elevations in a single drive/drilling location. A rig advances the Profiler and attached AW rod to the desired sampling depth. Lengths of AW drive rod are added as the assembly is advanced.

The Profiler Tip has screened inlets set circumferentially. The inlets lead to a single stainless steel fitting, where tubing that runs through the extension rods to the surface is attached. A Peristaltic Pump connected to the tubing is used to collect samples from each discrete depth.

To prevent the inlets from clogging, the Profiler is flushed with de-ionized (D.I.) water while it is driven between sampling zones.

AW Drive-Point Profiler Setup

1. Ensure a Peristaltic Pump is available and functioning properly.
2. Check that enough de-ionized water is on hand to complete the job. During driving, flushing approximately 5 to 20 ml/min is sufficient.
3. Cut an appropriate length of 5/32" (4 mm) LDPE or Teflon-lined tubing. The minimum tubing length cut should be equal to the expected drive depth, plus an additional 10 ft (3 m).
4. Pass the tubing through the first length of AW Drive Rod and AW Coupling and push-fit the tubing into the fitting on the inside of the Profiler Tip.
5. Thread the AW Coupling and Drive Rod into the Profiler Tip and tighten with pipe wrenches.
6. Thread the AW Drive Head Adaptor (not supplied by Solinst) over the tubing and tighten onto the AW Drive Rod.
7. Slip the AW Drive Head over the tubing and onto the Adaptor ensuring that the tubing protrudes through the AW Drive Head slot.
8. Connect the 5/32" (4 mm) tubing to the Peristaltic Pump.

Advancing

1. Turn the Peristaltic Pump on and start the delivery of D.I. water. Begin advancing the Profiler to the desired sampling depth.
 - a. Monitor the level of the D.I. water in the source container in order to ensure continuous flow. Also note the rate and volume of water injected into the ground.
 - b. If the Profiler is clogged, the flow will stop.
 - c. Increase the pumping rate to clear the obstruction.
2. Turn off the pump and stop driving when the appropriate sampling depth has been reached.
3. Sampling
 - a. Remove the pump tubing from the D.I. water.
 - b. Hold the pump tubing over a waste water container and reverse the flow of the pump.
 - c. Monitor the clarity, volume, and conductivity of the sampled water.

- d. Take samples when the water becomes “dirty”, the volume removed equals the volume injected, and the conductivity exhibits marked change, indicating that all D.I. water has been purged and formation water is being extracted.
4. Place the pump tubing back into the D.I. source and pump D.I. water (amount equal or greater than the volume of the tubing) back into the system to rinse the tubing before driving to the next sampling point.
5. Repeat steps 1 through 3 for each subsequent sampling point.

Adding Drive Rod Lengths

1. Disconnect the 5/32" (4 mm) tubing from the Peristaltic Pump.
2. Remove the AW Drive Head and Drive Head Adaptor.
3. Thread an AW Coupling and Drive Rod over the Tubing.
4. Thread the Drive Rods together using the Coupling and tighten.
5. Reinstall the AW Drive Adaptor and Drive Head.
6. Reconnect the 5/32" (4 mm) tubing to the Peristaltic Pump.
7. Continue advancing and sampling.

Sealing Profiler Holes

1. Grout Tip AW Drive-Point Profiler holes in most homogeneous sands will collapse as soon as the Profiler is withdrawn. In other geologic formations it is best to use a Profiler fitted with a Grout Tip.
 - a. Sampling using the Grout Tip Profiler is done in the same manner as those without a Grout Tip. (See previous page).
 - b. The Grout Tip is a single use tip that can be separated from the Profiler with a high-pressure grout pump, after sampling is complete.
 - c. This allows the hole to be grout sealed as the Profiler is being withdrawn, ensuring no void spaces.
 - d. Replacement Grout Tips are available (#100643), and easily fit onto existing Grout Tip Bodies by pushing into the end until the O-ring properly seats.

Maintenance and Decontamination

1. After the system has been removed, proper decontamination of the Drive-Point Profiler must be performed.
 - a. Disconnect the 5/32" (4 mm) tubing and discard or appropriately decontaminate.
 - b. Using the Allen Key provided, remove the screened inlet hole inserts and then remove the screens (50 mesh).
 - c. Wash all components with a mild detergent and thoroughly rinse with
 - d. D.I. water, or follow local guidelines or standards as required by your decontamination procedure.

DRIVE-POINT PIEZOMETER

Installation with a Manual Slide Hammer

1. Ensure that all components are clean prior to use.

2. Cut the piezometer tubing to the depth of the proposed installation plus an additional 5 ft (1.5 m).
3. Connect the piezometer tubing to barbed fitting on the Drive-Point Piezometer Tip by pushing firmly until the tubing reaches the base of the fitting.
4. Slide a length of extension drive pipe over the tubing, and thread it firmly onto the Drive-Point Piezometer Tip. Tighten with a pipe wrench.
5. Hold the tubing to prevent it from turning, then slide the Tubing Bypass over the tubing and tighten it firmly onto the extension pipe, with the tubing extending through the side hole.
6. Thread a Drive Extension and the Drive Head onto the Tubing Bypass and tighten firmly.
7. Slide the Slide Hammer over the Drive Head and operate the hammer to drive the device until only about 6" (15 cm) of the extension pipe below the Tubing Bypass remains above the ground.
8. Remove the hammer, then holding the tubing to prevent it from turning, remove all sections of the Drive Head Assembly.
9. Slide a coupling over the tubing and tighten firmly onto the previous extension pipe. Slide the next extension pipe over the tubing and tighten it securely.
10. Repeat steps 5 through 10 until the desired sampling depth is reached.
11. Cut the piezometer tubing to fit flush to the top of the extension pipe. Attach a cap to the top of the piezometer to complete the installation.

Component List

1. Drive-Point Piezometer Tip
2. Extensions (suitable to reach the required depth)
3. Couplings (one required for each extension)
4. Manual Slide Hammer
5. Piezometer tubing (suitable to reach the required depth)
6. Drive Head Assembly (3 parts)
7. Includes: Drive Head, Drive Extension & Tubing Bypass
8. Stainless Steel Cap (101057)

Important Notes about Shielded Piezometers

1. Before driving into the ground, ensure that the shield is on firmly and the o-ring seats properly.
2. Drive the Piezometer an equal length past the desired depth, then pull back/up to expose the inlet.
3. 1 ft (102412) and 6" (104370) Replacement Shields are available when re-using the Drive-Point Piezometer.

PERISTALTIC PUMP

Important Notes about Peristaltic Pumps

1. Pump is water resistant but not waterproof. Do not submerge in water.
2. Pumping rates will decrease as the amount of lift increases.
3. Remove tubing when stored.

4. Replace the tubing regularly. The pump will be inefficient if the tubing is worn. This will show as a limited ability to lift water. If the tubing looks worn, flattened or cracked, replace the tubing.
5. If used in cold weather, ensure that there is no ice in the tubing before starting the pump.
6. Pump is not designed for long-term continuous uninterrupted use.

Power

The pump operates from an external 12V DC power supply such as a car, truck or marine 12 volt battery and has a 12 ft (3.6 m) power cable with connector clips for direct battery connection.

The power cable clips are oversized for use with automotive batteries. The red clip connects to the positive (+) battery terminal, black to negative (-) battery terminal. If the battery is connected with reverse polarity the pump will not be harmed, but it will NOT operate until the polarity is connected correctly.

An externally accessible fuse holder is located on the side of the pump case. In the event of a blown fuse due to a stalled pump head, replace fuse with an 8 AMP, type 3AG (1/4" x 1 1/4") 'Slo-Blow' fuse.

Do not use a larger amperage fuse.

If the pump is to be powered by a vehicle battery for more than 3 continuous hours, start vehicle and run for 15 minutes to recharge the battery.

Operation

1. The Solinst Peristaltic Pump has an integral Forward/Reverse, variable flow dial with an OFF position, which has a central detent. When turning the unit OFF, ensure you feel the dial snap into position.
2. The pump should always be kept with the control in the OFF position when it is being attached to a power source or stored.
3. Once attached to a power source, turn the dial in the direction required and adjust the flow as desired.
4. The standard 5/8" (16 mm) OD medical grade silicon tubing can be attached to 1/2" (13 mm) OD down-hole sample tubing and gives purge rates up to 3.5 L/min and 120 mL/min at the low end.
5. The optional 3/8" (10 mm) OD silicon tubing and adaptor kit allow the use of 1/4" (6 mm) OD down-hole sample tubing, giving flow rates up to 900 mL/min and sampling rates as low as 40 mL/min.
6. Ensure that the chosen silicon tubing has been properly installed in the pump head.
7. Connect one end of the silicon tubing to the down-hole sample line.
8. Either connect the other end of the silicon tubing to a discharge tube, or simply discharge out of this end of the tubing.
9. Connect the negative (black) battery clip to the negative terminal post on a 12V DC battery and the positive (red) battery clip to the positive terminal.

Changing or Installing 5/8" Silicon Tubing

1. To install or replace the tubing, disconnect the pump from its power supply, then undo the four thumbscrews on the drive head (black plastic end). Remove the drive head cover.
2. Manually rotate the pump impeller in any direction while gently pulling on the tubing to pull it away from the body.
3. Remove tube clamps from the old tubing.
4. Position the new tubing around the impeller in a "U" shape with equal lengths. Turn the impeller to the 6 and 12 o'clock position and push the right hand tubing into the tubing pathway, holding near the bottom. Rotate the impeller clockwise until tubing is in place. Push the left half of the tubing into place and rotate the impeller.
5. Replace clamps onto the tubing close to the drive head to prevent the tubing from being pulled into the drive head.
6. Reposition the pump head cover and screw firmly in place, but only finger tight. Do not use a wrench or over tighten.

Installing Optional Adapter Kit & 3/8" Tubing

1. Components
 - a. 3 ft of 3/8" OD Silicon Tubing • 2 Tube Bushings
 - b. 2 Tube Clamps • 1 Drive Head Insert
2. Installation
 - a. Disconnect the pump from the power supply, then undo the four thumbscrews on the drive head (black plastic end). Remove the drive head cover. Remove the existing tubing.
 - b. Make a "U" shape with the white plastic drive head insert and place around the tubing pathway in the drive head.
 - c. Position the new tubing around the impeller, following instruction #4 above.
 - d. Place the bushings onto the tubing making sure they are placed INTO the drive head tubing inlet/outlet.
 - e. To prevent the tubing from being pulled into the drive heads, place the clamps onto the tubing, close to the bushings and using the narrower clamp position.
 - f. Re-position the pump head cover and screw it firmly in place, but only finger tight. Do not use a wrench or over-tighten.

F | S STANDARD GUIDELINE

Soil Sample Collection

DATE/LAST UPDATE: December 2022

These procedures should be considered standard guidelines and are intended to provide useful guidance when in the field but are not intended to be step by step procedures, as some steps may not be applicable to all projects.

All field staff should be sufficiently trained in the standard guidelines for the sampling method they intend to use and should review and understand these procedures prior to going into the field. It is the responsibility of the field staff to review the standard guidelines with the field manager or project manager and identify any deviations from these guidelines prior to field work. When possible, the project-specific Sampling and Analysis Plan should contain any expected deviations and should be referenced in conjunction with these standard guidelines.

1.0 Scope and Purpose

This standard guideline presents commonly used procedures for collection of soil samples for characterization and laboratory analysis. The methods presented in this guideline apply to the collection of soil samples during the following characterization activities: soil borings via drilling, manual collection of shallow soil samples, test pit excavation, excavation confirmation, and stockpile characterization. Specific details regarding the collection of discrete and composite samples, and special sampling techniques for volatile organic compounds (VOCs) are also included. The guideline is intended to be used by staff who collect soil samples in the field.

It is important that the field staff completing the soil sample collection discusses the specific needs for a particular investigation with the project geologist, the project manager, or whoever will ultimately be responsible for interpreting the findings of the field investigation. This discussion is in addition to field training and general knowledge about soil sampling, and should happen prior to entering the field, with additional follow-up before finalizing the field forms, after the investigation is complete.

2.0 Equipment and Supplies

Soil Sampling Equipment and Tools:

- Tape measure or measuring wheel
- Stainless steel bowls and spoons
- Trowel, hand auger, or shovel (if needed)
- Table and disposable sheeting, tape or clamps to hold down sheeting (if needed).
- White board and dry erase pen
- Graduated plunger and collection tubes for VOC samples (if needed)
- Photoionization detector (PID) (if needed)
- Ziploc bags (sandwich and gallon sizes)
- Trash bags
- Decontamination tools including:
 - Paper towels or shop towels
 - Spray bottles of Alconox (or similar) solution
 - Deionized or distilled water
 - Scrubbing brush and bucket
- Adhesive drum labels, and paint or grease pen
- Washington State Department of Transportation- (WSDOT) approved drums for investigation-derived waste (IDW) disposal, if needed (if drilling, to be provided by driller)
- Camera
- Hand-held global position system (GPS; if needed)
- Coolers, sample jars, labels, ice

Paperwork:

- Work Plan and/or Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP)
- Field map printed on Rite in the Rain paper
- Site-specific Health and Safety Plan (HASP)
 - Tailgate meeting form (for each day you expect to be on Site)
 - Safety Data Sheets
- Floyd|Snider's Accident Prevention Plan (APP)

- Sample collection forms printed in Rite in the Rain paper
- Boring Logs
- Rite in the Rain field notebook
- Chain of custody forms
- Emergency contact numbers for utilities, property owner/manager, etc. (as needed)

Safety Equipment:

- Steel-toed boots
- Safety vest
- Safety glasses
- Nitrile gloves
- Rain gear
- Work gloves
- Hard hat
- Ear protection
- Traffic barricades or cones
- Vehicle emergency kit (road flares, fire extinguisher, first aid kit, etc.)
- Sunscreen if needed
- Hand and foot warmers, if needed
- Mosquito repellent, Hornet Spray, if needed
- Drinking water
- Rain or sun shelter, if needed
- Cell phone and charger cables

3.0 Standard Procedures

3.1 OFFICE PREPARATION

Prior to going into the field, review the SAP and QAPP to become familiar with the sampling goals, data quality objectives, desired sample intervals and nomenclature, field Quality Assurance (QA) samples (i.e., frequency of field duplicates, MS/MSDs) to be collected, analytes, sample containers, and holding times for each analytical method.

At least one week prior to sampling, coordinate with the laboratory specified in the SAP/QAPP to receive coolers and appropriate sample containers (including additional containers for

QA samples). Familiarize yourself with the volume requirements and container types, preservation methods, and holding times for each class of analytes.

If drilling or digging test pits, mark the sample area and sample locations with white spray paint prior to sampling, then submit an 811 public utility locate request at least 3 business days prior to work. Hire a private utility locator and schedule to locate utilities on private property and ensure proposed boring and/or excavation locations are free of utilities (Note: not all locators are equipped to mark non-conductible utilities).

3.2 TAILGATE SAFETY MEETING

Conduct a tailgate safety meeting prior to beginning work at the Site. Include any subcontractors working with you at the Site in this meeting. The safety meeting should cover the hazards specific to soil sampling. Typical hazards include:

- Heavy machinery/drill rig awareness (overhead hazards, pinch points, noise, uncontrolled release of energy). Always make eye contact before approaching an operator.
- Physical hazards (heavy lifting, uneven ground/trip hazards)
- Chemical hazards (dust, site-specific contaminants of concern, lab preservatives)
 - Refer to HASP for specific air monitoring requirements, permissible exposure limits (PELs), and actions if PELs are exceeded.

Additional hazards that may be present at any job site include traffic, adverse weather, slips, trips, falls, biological hazards (such as insects, plants, animals), and worksite distractions (such as pedestrians or other onsite activities).

Record the meeting attendees and topics discussed on the front page of the tailgate safety meeting form. All attendees should sign the form.

3.3 OTHER HEALTH AND SAFETY GUIDELINES

The following are additional health and safety guidelines that should be followed in the field. These guidelines are intended to supplement the guidelines and requirements identified in the HASP and are not intended to replace the HASP.

- Review and sign the HASP prior to going out into the field.
- Conduct a tailgate safety meeting prior to beginning work at the site as discussed in Section 3.2.
- If conditions change (e.g., weather or personnel) or when moving between sampling locations/switching to different sampling tasks, assess any additional hazards that may be associated with the new condition or location/task. Record additional hazards noted and corrective actions to address those hazards on the second page of tailgate safety meeting form.

Record near misses and incidents on the Near Miss and Incident Reporting Form (included as an attachment to the HASP) and conduct management/client notifications according to the protocols detailed in the HASP.

3.4 GENERAL SOIL SAMPLE COLLECTION PROCEDURES

1. Locate the desired sample location and depth interval using a handheld GPS or by taking field measurements from known site features. Record the soil type and any other observations or indications of contamination on a soil boring log (enclosed), soil sample collection form, or field notebook, as described in the Soil Logging Standard Guideline. Note the location and depth of the sample on the whiteboard or notecard and take a photograph with a scale (e.g., tape measure), if possible.
2. Refer to Sections 3.4.1 through 3.4.4 for the appropriate soil collection procedures for drilling, shallow soil, test pit excavation, excavation confirmation, and stockpiles. If collecting samples for VOC analysis by the U.S. Environmental Protection Agency (USEPA) Method 5035, refer to Section 3.5 for specific sample collection procedures for this method. If composite soil sampling is recommended, refer to Section 3.6 for details.
3. Once soil has been collected from the desired depth or interval, mix thoroughly in a disposable or decontaminated stainless-steel bowl until the sample is homogenous in color, texture, and moisture.
4. Fill the required laboratory-provided jars, taking care not to overfill. If large gravels (diameter greater than ~ 1 inch) are encountered, these should be discarded to ensure that an adequate soil volume is collected for analysis. If necessary, use a clean paper towel to remove soil particles from the threaded mouth of the jar before securing lids to ensure a good seal. Remove any soil or dirt from the outside of the jar with a clean paper or shop towel.
5. Label each jar with the sample name, date, time, field staff initials and required analyses. If collecting a field duplicate, use the sample nomenclature specified in the SAP\QAPP and note the field duplicate name and sample time in the sample log and/or field notebook. If extra volume for matrix spike/matrix spike duplicate (MS/MSD) analysis is required, use the same name on all jars. Soil samples should be protected from moisture by placing the filled sample jars into separate sealed Ziploc bags before placing them into a cooler.
6. Upon completion of each day of sampling, complete a chain-of-custody form for all samples, including sample names, date and time of collection, number of containers, and required analyses and methods. Write neatly and make sure information on the chain is legible. If you need to correct an entry, strike the incorrect entry out once, and add your initials next to the strike out. Samples collected for waste characterization purposes should be recorded on a separate chain-of-custody. Keep samples on ice (unless otherwise specified in the SAP/QAPP) to maintain

temperatures of 4-6 degrees Celsius (°C) and transport to the laboratory under chain-of-custody procedures.

3.4.1 Soil Sample Collection via Drilling

These procedures should be used for drilling via direct-push, hollow stem auger, or roto-sonic methods where a pre-designated sample interval (i.e., 0 to 5 feet below ground surface [bgs]) is retrieved from the subsurface using a split spoon sampling device, lined core, or bag sampler.

1. Ensure that reusable sampling equipment has been thoroughly decontaminated prior to sampling.
2. Collect PID measurements and other field tests, if necessary. PID measurements should be collected using the head-space method: put a small amount of soil from the selected interval into a sandwich bag and seal the bag. Label the bag with the soil interval. After at least 10 seconds, insert the tip of the PID into the bag and record the PID reading on the boring log or field collection form. If a sheen test is necessary, place a small amount of soil into a disposable or decontaminated stainless steel bowl, spray it with tap water or deionized water and observe whether a sheen appears on the water. Record results on the boring log or sample collection form.
3. Prior to sample collection, log soil on the boring log or sample collection form following the Soil Logging Standard Guideline.
4. Use a stainless-steel spoon or trowel, or disposable scoop to remove an equal volume of soil across the targeted depth interval from the sampler.
 - a. If using a split spoon sampler or other reusable sampler, avoid collecting the soil that is touching the sides of the sampler to the extent practical.
 - b. If the soil touching a reusable sampler must be collected to obtain adequate volume for analysis, notify the PM and record in the field logbook.

3.4.2 Manual Collection of Shallow Soil Samples

These procedures should be used for shallow soil sampling via scoop, trowel, shovel, or hand auger.

1. Dig or auger to the bottom depth of the shallowest sample to be collected, using a tool that has been thoroughly decontaminated. Verify that the target depth has been reached using a measuring tape.
2. If using a scoop or trowel, collect the soil directly into a decontaminated stainless-steel bowl.
3. If using a shovel, the soil may either be collected in bowls or set aside on plastic sheeting in favor of collecting the sample from the sidewall of the hole. If sampling the sidewall, use a decontaminated or disposable scoop or trowel to collect soil from the target depth, or scrape along the sidewall to collect soil across a target depth

interval. Transfer soil to a disposable or decontaminated stainless-steel bowl, repeating until a sufficient volume has been collected.

4. If using a hand auger, empty the cylinder of the auger directly into a disposable or decontaminated stainless-steel bowl. It may be necessary to empty the hand auger onto plastic sheeting or into a bowl to reach the target depth without overflowing the sampler.
5. Any soil from depth intervals that are not targeted for sampling should be set aside on plastic sheeting and returned to the hole after sampling.
6. Collect PID measurements and other field tests as described in Section 3.4.1.

3.4.3 Sample Collection from Test Pits or Limited Soil Excavations

These procedures should be used for collecting samples from test pit explorations excavated using a backhoe or excavator. These same general procedures should also be followed for post-excavation soil samples used to confirm that an excavation has removed contaminated material or to document post-excavation conditions after target excavation limits have been reached.

1. Measure the length, width, and depth of the test pit or excavation area to verify that the target extents have been reached. The lateral spacing of the test pit or excavation confirmation samples, or exact location of samples should be specified in the work plan and typically depend on the size of the excavation area but can vary significantly by project.
2. If not specified in the work plan, sidewall samples may be collected either midway between the ground surface and base of the excavation, or incrementally along the entire height of the sidewall. Both sidewall and base (bottom) samples should penetrate a minimum of 6 inches into the excavated surface.
3. If the test pit or excavation is less than 4 feet deep, or has been benched to accommodate safe entry, a sample may be collected directly from the sidewall(s). Do not enter an excavation before reviewing and verifying the necessary safety requirements. Most excavations can be sampled without entering, which is preferred. If entering is safe, based on the depth or accommodations to support entry, to collect soil from a sidewall, use a decontaminated or disposable scoop, trowel, or shovel to obtain soil from the desired depth or depth interval directly into a decontaminated stainless-steel bowl.
4. If a test pit or excavation cannot be safely entered, instruct the excavator operator to scoop sidewall material from the target depth or depth interval. Collect the soil sample from the excavator bucket using a decontaminated stainless-steel spoon, trowel, or disposal scoop, avoiding material that has come into contact with the teeth or sides of the bucket. Place an adequate volume of soil into a decontaminated stainless-steel bowl. If necessary, follow the compositing procedures in Section 3.6.

3.4.4 Stockpile Sampling

These procedures should be used for classifying stockpiled soil, including excavated soil and imported backfill material.

1. Where potentially contaminated soils have been previously excavated and stockpiled on site, Washington State Department of Ecology (Ecology) guidance recommends using a decontaminated or disposable scoop or trowel, penetrating 6 to 12 inches beneath the surface of the pile at several locations until sufficient volume for analysis is achieved. A decontaminated shovel may also be used to facilitate collection of soil from large piles. The locations for soil collection should be where contamination is most likely to be present based on field screening (i.e., staining, odor, sheen, or elevated photoionization detector [PID] readings). If there are not field indications of contamination, the locations should be distributed evenly around the stockpile.
2. The stockpile may need to be broken up into sections for sample collection depending on the size of the pile (i.e., segregate the pile in half or quarters). If this is necessary, it is important to document where each set of samples were collected from (i.e., north quadrant) and create a field sketch in the project notebook of the pile for reference and mark sample locations with flags.
3. If a sampling frequency is not specified in the work plan, the general rule of thumb for contaminated soil stockpile profiling is to collect and submit 3 analytical samples (these samples can be multi-point composites or grabs) for stockpiles less than 100 cubic yards (CY), 5 samples for stockpiles between 100 and 500 CY, 7 samples for stockpiles 500 to 1,000 CY, 10 samples for stockpiles 1,000 to 2,000 CY, and 10 samples for stockpiles larger than 2,000 CY with an additional sample collected for every 500 CY of material. This rule of thumb is consistent with the Washington State Guidance for Remediation of Petroleum Contaminated Site (Ecology 2016).
4. Samples for characterization of stockpiles of imported backfill or other presumed clean material should also be collected as described under 3. If not described in the work plan, the typical sample frequency for imported or clean material characterization is one sample per 500 CY.

3.5 SOIL SAMPLE COLLECTION FOR VOC ANALYSIS

If collecting soil samples for VOC analysis by USEPA Method 5035, collect these samples first before disturbing the soil. This method uses a soil volume gauge fitted with a disposable soil sampling plunger tube to collect a soil plug that can be discharged directly to a VOA vial, limiting the loss of volatiles during sampling. The collection of VOC samples using the 5035 method specifies use of an airtight VOA vial with a septum lid. Ecology's interpretation of the USEPA 5035 method allows for field preservation of the sample with methanol or sodium bisulfate, or laboratory preservation (i.e., field collection into an un-preserved vial). It is important to note that if laboratory preservation is the selected method, samples must be received at the laboratory within 48-hours of sample collection. The method of sample preservation for the 5035 method will vary for each site and is dependent on site-specific conditions. Preservation

method selection should be coordinated with the laboratory and specified in the sampling plan. Note that not all labs use the soil volume gauge as described below (some use syringes or Terra Core samplers) and that it is important to verify the sampling process with the lab.

1. Note the volume of soil needed for analysis as specified by the laboratory (commonly 5 or 10 grams). Raise the handle of the soil volume gauge to the slot in the gauge body corresponding to the desired volume and turn clockwise until the tabs in the handle lock into the slot.
2. Insert a sample tube at the open end of the gauge body and turn clockwise until the tabs on the tube lock into the “0 gram” slot. Remove the cap from the sample tube and press directly (where possible) into the shallow soil, soil core/sampler, excavation base or sidewall, or stockpile.
3. Continue pressing the sample tube until the plunger is stopped by the sample volume gauge. If a depth interval (for example 9 to 10 feet) is targeted for VOC sampling, collect small volumes of soil across this interval until the sample tube is filled.
4. Twist counterclockwise to disengage the sample tube, then depress the plunger to eject the soil plug directly into a laboratory-provided VOA vial. Wipe off any soil particles on the VOA vial threads before tightening the lid. Grit on the VOA vial threads can cause a poor seal and interfere with the laboratory analyses. If multiple vials per sample are required, the same plunger may be re-used to fill the remaining vials.

3.6 COMPOSITE SAMPLE COLLECTION

For this guideline, composites are considered samples that are collected across more than one location, or multiple depth intervals at a single location. Samples collected over continuous depth intervals within a sampling device (i.e., split spoon) are addressed for each sampling method in Section 3.4 above.

Compositing of sample material may be performed in the field or by the analytical laboratory. To collect a field composite sample, identify the locations and depth(s) that will comprise the composite. Collect soil from the first target sub-sample depth or depth interval and hold in a decontaminated stainless-steel bowl, covered with aluminum foil to prevent cross contamination and label with the location and depth. Continue to collect and hold individual sub-samples until all components of the composite have been collected, then transfer an equal amount of each sub-sample to a clean bowl and homogenize. Fill necessary sample jars from homogenized composite. In some cases, project plans may require that each individual sample that comprised the composite be collected in jars and submitted to the laboratory if individual sample analysis is desired, or if laboratory compositing is requested in addition to field compositing as a field quality control measure. In this case, label each individual jar, but indicate HOLD on the chain-of-custody, and note that the sample is part of composite XYZ.

To collect a laboratory composite sample, collect, and label each sub-sample using the procedures described above in Section 3.4. Record each sub-sample on the chain-of-custody form, and indicate on this form which samples should be composited by the laboratory and the

desired name of the composite sample. It is important to communicate to the laboratory if discrete samples will also require analysis (in some cases) or only the composite sample. It is helpful to send a follow up email to the laboratory PM with laboratory compositing details.

4.0 Decontamination

All reusable equipment that contacts soil or dust should be decontaminated prior to moving to the next sampling location.

Stainless-steel bowls and spoons, and any tools used for sample processing will be decontaminated between each sample; alternatively, disposable bowls and spoons may be used. Equipment decontamination will consist of a tap water rinse to remove soil particles, followed by scrubbing with brushes and an Alconox (or other soap)/tap water solution, and a final rinse with distilled or deionized water.

5.0 Investigation-Derived Waste

Unless otherwise specified in the project work plan, waste soils accumulated as investigation derived waste (IDW) will be contained, transported, disposed of in accordance with applicable laws, and stored in designated drums in a designated area until transported off-site for disposal.

The approach to handling and disposal of these materials is as follows. For IDW that is containerized, such as waste soils, 55-gallon drums approved by WSDOT (or the applicable stage agency) will be used for temporary storage pending profiling and disposal. Each container holding IDW will be sealed and labeled as to its contents (e.g., "soil"), the dates on which the soil was accumulated, the site owner's name (i.e., the generator), Floyd|Snider name, and the Floyd|Snider field person contact information or front desk telephone number.

Refer to the IDW Special Conditions SOP for further information on IDW storage, sampling, profiling, and handling.

Disposable sampling materials and incidental trash such as paper towels and personal protective equipment (PPE) used in sample processing will be placed in heavy duty garbage bags or other appropriate containers and disposed of as solid waste in the municipal collection system (i.e., site dumpster).

6.0 Field Documentation

All observations including sample collection locations, soil descriptions, sample depths, collection times, analyses, and field QC samples should be recorded on a boring log, soil sample collection form, and/or bound field notebook. Information recorded should additionally include personnel present (including subcontractors), purpose of field event, weather conditions, sample collection date and times, sample analytes, and any deviations from the SAP.

At the end of the day, complete and review the second page of the tailgate safety meeting form detailing additional hazards, corrective actions, near-misses or incidents. Any incidents that result in field staff injuries or have the potential to result in staff injuries (such as hitting buried utility lines when drilling) should be reported immediately to the PM.

7.0 Demobilization

Upon returning to the office, ensure that all equipment is properly cleaned and put away in the field room. Equipment with rechargeable batteries should be plugged in as appropriate so it is ready for use by the next person. It is preferable to dispose of trash at the project site, but any trash left in the field vehicle should be brought upstairs, labeled, and placed in the front production room for building staff to dispose of.

If equipment or sample coolers will be placed at the front desk for pickup, clearly label each item with the company picking it up, anticipated pickup time frame, and your contact information so front desk staff can contact you if there are any questions. Notify front desk staff if any items require a signature at pickup.

Within one week of returning from the field, the field lead for the event should review field notes, sampling forms and tailgate safety meeting forms with the PM. Following PM review and approval, field notes will be scanned and saved to the project folder. Hard copies should be filed. The PM will provide copies of near miss and incident reports to the Health and Safety Administrator.

Enclosures: Boring Log
Test Pit Log and Sample Collection Form

Record of Revisions:

Revisions	Date
Added H&S information and line edits for clarity.	7/22/2022
Reviewed with minor updates	SD 12/9/2022

FLOYD SNIDER strategy ▪ science ▪ engineering	PROJECT:	LOCATION:	BORING ID:
	LOGGED BY:	COORDINATE SYSTEM:	
DRILLED BY:	NORTHING:	EASTING:	
DRILLING EQUIPMENT:	GROUND SURFACE ELEVATION:		
DRILLING METHOD:	TOTAL DEPTH (ft bgs):	DEPTH TO WATER (ft bgs):	
SAMPLING METHOD:	BORING DIAMETER:	DRILL DATE:	

Depth (feet)	USCS	Description	Drive	Recovery	# of Blows	PID (ppm)	Sample ID
0							
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

ABBREVIATIONS: ft bgs = feet below ground surface ppm = parts per million	USCS = Unified Soil Classification System ▼ = denotes groundwater table	NOTES:
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FLOYD SNIDER strategy ▪ science ▪ engineering		PROJECT:		LOCATION:		BORING ID:	
		LOGGED BY:		COORDINATE SYSTEM:			
DRILLED BY:				NORTHING:		EASTING:	
DRILLING EQUIPMENT:				GROUND SURFACE ELEVATION:			
DRILLING METHOD:				TOTAL DEPTH (ft bgs):		DEPTH TO WATER (ft bgs):	
SAMPLING METHOD:				BORING DIAMETER:		DRILL DATE:	
Depth (feet)	USCS	Description	Drive	Recovery	# of Blows	PID (ppm)	Sample ID
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
ABBREVIATIONS: ft bgs = feet below ground surface ppm = parts per million			USCS = Unified Soil Classification System ▼ = denotes groundwater table			NOTES:	

Test Pit Log and Sample Collection Form

[illegible]

F | S STANDARD GUIDELINE

Low-Flow Groundwater Sample Collection

DATE/LAST UPDATE: November 2023

These procedures should be considered standard guidelines and are intended to provide useful guidance when in the field but are not intended to be step-by-step procedures, as some steps may not be applicable to all projects.

All field staff should be sufficiently trained in the standard guidelines for the sampling method they intend to use and should review and understand these procedures prior to going into the field. It is the responsibility of the field staff to review the standard guidelines with the field manager or project manager and identify any deviations from these guidelines prior to field work. When possible, the project-specific Sampling and Analysis Plan should contain any expected deviations and should be referenced in conjunction with these standard guidelines.

1.0 Scope and Purpose

This standard guideline provides details necessary for collecting representative groundwater samples from monitoring wells using low-flow methods. These guidelines are designed to meet or exceed guidelines set forth by the Washington State Department of Ecology (Ecology). Low-Flow sampling provides a method to minimize the volume of water that is purged and disposed from a monitoring well, and minimizes the impact that purging has on groundwater chemistry during sample collection.

2.0 Equipment and Supplies

Groundwater Sampling Equipment and Tools

- For wells with head less than 25 feet:
 - Peristaltic pump with fully charged internal battery or standalone battery and appropriate connectors
- For wells with head greater than 25 feet:
 - Bladder pump and controller, as well as an air cylinder, or air compressor (with extension cord if near an electrical outlet; with battery and appropriate connectors or generator if not near an outlet)

OR

- Low-flow submersible pump and controller (with extension cord if near an electrical outlet; with battery and appropriate connectors or generator if not near an outlet)
- Multi-parameter water quality meter
- Turbidity meter
- Water level meter
- Polyethylene tubing, Teflon tubing, or similar (assume polyethylene unless otherwise specified in SAP) and tubing weights (for wells deeper than approximately 10 feet)
- Silicone tubing
- Filters (if field filtering)
- Tools for opening wells and drums (1/2-inch, 9/16-inch, 5/8 and 15/16-inch sockets ratchet, screwdriver, hammer/rubber mallet, bung wrench; any other necessary tools if non-standard monuments have been used)
- Well keys
- Tube cutters, razor blade, or scissors
- 5-gallon buckets, lids, and clamp
- Decontamination supplies: Alconox (or similar), distilled or deionized water, spray bottles, and paper towels
- Bailer or hand pump to drain well box if full of stormwater
- Trash bags

Lab Equipment

- Sample jars/bottles
- Coolers
- Chain-of-Custody Forms
- Labels
- Ice
- Ziploc bags

Paperwork

- Field notebook with site maps
- Table of well construction details and/or well logs, if available
- Sampling forms (enclosed)
- Purge water plan

- Rite-in-the-Rain pens, paper, and permanent markers
- Site-Specific Health and Safety Plan (HASP) and F|S Accident Prevention Plan (APP)
- List of emergency contacts for the Site or facility
- Safety Data Sheets (SDS) binder
- Sampling and Analysis Plan (SAP) and/or Quality Assurance Project Plan (QAPP) (including tables of analytes and bottle types)

Safety Equipment

- PPE:
 - Waterproof boots (safety toed, depending on site)
 - Safety vest
 - Safety glasses
 - Rain gear
 - Nitrile gloves
 - Work gloves
- First Aid kit
- Emergency kit (fire extinguisher, road flares)
- Traffic barricades or cones

3.0 Standard Procedures

Low-flow groundwater sampling consists of purging groundwater within the well casing at a rate equal to or less than the flow rate of representative groundwater from the surrounding aquifer into the well screen. The flow rate will depend on the hydraulic conductivity of the aquifer and the drawdown, with the goal of minimizing drawdown within the monitoring well. Field parameters are monitored during purging and groundwater samples are collected after field parameters have stabilized. Deviations from these procedures should be approved by the Project Manager and fully documented.

3.1 OFFICE PREPARATION

First, meet with the PM to identify the key objectives of the groundwater sampling effort. This may include the order of wells to be sampled (e.g., if using non-dedicated equipment, wells may need to be sampled in order of least contaminated to most contaminated), whether any wells require redevelopment at least 24-hours prior to sampling, and/or key stabilization parameters (e.g., elevated turbidity may require purging beyond 30 minutes, even if the readings are within 10%).

Conduct a kick-off meeting with the sampling team to discuss site health and safety protocols, data quality objectives, and any site-specific special considerations or sampling procedures.

3.2 TAILGATE SAFETY MEETING

Conduct a tailgate safety meeting prior to beginning work at the site. Emergency evacuation procedures, rally points, and onsite communication protocols should be discussed at the first tailgate meeting and repeated if new personnel join the field team onsite.

The safety meeting should cover the hazards specific to groundwater sampling. Typical hazards include the following:

- Chemical hazards (refer to HASP for site chemical exposure hazards)
- Site hazards
 - Traffic hazards onsite (e.g., truck traffic, heavy machinery)
 - Biological hazards (e.g., spiders or wasps within well monuments)
- Physical hazards associated with lifting and carrying heavy equipment and repeated bending while sampling
- Cuts and abrasions associated with using blades and tools
- Electrical hazards (make sure all wires/cables are in good condition and connections to battery or outlet are secure)
- Heat stress and cold stress

Record the meeting attendees and topics discussed on the front page of the tailgate safety meeting form (included as an attachment to the HASP). All attendees should sign the form.

3.3 OTHER HEALTH AND SAFETY GUIDELINES

The following are additional health and safety guidelines that should be followed in the field. These guidelines are intended to supplement the guidelines and requirements identified in the HASP and are not intended to replace the HASP.

- Review and sign the HASP prior to going into the field.
- Conduct a tailgate safety meeting prior to beginning work at the site as discussed in Section 3.2
- When moving between monitoring wells or switching to different tasks (e.g., transitioning from sampling to cooler QC prior to lab pickup), assess any additional hazards that may be associated with the new location or task. Record additional hazards noted and corrective actions to address those hazards on the Daily Tailgate Safety Meeting and Debrief Form (included as an attachment to the HASP).
- Record near misses and incidents on the Near Miss and Incident Reporting Form (included as an attachment to the HASP) and conduct management/client notifications according to the protocols detailed in the HASP.

3.4 CALIBRATION OF WATER QUALITY METERS

All multi-parameter water quality meters to be used will be calibrated prior to each sampling event. Calibration procedures are outlined in each instrument's specific user manual.

3.5 MONITORING, MAINTENANCE, AND SECURITY

Prior to sampling, depth to water and total depth measurements will be collected and recorded for accessible monitoring wells onsite (or an appropriate subset for larger sites). Check for an existing measuring point (notch or visible mark on top of casing). If a measuring point is not observed, a measuring point should be established on the north side of the casing. The conditions of the well box and bolts will also be observed, and deficiencies will be recorded on the sampling forms or logbook (i.e., missing or stripped bolt). The following should also be recorded:

- Condition of the well box, lid, bolts, locks, and gripper cap, if deficiencies
- Condition of gasket if deficient and if water is present in the well box
- Note any obstructions or kinks in the well casing
- Note any equipment in the well casing, such as transducers, bailers, or tubing
- Condition of general area surrounding the well, such as subsidence, potholes, or if the well is submerged within a puddle.

Replace any missing or stripped bolts and redevelop wells if needed.

3.6 LOW-FLOW PURGING METHOD AND SAMPLING PROCEDURES

Groundwater samples will be collected using low-flow purging and sampling procedures consistent with Ecology guidelines and the U.S. Environmental Protection Agency (USEPA) standard operating procedures (USEPA 1996). The following describes the Low-Flow purging and sampling procedures for collecting groundwater samples using a peristaltic pump. If the water level is greater than approximately 20 to 25 feet below ground surface (bgs), Grundfos or Geotech submersible pumps or bladder pumps can be used since their pumping rates can be adjusted to low-flow levels. Submersible pumps are preferable to bladder pumps in situations where less than 5 feet of water column are present in the well casing.

- Place the peristaltic pump and water quality equipment near the wellhead. Slowly lower new poly tubing down into the well casing approximately to the middle of the well screen. When sampling wells with a bottom screen depth greater than approximately 10 feet, it is important to measure the length of tubing prior to placement as longer lengths of tubing are more likely to get caught or otherwise obstructed and feel like it has reached the well bottom; this issue can be mitigated by using decontaminated stainless steel tubing weights. If the depth of the well screen is not known, lower the appropriate length of tubing to the bottom of the well, making sure that the tubing has not been caught on the slotted well casing, and then raise the tubing 3 to 5 feet off the bottom of the casing (limit this distance to 2 feet for wells with total depth less than 10 feet). Document the estimated depth of the tubing

placement within the well. Connect the tubing to the peristaltic pump using new flex tubing and connect the discharge line to the flow-through cell of the water quality meter. The discharge line from the flow cell should be directed to a bucket to contain the purged water.

- If using a low-flow submersible pump, connect the pump head to dedicated or disposable tubing. If using a bladder pump, connect both the air intake and water discharge ports to decontaminated or disposable tubing, using the manufacturer's instructions to ensure a secure connection. Lower the pump with tubing into the well as described above and connect the water discharge tubing directly to the flow-through cell.
- Measure the depth to water to the nearest 0.01 foot with a decontaminated water level meter and record the information on a sampling form.
- Start pumping the well at a purge rate of 0.1 to 0.2 liters per minute and slowly increase the rate. Purge rate is adjusted using a speed control knob or arrows on peristaltic and low-flow submersible pumps. The purge rate for bladder pumps is controlled by the air compressor, which first pressurizes the pump chamber in order to compress the flexible bladder and force water through the discharge line, and then vents the chamber in order to allow the bladder to refill with water.
 - A good rule of thumb is to pressurize to 10 psi + 0.5 psi/foot of tubing depth and begin with 4 discharge/refill cycles per minute; using greater air pressure and accelerating the pump cycles will increase the purge rate.
- Check the water level. If the water level is dropping, lower the purge rate. Maintain a steady flow with no or minimal drawdown (less than 0.33 feet according to USEPA 2002). Maintaining a drawdown of less than 0.33 feet may not be feasible depending on hydrogeological conditions. If possible, measure the discharge rate of the pump with a graduated cylinder or use a stopwatch when filling sampling jars (500 milliliters [mL] polyethylene or glass ambers) to estimate the rate. When purging water through a flow cell, the maximum flow rate for accurate water quality readings is about 0.5 liters per minute (L/minute).
- The discharge tubing should be connected to the flow cell immediately upon initial water discharge, unless the discharge water is visibly turbid or flocculant is observed. Monitor and record water quality parameters every three to five minutes after one tubing volume (including the volume of water in the flow cell) has been purged.
 - One foot of ¼-inch interior diameter tubing holds about 10 mL of water, and flow-through cells typically hold less than 200 mL of water; one volume should be purged after about 5 minutes at a flow rate of 0.1 L/minute.
- Water-quality indicator parameters that will be monitored and recorded during purging include:
 - pH
 - Specific conductivity

- Dissolved oxygen
- Temperature
- Turbidity
- Oxidation reduction potential (ORP)
- Continue purging until temperature, pH, turbidity, and specific conductivity are approximately stable (when measurements are within 10 percent) for three consecutive readings, or 30 minutes have elapsed. Because these field parameters (especially dissolved oxygen and ORP) may not reach the stabilization criteria, collection of the groundwater sample will be based on the professional judgment of field personnel at the time of sampling. A minimum of 5 water quality readings should be collected prior to sampling.
- The water sample can be collected once the criteria above have been met.
- If drawdown in the well cannot be maintained at 0.33 feet or less, reduce the flow or turn off the pump for 15 minutes and allow for recovery. If the water quality parameters have stabilized, and if at least two tubing volumes and the flow cell volume have been purged, then sample collection can proceed when the water level has recovered, and the pump is turned back on. This should be noted on the sampling form.
- To collect the water sample, maintain the same pumping rate. After the well has been purged and the sample bottles have been labeled, the groundwater sample will be collected by directly filling the laboratory-provided bottles from the pump discharge line prior to passing through the flow cell. All sample containers should be filled with minimum disturbance by allowing the water to flow down the inside of the bottle or vial. When collecting a volatile organic compound (VOC) sample, fill to the top to form a meniscus over the mouth of the vial prior to placing the cap to eliminate air bubbles. Be careful not to overflow preserved bottles/pre-cleaned Volatile Organic Analyte (VOA) vials.
- If sampling for filtered metals, collect these samples last and fit an in-line filter at the end of the discharge line. Take note of the flow direction arrow on the filter prior to fitting, invert filter to eliminate air bubbles, and allow minimum of 0.5 to 1 liter of groundwater to pass through the filter prior to collecting the sample.
- Sample labels will clearly identify the project name, sampler's initials, sample location and unique sample ID, analysis to be performed, date, and time. After collection, place samples in a cooler maintained at a temperature of approximately 4 to 6 degrees Celsius (°C) using ice (if required). Complete the chain-of-custody forms. Upon transfer of the samples to the laboratory, the Chain-of-Custody Form will be signed by the persons transferring custody of the sample containers to document change in possession.
- When sample collection is complete at a designated location, remove and properly dispose of the non-dedicated tubing. In most cases, this waste is considered solid waste and can be disposed of as refuse. Close and lock the well.

4.0 Decontamination

All reusable equipment that comes into contact with groundwater should be decontaminated using the processes described in this section prior to moving to the next sampling location.

Water Level Meter: The water level indicator and tape will be decontaminated between sampling locations and at the end the day by spraying the entire length of tape that came in contact with groundwater with an Alconox (or similar)/clean water solution followed by a thorough rinse with distilled or deionized water.

Water Quality Sensors and Flow-Through Cell: Distilled water or deionized water will be used to rinse the water quality sensors and flow-through cell. No other decontamination procedures are recommended since they are sensitive equipment. After the sampling event, the water quality meters will be cleaned and maintained according to the specific manual.

Submersible Pump (if applicable): Decontaminating the pump requires running the pump in three progressively cleaner grades of water.

1. Fill a bucket with approximately 4 gallons of an Alconox (or similar)/clean water solution to sufficiently cover the pump. Place the pump and the length of the power cord (if applicable) that was in contact with water into the bucket and run the pump for approximately two minutes or until the volume of water in the bucket has been exhausted.
2. Fill a second bucket containing approximately 4 gallons of clean water to sufficiently cover the pump. Place the pump and cord into this bucket and run the pump for approximately two minutes or until the volume of water in the bucket has been exhausted.
3. Fill a third bucket with approximately 4 gallons of distilled or deionized water to sufficiently cover the pump. Place the pump and cord into this bucket and run the pump for approximately two minutes or until the volume of water in the bucket has been exhausted.

The soap/water solution may be reused; however, rinse water should be collected for disposal as described in Section 5.0 below. When done for the day, dry the exterior of the pump and cord with clean towels to the extent practical prior to storage.

Bladder Pump: Clean the inside and outside of the pump body with an Alconox (or similar)/clean water solution, followed by a thorough rinse with distilled or deionized water. The outside of the air supply line that came in contact with groundwater may also be cleaned with Alconox (or similar) solution and re-used; bladders and water discharge lines must be replaced after each sample is collected.

5.0 Investigation-Derived Waste (IDW)

Unless otherwise specified in the project work plan, water generated during groundwater sampling activities will be contained, transported, disposed of in accordance with applicable laws, and stored in a designated area until transported off-site for disposal. This includes purge water and decontamination waste water.

The approach to handling and disposal of these materials for a typical cleanup site is as follows.

For IDW that is containerized, such as purge water, 55-gallon drums (or other smaller sized drums) approved by the Washington State Department of Transportation will be used for temporary storage pending profiling and disposal. Each container holding IDW will be sealed and labeled as to its contents (e.g., “purge water”), the dates on which the wastes were placed in the container, the owner’s name and contact information for the field person who generated the waste, and the site name.

IDW containerized within drums will be characterized relative to applicable waste criteria using data from the sampling locations whenever possible. Material that is designated for off-site disposal will be transported to an off-site facility permitted to accept the waste. Manifests will be used, as appropriate for disposal. Refer to the FS Special Condition Standard Guideline for Investigation Derived Waste for additional information regarding proper profiling and disposal of wastewater generated by groundwater sampling.

Disposable sampling materials and incidental trash such as tubing, paper towels and gloves/other disposable used in sample processing will be placed in heavy-duty garbage bags or other appropriate containers and disposed of as trash in the municipal collection system unless otherwise specified in the SAP.

6.0 Field Documentation

Groundwater sampling activities will be documented in field sampling forms and/or field notebooks, and Chain-of-Custody Forms. Information recorded will, at a minimum, include personnel present (including subcontractors or client representatives), purpose of field event, weather conditions, sample collection date and times, sample analytes, depths to water, water quality parameters, well box/lid conditions, amount of purged water generated, and any deviations from the SAP. Photographs of damaged well casings or well boxes should be taken.

At the end of the day, complete and review the second page of the tailgate safety meeting form detailing additional hazards, corrective actions, near-misses or incidents. Any incidents that result in equipment damage or field staff injuries should be reported immediately to the PM.

7.0 Demobilization

Upon returning to the office, ensure that all equipment is properly cleaned and put away in the field room. Equipment with rechargeable batteries should be plugged in as appropriate. It is

preferable to dispose of trash on-site, but any trash left in the field vehicle should be disposed as regular trash at Two Union Square.

If rented equipment or sample coolers will be placed at the front desk for pickup, clearly label each item with the company picking it up, anticipated pickup time frame, and your contact information so front desk staff can contact you if there are any questions. Notify front desk staff if any items require a signature at pickup.

Within one week of returning from the field, the field lead for the event should review field notes, sampling forms and tailgate safety meeting forms with the PM. Following PM review and approval, field notes will be scanned and saved to the project folder. Hard copies should be filed. The PM will provide copies of near miss and incident reports to the Safety Program Manager.

8.0 References

U.S. Environmental Protection Agency (USEPA). 1996. Low-Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells, Revision 2. Region 1. July 30, 1996.

_____. 2002. Groundwater Sampling Guidelines for Superfund and CAR Project Managers. Office of Solid Waste and Emergency Response. EPA 542.S-02-001. May 2002.

Enclosures: Groundwater or Surface Water Sample Collection Form

Record of Revisions:

Revisions	Date
Added health and safety information, reviewed EPA guidance, and added revisions table.	12/9/2022
Added turbidity meter to equipment list and appended updated field form to PDF	11/29/2023

GROUNDWATER OR SURFACE WATER SAMPLE COLLECTION FORM

Project: _____

Date of Collection: _____

Task: _____

Field Personnel: _____

Purge Data

Well ID: _____ Secure: ☐ Yes ☐ No Ecology Tag #: _____ Casing Type/Diameter/Screened Interval _____

Replacement Required: ☐ Monument ☐ Lid ☐ Lock ☐ Bolts: Missing (#) _____ Stripped (#) _____ Other Damage: _____

Depth Sounder decontaminated Prior to Placement in Well: ☐ Yes ☐ No One Casing Volume (gal): _____

Depth of water (from TOC): _____ Time: _____

Total Depth (from log or field measurement): _____

After 5 minutes of purging (from top of casing): _____

Begin purge (time): _____ End purge (time): _____

Volume purged: _____ Purge water disposal method _____

Volume of Schedule 40 PVC Pipe				
Diameter	O.D.	I.D.	Volume (Gal/Linear Ft.)	Weight of Water (Lbs/Lineal Ft.)
1 1/4"	1.660"	1.380"	0.08	0.64
2"	2.375"	2.067"	0.17	1.45
3"	3.500"	3.068"	0.38	3.2
4"	4.500"	4.026"	0.66	5.51
6"	6.625"	6.065"	1.5	12.5

Time	Depth to Water (ft)	Vol. Purged (_____)	pH (s.u.)	DO (mg/L)	Specific Conductivity (µs/cm)	Turbidity (NTU)	Temp (°C)	ORP (mV)	Comments
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

Sampling Data

Sample No: _____ Location and Depth: _____

Date Collected (mo/dy/yr): _____ Time Collected: _____ Weather: _____

Type: ☐ Ground Water ☐ Surface Water Other: _____ Sample: ☐ Filtered ☐ Unfiltered Filter Type: _____

Sample Collected with: ☐ Bailer ☐ Pump Other: _____ Type: ☐ Peristaltic ☐ Bladder ☐ Submersible Other: _____

Water Quality Instrument Data Collected with: Type: ☐ YSI ProDSS ☐ Turbidity Meter ☐ Other: _____

Sample Decon Procedure: Sample collected with: ☐ decontaminated all tubing; ☐ disposable tubing ☐ dedicated silicon and poly tubing; ☐ dedicated tubing replaced

Sample Description (Color, Turbidity, Odor, Other): _____

Sample Analyses

Analyte	Analysis Method	Sample Container	Quantity	Preservative	Notes
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

QC samples

Duplicate Sample No: _____ Duplicate Time: _____ MS/MSD: ☐ Yes ☐ No

Signature: _____ Date: _____

F|S STANDARD GUIDELINE

Groundwater Sample Collection with a Direct-Push (i.e., Geoprobe) Drill Rig

DATE/LAST UPDATE: December 2022

These procedures should be considered standard guidelines and are intended to provide useful guidance when in the field but are not intended to be step-by-step procedures, as some steps may not be applicable to all projects.

All field staff should be sufficiently trained in the standard guidelines for the sampling method they intend to use and should review and understand these procedures prior to going into the field. It is the responsibility of the field staff to review the standard guidelines with the field manager or project manager and identify any deviations from these guidelines prior to field work. When possible, the project-specific Sampling and Analysis Plan should contain any expected deviations and should be referenced in conjunction with these standard guidelines.

1.0 Scope and Purpose

This standard guideline provides details necessary for collecting representative groundwater samples using a direct-push drill rig. These guidelines are designed to meet or exceed guidelines set forth by the Washington State Department of Ecology (Ecology).

2.0 Equipment and Supplies

Groundwater Sampling Equipment and Tools

- For wells with head less than 25 feet:
 - Peristaltic pump with fully charged internal battery or standalone battery and appropriate connectors (typically provided by driller; confirm prior to mobilization)
- For wells with head greater than 25 feet:
 - Submersible pump (and controller if low-flow; with extension cord if near an electrical outlet; with battery and appropriate connectors or generator if not near an outlet)

- Peristaltic pump and internal battery or standalone battery with appropriate connectors (typically provided by driller; confirm prior to mobilization)
- Water level meter
- Multi-parameter water quality meter (if applicable)
- Polyethylene tubing, Teflon tubing, or similar (assume polyethylene unless otherwise specified in SAP) and tubing weights (for wells deeper than approximately 10 feet)
- Silicone tubing
- Filters (if field filtering)
- Tools for opening drums (15/16-inch socket, ratchet, screwdriver, hammer/mallet, bung wrench)
- Tube cutters, razor blade, or scissors
- 55-gallon drum and clamp (or 5-gallon drum) and labels
- 5-gallon bucket and lid
- Decontamination supplies: Alconox (or similar), distilled or deionized water, spray bottles, and paper towels
- Trash bags

Lab Equipment

- Sample jars/bottles
- Coolers
- Chain-of-Custody Forms
- Labels
- Ice
- Ziploc bags

Paperwork

- Field notebook with site maps and previous boring logs, if available
- Sampling forms (enclosed)
- Purge water plan
- Rite-in-the-Rain pens, paper, and permanent markers
- Site-Specific Health and Safety Plan (HASP), Tailgate Safety Meeting Forms (for each day you expect to be on site), and F|S Accident Prevention Plan (APP)
- Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP), or other similar work plan

- List of emergency contacts for the Site or facility
- Safety Data Sheets (SDS) binder

Safety Equipment

- PPE:
 - Safety-toed boots
 - Safety vest
 - Hard hat
 - Nitrile gloves
 - Safety glasses
 - Hearing protection
 - Rain gear
 - Work gloves
- Traffic barricades or cones
- Vehicle emergency kit (road flares, fire extinguisher, etc.)
- First Aid Kit

3.0 Standard Procedures

The following sections describe the procedure for sampling groundwater using direct-push methods. Before entering the field, project considerations including the target aquifer or depth for sampling and screen placement (i.e., across or within the water table) should be discussed with the Project Manager. Any deviations from these procedures should be approved by the Project Manager and fully documented. Groundwater sampling from a direct-push boring consists of purging and sampling water within the borehole with a peristaltic pump. Direct-push drilling activities will typically follow Floyd|Snider Standard Guidelines for Soil Sampling.

3.1 TAILGATE SAFETY MEETING

Conduct a tailgate safety meeting prior to beginning work at the Site. Emergency evacuation procedures, rally points, and onsite communication protocols should be discussed at the first tailgate meeting and repeated if new personnel join the field team onsite.

The safety meeting should cover the hazards specific to direct-push groundwater sampling. Typical hazards of this type of sampling include:

- Drilling with a direct-push rig
 - Buried utilities
 - Pinch points

- Hot exhaust and fire hazards
 - Overhead equipment
 - Moving heavy equipment such as direct-push rods
 - Loud noise
- Well point purging and sampling
 - Lifting heavy buckets and coolers
 - Splash hazards from water/mud
 - Sharp blades
 - Electrical hazards when working with exposed battery contacts
- Site Hazards
 - Traffic
 - Slips, trips and falls (uneven terrain, wet ground, equipment on site, etc.)
 - Biological (insects, animals, plants)
- Chemical hazards (refer to HASP for Site COCs)

Record the meeting attendees and topics discussed on the front page of the tailgate safety meeting form. All attendees should sign the form. The drilling crew may have an additional safety meeting template and meeting form to cover more specific hazards related to operation of and working around the drill rig.

3.2 OTHER HEALTH AND SAFETY GUIDELINES

The following are additional health and safety guidelines that should be followed in the field. These guidelines are intended to supplement the guidelines and requirements identified in the HASP and are not intended to replace the HASP.

- Review and sign the HASP prior to going into the field.
- Conduct a tailgate safety meeting prior to beginning work at the site as discussed in Section 3.1
- When moving between well points or switching to different tasks (e.g., transitioning from sampling to cooler QC prior to lab pickup), assess any additional hazards that may be associated with the new location or task. Record additional hazards noted and corrective actions to address those hazards on the Daily Tailgate Safety Meeting and Debrief Form (included as an attachment to the HASP).
- Record near misses and incidents on the Near Miss and Incident Reporting Form (included as an attachment to the HASP) and conduct management/client notifications according to the protocols detailed in the HASP.

3.3 CALIBRATION OF WATER QUALITY METERS

Water quality meters used during groundwater sampling (if applicable) will be calibrated prior to each sampling event. Calibration procedures are outlined in each instrument's specific user manual.

3.4 PURGING AND SAMPLING PROCEDURES

Once the direct-push drilling activities have reached the desired depth, a new polyvinyl chloride (PVC) or decontaminated stainless-steel casing and screen is temporarily installed in the borehole by the driller. Record the depth-to-water and total depth of the well to calculate the volume (this is calculated by multiplying the area inside the casing by the height of water in the casing).

- The maximum depth to water that can be sampled in a temporary well point using a peristaltic pump is approximately 20 to 25 feet bgs. For wells with 25 feet or less of head, slowly lower new polyethylene or Teflon tubing down the temporary casing and use a peristaltic pump to purge and collect groundwater samples. When sampling temporary well points with a bottom screen depth greater than approximately 10 feet, it is important to measure the length of tubing prior to placement as longer lengths of tubing are more likely to get caught or otherwise obstructed and feel like it has reached the bottom; this issue can be mitigated by using decontaminated stainless steel tubing weights.
- For temporary well points with more than 25 feet of head, connect a submersible pump to a discharge line of appropriate length to situate the pump within the lower half of the water column. Slowly lower the decontaminated submersible pump with a discharge line into the monitoring well and note any restrictions. If the connection of the polyethylene tubing to the pump outlet does not feel secure, use a small hose clamp to reinforce the connection. A small piece of silicone tubing maybe used to connect a pump outlet and polyethylene tubing of different diameters.
- The discharge line should be directed to a 55-gallon drum (or 5-gallon drum or bucket), provided by the drilling subcontractor to contain the purge water generated. Purging will continue until the groundwater is visually clear (if achievable) or at least 3 well volumes have been removed. Collect water quality parameters, if applicable, either by lowering the quality instrument into the well or placing the instrument into a container filled with purge water. The following water-quality parameters may be collected prior to sampling:
 - pH
 - Specific conductivity
 - Dissolved oxygen
 - Temperature
 - Turbidity
 - Oxidation Reduction Potential (ORP)

After the well has been purged and the sample bottles have been labeled, the groundwater sample will be collected by directly filling the laboratory-provided bottles from the pump discharge line. All sample containers should be filled with minimum disturbance by allowing the water to flow down the inside of the bottle or vial. When collecting a volatile organic compound (VOC) sample, fill to the top to form a meniscus over the mouth of the vial prior to placing the cap in order to eliminate air bubbles. Do not overfill preserved sample jars or pre-cleaned Volatile Organic Analyte (VOA) sampling vials.

If sampling for dissolved analytes (such as metals), collect these samples last and with attention to the flow direction arrow, fit an in-line filter at the end of the discharge line, invert filter to minimize air bubbles and allow a minimum of 0.5 to 1 liter of groundwater to pass through the filter prior to collecting the sample.

Sample labels will clearly identify the project name, sampler's initials, sample location and unique sample ID, analysis to be performed, date, and time. Upon collection, place samples in a cooler maintained at a temperature of approximately 4 to 6 degrees Celsius (°C) using ice (if required). Complete the chain-of-Custody forms. Upon transfer of the samples to the laboratory, the Chain-of-Custody Form will be signed by the persons transferring custody of the sample containers to document change in possession.

When sample collection is completed at a designated location, remove and properly dispose of the tubing and temporary well screen and casing or decontaminate reusable tubing and well screens. In most cases, this waste is considered solid waste and can be disposed of as refuse.

4.0 Decontamination

Prior to moving to the next sampling location, all reusable equipment that has come into contact with groundwater should be decontaminated using the processes described in this section.

Water Level Meter: The water level indicator and tape will be decontaminated between direct-push sampling locations and at the end the day by spraying the entire length of tape that came in contact with groundwater with an Alconox (or similar)/water mixture followed by a thorough rinse with distilled or deionized water.

Water quality sensors and flow-through cell (if used): Use distilled or deionized water to rinse the water quality sensors and flow-through cell. No other decontamination procedures are recommended since the equipment is sensitive. After the sampling event, the water quality meters will be cleaned and maintained according to the specific manual.

Submersible Pump: Decontaminating the pump requires running the pump in three progressively cleaner grades of water.

1. Fill a bucket with approximately 4 gallons of an Alconox (or similar)/clean water solution to sufficiently cover the pump. Place the pump and the length of the power cord (and reusable tubing, if applicable) that was in contact with water into the bucket

and run the pump for approximately two minutes or until the volume of water in the bucket has been exhausted.

2. Fill a second bucket containing approximately 4 gallons of clean water to sufficiently cover the pump. Place the pump and cord (and reusable tubing, if applicable) into this bucket and run the pump for approximately two minutes or until the volume of water in the bucket has been exhausted.
3. Fill a third bucket with approximately 4 gallons of distilled or deionized water to sufficiently cover the pump. Place the pump and cord (and reusable tubing, if applicable) into this bucket and run the pump for approximately two minutes or until the volume of water in the bucket has been exhausted.

The Alconox/water solution may be re-used; however, rinse water should be collected for disposal as described in Section 5.0 below. When done for the day, dry the exterior of the pump and cord with clean towels to the extent practical prior to storage: all decontaminated water (including Alconox solution) should be managed in accordance with Section 5.0 below.

All reusable equipment on the drill rig (such as casings and rods) that comes into contact with soil or groundwater will be decontaminated by the driller between locations. The drilling subcontractor will store all decontaminated water in labeled 55-gallon drums on-site for proper disposal unless otherwise specified.

5.0 Investigation-Derived Waste (IDW)

Unless otherwise specified in the project-specific work plan, water generated during groundwater sampling activities will be contained and stored in a designated area until it can be transported and disposed of off-site in accordance with applicable laws. This includes purge water and decontamination wash water.

The approach to handling and disposal of these materials for a typical cleanup site is as follows.

For IDW that is containerized, (such as purge water), 55-gallon drums (or other smaller sized drums) approved by the Washington State Department of Transportation will be used for temporary storage pending profiling and disposal. Each container holding IDW will be sealed and labeled as to its contents (e.g., “purge water”), the dates on which the wastes were placed in the container, the owner’s name, contact information for the field person who generated the waste, and the site name.

IDW containerized within drums will be characterized relative to applicable waste criteria using data from the sampling locations whenever possible. Material that is designated for off-site disposal will be transported to an off-site facility permitted to accept the waste. Manifests will be used, as appropriate, for disposal. Refer to the FS Special Condition Standard Guideline for Investigation Derived Waste for additional information regarding proper profiling and disposal of wastewater generated by groundwater sampling

Disposable sampling materials and incidental trash such as paper towels and gloves/other disposable PPE used in sample processing will be placed in heavy-duty garbage bags or other appropriate containers and disposed of as trash in the municipal collection system, unless otherwise specified in the SAP.

6.0 Field Documentation

Drilling and groundwater sampling activities will be documented in field sampling forms and/or notebooks and Chain-of-Custody Forms. Information recorded will at a minimum include personnel present (including subcontractors), purpose of field event, weather conditions, sample collection date and times, sample analytes, depths to water, water quality field measurements (if collected), amount of purged water generated, and any deviations from the SAP.

At the end of the day, complete and review the second page of the tailgate safety meeting form detailing additional hazards, corrective actions, near-misses or incidents. Any incidents that result to field staff injuries or have the potential to result in staff injuries should be reported immediately to the PM.

7.0 Demobilization

Upon returning to the office, ensure that all equipment is properly cleaned and put away in the field room. Equipment with rechargeable batteries should be plugged in as appropriate. It is preferable to dispose of trash on-site, but any trash left in the field vehicle should be brought upstairs, labeled and placed in the front production room.

If equipment or sample coolers will be placed at the front desk for pickup, clearly label each item with the company picking it up and anticipated pickup time frame. Notify front desk staff if any items require a signature at pickup.

Within one week of returning from the field, the field lead for the event should review field notes, sampling forms and tailgate safety meeting forms with the PM. Following PM review and approval, field notes will be scanned and saved to the project folder. Hard copies should be filed. The PM will provide copies of near miss and incident reports to the Safety Program Manager.

Enclosures: Groundwater or Surface Water Sample Collection Form

Record of revisions:

Revisions	Date
Added health and safety information, reviewed EPA guidance, and added revisions table.	12/9/2022

GROUNDWATER OR SURFACE WATER SAMPLE COLLECTION FORM

Project: _____

Date of Collection: _____

Task: _____

Field Personnel: _____

Purge Data

Well ID: _____ Secure: ☐ Yes ☐ No Ecology Tag #: _____ Casing Type/Diameter/Screened Interval _____

Replacement Required: ☐ Monument ☐ Lid ☐ Lock ☐ Bolts: Missing (#) _____ Stripped (#) _____ Other Damage: _____

Depth Sounder decontaminated Prior to Placement in Well: ☐ Yes ☐ No One Casing Volume (gal): _____

Depth of water (from TOC): _____ Time: _____

Total Depth (from log or field measurement): _____

After 5 minutes of purging (from top of casing): _____

Begin purge (time): _____ End purge (time): _____

Volume purged: _____ Purge water disposal method _____

Volume of Schedule 40 PVC Pipe				
Diameter	O.D.	I.D.	Volume (Gal/Linear Ft.)	Weight of Water (Lbs/Lineal Ft.)
1 1/4"	1.660"	1.380"	0.08	0.64
2"	2.375"	2.067"	0.17	1.45
3"	3.500"	3.068"	0.38	3.2
4"	4.500"	4.026"	0.66	5.51
6"	6.625"	6.065"	1.5	12.5

Time	Depth to Water (ft)	Vol. Purged (_____)	pH (s.u.)	DO (mg/L)	Specific Conductivity (µs/cm)	Turbidity (NTU)	Temp (°C)	ORP (mV)	Comments
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

Sampling Data

Sample No: _____ Location and Depth: _____

Date Collected (mo/dy/yr): _____ Time Collected: _____ Weather: _____

Type: ☐ Ground Water ☐ Surface Water Other: _____ Sample: ☐ Filtered ☐ Unfiltered Filter Type: _____

Sample Collected with: ☐ Bailer ☐ Pump Other: _____ Type: ☐ Peristaltic ☐ Bladder ☐ Submersible Other: _____

Water Quality Instrument Data Collected with: Type: ☐ YSI ProDSS ☐ Tudbidity Meter ☐ Other: _____

Sample Decon Procedure: Sample collected with: ☐ decontaminated all tubing; ☐ disposable tubing ☐ dedicated silicon and poly tubing; ☐ dedicated tubing replaced

Sample Description (Color, Turbidity, Odor, Other): _____

Sample Analyses

Analyte	Analysis Method	Sample Container	Quantity	Preservative	Notes

QC samples

Duplicate Sample No: _____ Duplicate Time: _____ MS/MSD: ☐ Yes ☐ No

Signature: _____ Date: _____

F | S STANDARD GUIDELINE

Seep and Spring Identification and Sample Collection

DATE/LAST UPDATE: May 2021

These procedures should be considered standard guidelines and are intended to provide useful guidance when in the field, but are not intended to be step-by-step procedures, as some steps may not be applicable to all projects.

All field staff should be sufficiently trained in the standard guidelines for the sampling method they intend to use and should review and understand these procedures prior to going into the field. It is the responsibility of the field staff to review the standard guidelines with the field manager or project manager and identify any deviations from these guidelines prior to field work. When possible, the project-specific Sampling and Analysis Plan should contain any expected deviations and should be referenced in conjunction with these standard guidelines.

1.0 Scope and Purpose

This standard guideline provides information for identifying seeps and springs and procedures for sampling seeps and/or springs. This standard guideline is limited to seeps or springs which are defined as moist or wet areas (saturated soil) or pools (visible water) where groundwater is present at the ground surface. This guideline is not applicable to fresh water/marine water transition zone sampling. The following sections contain protocols that are specific to seep and/or spring sampling. This guideline may be modified on a site-by-site basis as required to accommodate varying site conditions, equipment limitations or limitations imposed by the procedure. Field personnel should always document actual procedures employed.

2.0 Equipment and Supplies

The following is a list of typical equipment and supplies that may be necessary to complete seep or spring sample collection. It is important to note that this list is for a typical project; site-specific conditions may warrant different equipment for completion of the work.

Seep/Spring Sampling Equipment and Tools:

- Peristaltic pump with fully-charged internal battery or standalone battery and appropriate connectors
- Multi-parameter water quality meter or turbidity meter
- Hand trowel, scoop, or shovel
- Polyethylene tubing (0.25-inch outer diameter)
- Silicone tubing (for use with the peristaltic pump)
- Filters (if field filtering)
- Tube cutters, razor blade, or scissors
- 500 milliliter (mL) or 1 liter (L) beaker to measure flow rate
- Paper towels
- Alconox (or similar decontamination solution), deionized water, spray bottles
- Tape measure to measure dimensions
- Plastic sheeting
- Disposable syringes (one per sample)
- Stainless-steel, 6-inch soil vapor screen
- Flume and water flow meter
- Stopwatch
- Calculator
- GPS
- Paper towels
- Trash bags

Lab Equipment:

- Sample jars/various types of pre-cleaned bottles (as appropriate)
- Coolers
- Chain-of-Custody Forms
- Labels
- Ice
- Ziploc bags

Paperwork:

- Field notebook with site maps
- Sampling forms
- Seep and Spring Surveys
- Rite-in-the-Rain pens, paper, and permanent markers
- Site-Specific Health and Safety Plan (HASP)
- Sampling and Analysis Plan (SAP) and/or Quality Assurance Project Plan (QAPP) (including tables of analytes and bottle types)

Personal Protective Equipment (PPE):

- Boots/waders
- Safety vest
- PFD
- Snake gaiters (if appropriate by location)
- Safety glasses
- Hard hat (if appropriate)
- Rain gear
- Nitrile gloves
- Work gloves

3.0 Standard Procedures

The procedures for sampling are designed to ensure that collected samples are representative of the groundwater emerging at the surface at the seep or spring location. Identifying the nature and type of seep or spring encountered will facilitate the sampling procedures required. Seeps or springs may be associated with a pool of standing water or may be present as an area of moist soil without a pool of water. Knowing how to identify and sample seeps/springs can provide information regarding seasonal fluctuations in the groundwater potentiometric surface. Generally, seeps do not yield sufficient volume to be flowing beyond their above ground locations; while springs yield greater flow rates and can flow beyond their above ground location. For the purpose of this standard guideline, seeps and spring can be used interchangeably. Deviations from these standard procedures should be approved by the Project Manager and fully documented.

3.1 SEEP AND SPRING IDENTIFICATION ACTIVITIES

The process of identifying seeps and springs consist of visual inspections, beginning within drainage areas and expanding to attempt to identify all seeps and springs present in drainage

areas. Seeps and springs should be tracked to their origin to the extent practical. Seep and spring locations must be recorded using a GPS and/or marked accurately on a topographic map, and photographs must be taken from multiple angles to document location.

Once a seep or spring is identified, detailed observations should be recorded on field report forms throughout the sampling event. Before collecting a sample, the sampler should assess and record observations, if possible, including but not limited:

- Spatial extent of the seep/spring-impacted ground surface or pool, if present (i.e. length, width, depth);
- The approximate rate of flow from the seep/spring (or out of the pool);
- Water flow into the pool from sources other than the seep. Flow rate measurements can be estimated, typically in mL per minute, using a container with a known volume and stopwatch or with a flow meter, if needed.

3.2 VARIOUS SAMPLING TECHNIQUES USED FOR SEEPS AND SPRINGS

Seeps commonly produce little water and can require a considerable length of time to collect a representative sample, and they can be seasonal, often they stop flowing when low groundwater conditions are present (i.e., dry summer/drought conditions). Also, they often emerge from a relatively large surface area, producing a thin sheet of flowing water. Because of these characteristics, various sampling techniques can be used.

3.2.1 Direct Collection

If the flow rate from a spring is sufficiently high, a sample container can be directly filled with the water emerging from the subsurface by direct dipping of the sampling container into the seep or spring. If a pool of water is present, a sample can be collected directly from the pool using a peristaltic pump and associated tubing, disposable plastic syringe, or by directly filling the sample container. If sampling for VOCs, using a peristaltic pump or syringe to collect the seep samples is recommended. The known volume of the sample container can be used to estimate the flow rate.

3.2.2 Temporary Sampling Points

If the seep or spring does not produce sufficient water to collect samples directly from the flow emerging from the surface, a temporary sampling point can be placed within the soil to collect a sample. A temporary sampling point can also be used if the flow from the seep is diffused and discharged over a relatively large area. A temporary sampling point may consist of a short-length, slotted PVC screen or a stainless-steel gas vapor implant screen with a barbed connector and appropriate diameter tubing compatible with a peristaltic pump. The stainless-steel gas vapor implant can be used when low turbidity is required (i.e., less than 5 NTU) and cannot be achieved using other methods. Steps for sampling temporary points can include:

- Dig a small depression, approximately 6 inches by 6 inches by 1 foot in size within the area with the highest observed flow rate.
- If fine grained soils are present, use filter fabric or sand pack material, such as 20-40 Colorado, 2-12 Monterey sand, or similar, to surround the slotted PVC screen or 6-inch, stainless-steel, gas vapor implant screen connected to new polyethylene tubing. Bury the gas vapor implant horizontally.
- Use a peristaltic pump and tubing, either attached to the gas vapor implant or placed within the PVC casing, to pump water from seep. See Section 3.3 below.

Below is an example image of a stainless-steel gas vapor implant screen and a diagram showing an example of the installation method used to collect a seep sample. The image below is to illustrate the installation method of installing a gas vapor implant horizontally and is not limited to the site conditions shown below, such as rip rap and shoreline environments with freshwater/marine water transition zones.



AMS Vapor Implants have double woven stainless steel wire screens with a .0057-in. (0.15mm Pore).

3.2.3 Dam Construction

If the seep discharge emerges as a relatively large surface area, producing a thin sheet of flowing water, a dam can be constructed at the periphery of the seep to allow water to accumulate so samples can be collected. A dam can be constructed using clean plastic sheeting as dam material. Then the sample can be collected using the Direct Collection method (Section 3.2.1).

3.3 WATER QUALITY PARAMETERS AND SAMPLING PROCEDURES

Various methods can be employed for collecting samples from seeps. The sampling procedure using a syringe includes:

1. Put on clean nitrile gloves; use clean hands technique if required (refer to Clean Hands Sampling for Trace Metals Analysis in Water Standard Guideline).
2. Use a clean disposable syringe.
3. Remove the caps from the sample containers.
4. Place the syringe tip at least one inch below the surface of the water and fill by slowly pulling back on the plunger. Avoid drawing sediment or other foreign objects into the syringe.
5. Tilt the bottles upright at an angle and fill slowly until nearly full.
6. Place the cap back on and check for air bubbles if sampling for VOCs.

If using a syringe is impracticable, it is possible to use a clean (i.e., decontaminated) stainless-steel container or a clean disposable polyethylene container to collect the samples by submerging the container and transferring the sample to the sample containers. This technique is useful to obtain large sample volumes and if a pool is present. This technique should only be used if analyzing for analytes other than VOCs.

1. Put on clean nitrile gloves; use clean hands technique if required.
2. Invert and submerge a clean, stainless-steel pouring beaker at the desired location.
3. Slowly upright the container so that water flows in and avoid collecting sediment or other foreign objects into the container.
4. Lift the container up and slowly pour into sample containers.
5. Repeat until containers are filled and place the caps on immediately. Check for air bubbles if sampling for VOCs.

If using a temporary sampling point as described in Section 3.2.2, collect samples similar to the Low-Flow Groundwater Sample Collection Standard Guideline.

1. Put on clean nitrile gloves; use clean hands technique if required.
2. Place the peristaltic pump and water quality equipment near the sampling location. Slowly lower new polyethylene tubing down into the PVC casing or connect new polyethylene tubing from the gas vapor implant to the peristaltic pump.
3. Pump water until turbidity has stabilized, either visually or using a water quality meter or standalone turbidity meter. Once turbidity has stabilized or after 30 minutes have elapsed, collect the seep sample using the pumping rate during purging.

4. The sample can be collected by directly filling the laboratory-provided bottles from the pump discharge line.
5. Repeat until containers are filled and place the caps on immediately. Check for air bubbles if sampling for VOCs.

If sampling for filtered metals, collect these samples last and fit an in-line filter at the end of the discharge line. Take note of the flow direction arrow on the filter prior to fitting. A minimum of 0.5 to 1 liter of groundwater must pass through the filter prior to collecting the sample.

Once the sample is collected, water quality can be measured for field parameters including pH, conductivity, DO, ORP, and temperature by directly submerging the water quality meter probes into the pool. If insufficient flow is present at the seep or spring to completely immerse the multi-meter probe, water can be collected into a dedicated polyethylene bottle or through a transfer/flow-through cell to facilitate measurement of field parameters.

Sample labels must clearly identify the project name, sampler's initials, sample location and unique sample ID, analysis to be performed, date, and time. After collection, samples must be placed in a cooler maintained at a temperature of approximately 4 to 6 degrees Celsius (°C) using ice. Chain-of-Custody Forms must be completed. Upon transfer of the samples to the laboratory, the Chain-of-Custody Form must be signed by the persons transferring custody of the sample containers to document change in possession.

4.0 Decontamination

All reusable equipment that comes into contact with groundwater from seeps and springs should be decontaminated using the processes described in this section prior to moving to the next sampling location.

Water Quality Sensors and Flow-Through Cell: Distilled water or deionized water should be used to rinse the water quality sensors and flow-through cell. No other decontamination procedures are recommended since they are sensitive equipment. After the sampling event, the water quality meters will be cleaned and maintained according to their manufacturer equipment manual.

Reusable Equipment: All stainless-steel equipment, such as trowels and beakers, will be decontaminated between sampling locations and at the end the day by spraying the entire surface area with an Alconox (or similar)/clean water solution followed by a scrub to remove particles and then a thorough rinse with distilled or deionized water.

5.0 Investigation-Derived Waste

Typically, water generate during seep and/or spring sampling is minimal and should be placed back on the ground surface to infiltrate in the immediate area of the seep/spring. However, if the project requires that water generated during sampling activities be disposed off-site, then water generated during sampling activities will be contained, transported, disposed of in accordance

with applicable laws, and stored in a designated area until transported off-site for disposal. If the latter is required, the approach to handling and disposal of these materials for a typical cleanup site is as follows: For investigation-derived waste (IDW) that is containerized, such as purge water, 55-gallon drums (or other smaller sized drums) approved by the Washington State Department of Transportation will be used for temporary storage pending profiling and disposal. Each container holding IDW will be sealed and labeled as to its contents (e.g., “purge water”), the dates on which the wastes were placed in the container, the owner’s name and contact information for the field person who generated the waste, and the site name.

IDW containerized within drums will be characterized relative to applicable waste criteria using data from the sampling locations whenever possible. Material that is designated for off-site disposal will be transported to an off-site facility permitted to accept the waste. Manifests will be used, as appropriate for disposal.

Disposable sampling materials and incidental trash such as paper towels and PPE used in sample processing will be placed in heavy-duty garbage bags or other appropriate containers and disposed of as trash in the municipal collection system.

6.0 Field Documentation

Seep sampling activities will be documented in field sampling forms (Attachment A) and/or field notebooks, and Chain-of-Custody Forms. Information recorded will, at a minimum, include personnel present (including subcontractors or client representatives), purpose of field event, weather conditions, and seep locations (GPS coordinates and/or field topographic maps). Additional information may include sample collection date and times, sample analytes, seep pool dimensions, estimated flow rates, water quality parameters, amount of purged water generated, and any deviations from the SAP. Photographs of the seeps should be taken, and directions of photographs should be documented.

7.0 Health and Safety

Many seeps and springs are located in remote areas and are not entirely accessible by roads or trails. Sampling at these locations often requires field personnel to hike through areas that may contain dangerous plant and animal species. In addition, seeps may be located in areas that are surrounded by steep and/or unstable terrain. Field personnel should be familiar with the sections of the health and safety plan that address these hazards and should always exercise good common sense.

SEEP SAMPLE COLLECTION FORM

Project Name: _____

Date of Collection: _____

Project Number: _____

Field Personnel: _____

Seep Details and Observations

Location ID: _____

Seep Type: pool; moist to wet surface area; sheet flow; other: _____

GPS Coordinates: _____

Location Description: _____

Photo taken? _____ Location marked on field map? _____

Field Measurements

Seep Description (width, length, depth of pool): _____

Time	Flow (calculate or estimate)	pH	Dissolved Oxygen (mg/L)	Conductivity (μ S/cm)	Turbidity (NTU)	Temp ($^{\circ}$ C)	ORP (mV)

Flow Measurement Method: _____

Distance from creek or river drainage, if applicable: _____

Water Quality Instrument Data Collected with: Type: ☐ Horiba U-50 Other: _____ by: ☐ Directly in seep pool ☐ Dam ☐ Collection into bucket

Water Quality Parameters Collected after sample collected? ☐ Yes ☐ No

Seep Sampling Data

Sample No: _____ Location and Depth: _____

Date Collected (mo/dy/yr): _____ Time Collected: _____ Weather: _____

Duplicate Sample No: _____ Duplicate Sample Time Collected: _____

Sample: ☐ Filtered ☐ Unfiltered Other: _____

Sample Collected with: ☐ Syringe ☐ Direct Collection ☐ Pump Other: _____ Type: _____

Sample Description (Color, Turbidity, Odor, Other): _____

Sample Analyses

TPH-D (HCl) ☐ Chlor / Fluor (unpres) ☐ COD / TOC (H₂SO₄) ☐ Orthophos (FILTER) ☐ Diss. Metals (HNO₃) ☐
TPH-G (HCl) ☐ BTEX (HCl) ☐ Total Metals (HNO₃) ☐ TKN/Phos (N₂SO₄) ☐ VOCs (HCl) ☐

Additional Information

Types of Sample Containers:	Preservative:	Quantity:	Comments:

Signature: _____ Date: _____

F|S STANDARD GUIDELINE

Sediment Grab Sample Collection

DATE/LAST UPDATE: May 2022

These procedures should be considered standard guidelines and are intended to provide useful guidance when in the field, but are not intended to be step by step procedures, as some steps may not be applicable to all projects.

All field staff should be sufficiently trained in the standard guidelines for the sampling method they intend to use and should review and understand these procedures prior to going into the field. It is the responsibility of the field staff to review the standard guidelines with the field manager or project manager and identify any deviations from these guidelines prior to field work. When possible, the project-specific Sampling and Analysis Plan should contain any expected deviations and should be referenced in conjunction with these standard guidelines.

1.0 Scope and Purpose

These sediment grab standard guidelines should be used by the field staff performing sediment grab sampling via a grab type sampler (e.g., van Veen, Power Grab) sampler for sediment sampling in freshwater or marine environments. Power Grab samplers are often used when requiring collection of sediment deeper than 10 centimeters (cm; 4 inches) or in areas with debris.

It is important that the field staff completing the sediment sample collection discusses the sediment logging needs for a particular investigation with the project geologist, project manager (PM), or the person who will interpret the findings of the field investigation. This discussion is in addition to field training and general knowledge about sediment logging and sampling and should happen prior to entering the field, with additional follow-up before finalizing the field forms, after the investigation is complete.

2.0 Equipment and Supplies

An equipment and supplies list for sediment sampling is provided as Attachment 1. Most sampling and safety supplies are available in the field room. You will need to purchase ice for

samples the day of the event. Additional considerations for preparing equipment and supplies are provided below.

Sampling Equipment and Tools:

- Stainless steel ruler (with inch/cm and of sufficient length for grab depth, at least 1 foot); no cork or other non-steel backing
- Lead line (if not provided by vessel operator)
- Soil/sediment logging kit containing:
 - Small and large Ziploc bags
 - Small white board and dry-erase marker or note cards (for photographs)
 - Field guide for soil and stratigraphic analysis
 - Optional items from kit including: Munsell color chart, sieves, and white and grayscale color cards for photographs
- Stainless steel bowls for homogenizing (of sufficient size for anticipated sample volume)
- Large stainless steel pot of adequate volume for large sample composites (e.g., for bioassay)
- Large and small stainless steel spoons or paddle mixer
- Aluminum foil (for covering bowls, and creating clean surface for decontamination)
- Trash bags
- Duct Tape
- Alligator Clips (clamps for plastic sheeting)
- Photoionization detector or MX6 multi-gas monitor (as needed or required for air monitoring)
- Hydrogen sulfide monitor (where elevated hydrogen sulfide gas is expected; e.g., wood waste sites)
- Decontamination equipment including:
 - Pump sprayer with tap water or hose with site water (initial rinse)
 - Spray bottles filled with Alconox/Liquinox type soap solution
 - Spray bottle or pump sprayer with distilled water
 - Scrub brushes
 - Paper towels
 - Alconox/Liquinox

- Use phosphate-free soap solution (e.g., Liquinox) when working near bodies of water
 - Non-chlorinated solvent (as needed; e.g., for sites with expected NAPL)
 - Bins or 5-gallon buckets
- Boot wash station (shallow tub, brush and sprayer), as needed (generally required at CERCLA sites)
- Siphoning hose (usually on board vessel) and turkey baster
- Camera
- Hand-held global positioning system (GPS; if GPS not on board vessel)
- Sample coolers (bring enough for ice and sample storage for the duration of program or have a plan for the laboratory to provide more)
- Laboratory-provided sample jars (inspect jars upon receipt from laboratory to ensure you have the proper type and amount per the sampling plan)
- Box cutter/scissors
- Packing tape
- Ice
 - Purchase day-of if you do not have access to an on-site freezer
 - If there is access to on-site freezer, consider using reusable ice packs provided by the laboratory.
- Deionized water (laboratory grade, for rinsate blanks)
- Investigation-derived waste (IDW) drums (project-dependent; including labels and socket wrench)
 - Additional sample jars/bottles for collecting IDW characterization sample
- Extension cords (as needed; i.e., for electric drill)

Paperwork:

- Work Plan and/or Sampling and Analysis Plan (SAP)/Quality Assurance Project Plan
- Health and Safety Plan (HASP)
- Key figures and tables (laminated or printed on Rite in the Rain)
 - Sampling locations coordinates in desired format for subcontractor (can provide to vessel subcontractor prior to mobilization)
- Tide prediction tables (Note: If your sampling location is near an area with real-time tide data [e.g., Elliott Bay, Seattle], you may choose to save a link in your cell phone and reference it while in the field to have the most accurate tidal elevation.)

- Sediment grab sampling forms, printed on Rite in the Rain paper, and optional bound field notebook
- Sample labels (pre-printed is helpful if there are many samples/jars)
- Chain-of-custody forms and seals
- Rite in the Rain pen, permanent markers and pencils
- Field contact list (including PM, client contact, field team members, etc.)
- Copies of crew H&S certifications (if needed; e.g., for CERCLA sites)
- Copies of required permits

Additional Safety Equipment:

- Steel- or composite-toed boots
- Hard hat
- Life vest/personal flotation device
- Safety glasses
- Nitrile gloves
- Long rubber gloves (for decontamination or handling of IDW drums)
- Coveralls or Tyvek
- Rain gear
- Rain shelter
- Flagging or colored tape to delineate work zones
- Work gloves
- First aid kit
- Sunglasses and sunscreen
- Hand warmers

3.0 Standard Procedures

3.1 OFFICE PREPARATION

First, meet with the PM to identify key information and goals of the sediment sampling investigation. These may include fill/capping/dredging history, known or suspected sources of contamination and potential field indications of these contaminants, and identification of specific units, if applicable. Also discuss the appropriate level of detail for sediment descriptions and logging that meets the goals of the sediment characterization.

Next, review the work plan and existing materials such as surface sediment grab forms or sediment core logs from previous investigations to familiarize yourself with the site geology. A geologic map of the area from a reputable source such as the U.S. Geological Survey may also be reviewed if site-specific information about geology is not available, or in addition to site-specific information.

Talk with the PM about conducting a utility locate. Conduct necessary utility locate one-call for sampling locations. Note that utility locate contractors do not typically handle work on the water, and plan for adequate time before the event to submit a ticket via the local one-call system. You may need to follow up with individual contacts to provide more information. Request GIS layers or as-built utility maps if possible, which can be referenced against target sampling locations. Be sure you have cleared all sampling locations before you begin sampling.

If accurate sediment elevation data are critical to project success (i.e., dredge characterization, remedial design), discuss options with the PM and subcontractor before the field event on how to obtain accurate water levels. Certain subcontractors are equipped to obtain real-time water levels but need to know ahead of time that you need this capability. Additionally, actual (measured) tidal elevations are available for some locations online via the National Oceanic and Atmospheric Administration (NOAA) and can be updated by staff in the office but should be researched before the event. NOAA information is available online¹ and could be bookmarked on your phone for quick access in the field, if necessary. Some sites may have tidal gauges, which should be used when present. Note that predicated and actual tidal elevations are often different.

3.2 TAILGATE SAFETY MEETING

Conduct a tailgate safety meeting prior to beginning work at the site. The safety meeting should cover the hazards specific to sediment grab sampling. Typical hazards include the following:

- Traffic when mobilizing to and from the site
- Site hazards on sampling vessel
 - Drowning
 - Slips, trips, and falls (wet vessel surface, equipment on the vessel, etc.)
 - Heavy equipment
 - Splash hazards from water
 - Overhead hazards and pinch points
 - Lifting heavy coolers and buckets
- Chemical hazards (refer to HASP for site chemical exposure hazards)

Record the meeting attendees and topics discussed on the front page of the tailgate safety meeting form (included as an attachment to the HASP). All attendees should sign the form.

¹ <https://tidesandcurrents.noaa.gov/>

The marine subcontractor may conduct their own safety briefing and/or should review key safety items relevant to their vessel and equipment (extra life preservers, fire extinguisher, first aid kit, etc.). Field staff should participate and sign their safety form (if requested).

3.3 OTHER HEALTH AND SAFETY GUIDELINES

The following are additional health and safety guidelines that should be followed in the field. These guidelines are intended to supplement the guidelines and requirements identified in the HASP and are not intended to replace the HASP.

- Review and sign the HASP prior to going out into the field.
- Conduct a tailgate safety meeting prior to beginning work at the site as discussed in Section 3.2.
- When moving between grab sampling locations or switching to different sampling tasks (e.g., sample processing to decontamination), assess any additional hazards that may be associated with the new location or task. Record additional hazards noted and corrective actions to address those hazards on the Daily Tailgate Safety Meeting and Debrief Form (included as an attachment to the HASP).
- Record near misses and incidents on the Near Miss and Incident Reporting Form (included as an attachment to the HASP).

3.4 COLLECTING AND PROCESSING SEDIMENT GRAB SAMPLES

Sediment grab samples will typically be collected and processed on board the sampling vessel. Sediment grab samples may be processed at the shoreline where sample collection is not from a vessel (e.g., diver-assisted sample collection). All working surfaces and instruments will be thoroughly cleaned and decontaminated between sample locations.

1. Before starting, fill out the field form with the general project information:
 - A. Sample Method (i.e., Van Veen, Power Grab) and Sample Type/Depth (e.g., 0 to 10 cm)
 - B. Your name, date, project, weather, subcontractor, sample location ID name, and approximate descriptive location (if possible or applicable)
2. Have the boat operator maneuver the sampling vessel to the proposed sample location. Locations will be, in most situations, pre-determined in northings and eastings (to the nearest U.S. survey foot) referenced to the appropriate state plane system for the site, using the vessel-mounted digital global positioning system (DGPS) receiver referenced to North American Datum of 1983 (NAD 83). If there is no vessel-mounted DGPS available, a handheld portable GPS may be used.
3. Record the time, water depth (to mudline), water level, and actual sample location coordinates.

- A. At tidally influenced areas, water level will typically be the predicted or real-time tide elevation for the general area. Tide elevation is time sensitive and may need to be updated if the sample collection process is delayed.
 - B. At non-tidally influenced water bodies (lakes), water level will typically reference a surveyed water gauge located in the area.
 - C. Before going into the field, discuss project objectives and how to obtain the necessary water level information with the PM and/or contractor. Ensure you are taking all measurements in the correct vertical datum (e.g., feet mean lower low water [MLLW] or feet North American Vertical Datum of 1988 [NAVD 88]).
4. Calculate your sediment mudline elevation via the following equation:
Mudline = Water Level – Water Depth
Example Calculation:
Water level is +2 feet MLLW using predicted tide chart.
Water depth measured via lead line is 20 feet.
Mudline = +2 feet MLLW – 20 feet
Mudline = -18 feet MLLW
5. If utilizing a grab sampler, once retrieved, examine the sample for the following sediment acceptance guidelines and note observations on field form:
 - A. Sampler jaw is closed.
 - B. The sampler is not overfilled such that the sediment surface is not pressed against the top of the sampler.
 - C. Minimal leakage, as indicated by overlying water on the sediment surface (often not possible for coarse-grained sediments).
 - D. Minimal sample disturbance, as indicated by low turbidity in the overlying water and relatively flat sediment surface (no winnowing).
6. If the sediment acceptance guidelines noted above are met, check that the sample recovery depth meets the projects requirements. Carefully insert a decontaminated stainless-steel ruler into the sediment to obtain the sediment recovery depth.
 - A. The recovery depth should be at least 2.5 cm greater than the desired sample depth for grabs.
7. If sample acceptance guidelines are not achieved, the sample will be rejected and the location resampled after rinsing the sampler with site water. If the proposed sample location cannot be achieved (within ± 10 feet, or within a distance specified in the sampling plan after the prescribed number of re-attempts), notify the Floyd|Snider PM to determine an appropriate alternate location.

8. Siphon off any standing water from the surface of the sediment using a hose primed with site water. Care should be taken not to disturb the integrity of the sediment surface.
9. Take a digital photograph of the sediment surface prior to removal from the sampler. Write the sample location ID and grab replicate or run number (e.g., Run #1) with a marker on a white board (or similar) and photograph next to, but not touching, the sediment sample.
10. Collect sample volume for volatile organic compounds or sulfides, prior to disturbing the grab for characterization or other sampling (or as specified in the sampling plan).
11. Record the description of the grab sample on the field form with appropriate level of detail as discussed with the PM.
 - A. Grab recovery (depth in cm/inches)
 - B. Visual classification of sediments according to United Soil Classification System (ASTM D2487) and describing sediments using visual-manual procedures (ASTM D2488). Refer to the Soil Classification Section of the Floyd|Snider Soil Logging Standard Guideline. Logging procedures for upland soils and in-water sediments generally follow the same guidelines.
 - C. Descriptors including the following:
 - i. Odor (hydrogen sulfide, petroleum, etc.), typically qualified as slight, moderate, or strong
 - ii. Vegetation/organics (e.g., seaweed, sticks), anthropogenic debris (e.g., concrete, glass, wood chips, sawdust), or biota (e.g., detritus, shells, tubeworms, or other organisms), typically qualified as trace, occasional, moderate, or substantial
 - iii. Presence of oil sheen or obvious contamination; typical sheen qualifiers include the following:
 - a. Amount (slight, moderate, or heavy)
 - b. Oily or blocky (note blocky sheens are often biological in origin)
 - c. Color (silver, rainbow, or other)
 - iv. Any other distinguishing characteristics or features
 - D. Example Sediment Descriptions:
 - i. Loose, dark gray, poorly graded SAND (SP), 95% fine to medium sand, 5% fines, trace gravel (subrounded up to 2 inches), moist. Moderate biota (shell hash and worms), trace organics (sticks).

- ii. Very loose, brown, silty SAND (SM), 80% medium to coarse sand, 20% fines, trace fine gravel (subrounded), wet. Slight hydrocarbon odor. Sheen Test: trace rainbow sheen.²
 - iii. Soft, dark gray, sandy SILT with gravel (ML), 65% fines, 20% medium coarse sand, 15% fine gravel, moist. Occasional organics (wood fibers) and anthropogenic debris (plastic fragments).
12. Collect the surface sediment sample over the desired sampling depth (e.g., 0 to 10 cm) using a clean, stainless steel spoon and place the sample material into a clean stainless steel bowl. To prevent possible cross-contamination, do not collect sediments that are in direct contact with the sides of the sampler.
- A. Collecting multiple sample intervals from surface grabs may be utilized to characterize post-dredge surfaces and may be difficult in other soft sediments.
 - B. If collecting a subsurface sediment sample as well, then collect sediment for this sample over the desired sampling depth (e.g., 10 to 20 cm) using a separate clean stainless steel spoon and place this sample material in a separate clean stainless steel bowl.
13. Homogenize until the sediment appears uniform in color and texture and distribute to appropriate sample containers. Take a digital photograph of each sediment sample in the bowl after homogenizing the sample and before sample collection. Write the sample location name, grab replicate number, and sample depth interval on a white board or index card (or similar) and photograph next to, but not touching, the sediment sample.
14. After wiping any excess sediment from the sample container, complete the sample labels,³ attach them to the containers, and cover the sample label with clear tape. Sediment sample jars that will be archived frozen may expand and should not be completely filled to avoid breaking the jar.
- A. If there is insufficient sediment volume to fill sample containers, you may create a composite sample with additional grabs (or as directed by the sampling plan). Repeat Steps 1 through 11 at a new location within the prescribed distance from your sampling plan and label as subsequent Run # or Grab #. Equal volumes of sediment from each grab should be composited and homogenized prior to sample collection.
15. If you are containerizing waste as IDW (Section 5.0), you may wish to collect a running sediment composite with representative aliquots of all material containerized as IDW. At the end of sample processing, homogenize this sample, submit an IDW composite

² Refer to Soil Logging Standard Guideline Section 3.4 for description of sheen test.

³ In some cases, it may be more efficient to pre-fill sample labels with project name and number, date of sampling, and sample ID prior to mobilization. Pre-filled labels may be attached to the containers prior to filling the jars with sample material.

- sample to the laboratory, and analyze for the required parameters for IDW characterization (per the sampling plan). Check with the PM whether sample analytical data may suffice for IDW characterization.
16. Place the sample containers into a Ziploc bag to protect the label from water damage and becoming illegible. Store the samples in a cooler with ice away from the immediate work area. The samples should be maintained at 4 °C in the cooler.
 17. Thoroughly rinse the interior of the sampler with site water until all loose sediment has been washed off, and decontaminate the sampler by following the procedures provided in Section 4.0.
 18. Ensure that sediment descriptions and supporting field form entries are complete.
 19. Complete the chain-of-custody and check the cooler(s) to ensure that all samples on the chain-of-custody are present in the coolers. Transport samples to the analytical laboratory under standard chain-of-custody procedures.
 20. Manage excess sediment waste as IDW in accordance with the project SAP. Refer to Section 5.0 for additional IDW management procedures.

4.0 Decontamination

All reusable equipment that comes into contact with sediment should be decontaminated as follows prior to moving to the next sampling location.

Stainless steel bowls and spoons, sediment samplers, and any other tools used for sampling must be decontaminated between grab sample locations. Equipment decontamination will consist of a preliminary water rinse using water from the site to remove sediment particles, followed by scrubbing with brushes and a laboratory-grade anionic detergent (e.g., Alconox)/clean water solution and a final rinse with distilled or deionized water. Use phosphate-free soap solution (e.g., Liquinox) when working near bodies of water. Additional use of specific solvents (typically ethyl acetate) to decontaminate equipment that come into contact with non-aqueous phase liquid (NAPL) may be needed. Refer to the project SAP for any additional project-specific decontamination protocols

Decontaminated items should be placed on a clean surface to avoid any recontamination, typically a surface lined with clean aluminum foil. Decontaminated items can also be placed in a larger decontaminated vessel (like a bowl) and covered with a lid or foil.

5.0 Investigation-Derived Waste

Waste sediment and decontamination water and rinse water generated during sediment grab sampling activities should only be returned to the site by disposing of material overboard the vessel, as close to the sample location as possible, per the agency-approved sampling plan. Best practice is to have the contractor return the grab to near the mudline and open the jaws (if possible), so that you avoid creating a suspended sediment plume.

If required, waste sediment should be containerized in 55-gallon drums approved by the U.S. Department of Transportation pending profiling and disposal. Each container holding IDW will be sealed and labeled as to its contents (e.g., “sediments”), the waste accumulation dates, the waste generator’s name (site owner’s name or client name) and contact information for the Floyd|Snider field person who generated the waste, and the site name.

IDW containerized within drums will be characterized relative to applicable waste criteria using data from an IDW sample composite or the sampling locations. If decontamination/rinse water is collected as IDW, a sample composite may need to be collected from the drum(s) to accurately characterize this medium. Material that is designated for off-site disposal will be transported to an off-site facility permitted to accept the waste. Manifests will be used as appropriate for disposal. Sediment and decontamination/rinse water should be containerized in separate drums.

Disposable sampling materials and incidental trash such as paper towels and personal protective equipment (PPE) used in sample processing will be placed in heavy duty garbage bags or other appropriate containers and disposed of as solid waste in the municipal collection system (i.e., site dumpster), or as prescribed in the SAP. At some contaminated sites, PPE may need to be containerized as IDW.

6.0 Field Documentation

All observations should be recorded on the appropriate sediment sample forms and/or in a bound field notebook. Field staff should make an effort to record as much detail as possible.

At the end of each day, complete and review the second page of the tailgate safety meeting form detailing additional hazards, corrective actions, near-misses, or incidents. Fill out the Near Miss and Incident Reporting Form if applicable. Any incidents that result in equipment damage or field staff injuries should be reported immediately to the PM according to Floyd|Snider’s Accident Prevention Plan.

7.0 Demobilization

Upon returning to the office, ensure that all equipment is properly cleaned and put away in the field room. Equipment with rechargeable batteries should be plugged in as appropriate. It is preferable to dispose of trash on-site, but any trash left in the field vehicle should be placed in an appropriate municipal trash container or labeled and left at an arranged location for pickup.

If rented equipment or sample coolers will be placed at the front desk for pickup, clearly label each item with the name of laboratory/courier picking it up, anticipated pickup time frame, and your contact information so front desk staff can contact you if there are any questions. Ensure that sample coolers to be picked up remain sealed to maintain chain of custody. Notify front desk staff if any items require a signature at pickup.

Within 1 week of returning from the field, the PM for the event will provide copies of near miss and incident reports to the Health and Safety Administrator.

Within 1 week of returning from the field, the field lead for the event should complete the following tasks:

- Review field notes, sampling forms, and tailgate safety meeting forms with the PM.
- Scan field notes and forms and save to the project folder.
- File hard copies of the field forms, as required by the project or necessitated by project needs.
- Fill out the Event Tracking Form (ETF) and data standardization worksheet if applicable (available on the Data Services SharePoint page).
- Fill out and submit the equipment invoice (available on the Field SharePoint page) and submit to the PM for review.

Enclosures: Sediment Grab Equipment Checklist
Surface Sediment Sample Collection Form

Sediment Grab Equipment Checklist

Surface Sediment Sampling Equipment
- Camera
- Whiteboard, whiteboard pens, dry erase marker (or note cards)
- Stainless steel ruler (with metric, at least 1 foot long)
- Lead line (if not provided by contractor)
- Siphoning hose
- Turkey baster
- Field guide for soil and stratigraphic analysis (as needed)
- Munsell color chart, sieves, white and grayscale (as needed)
- Stainless steel bowls for homogenizing
- Large stainless steel spoons and/or mixer adaptor to drill
- Small stainless steel spoons
- Large stainless steel mixing pot (for large composites)
Decontamination/IDW Equipment
- Decontamination bins or bucket
- Pump sprayer for tap water or site water
- Spray bottles filled with Alconox/Liquinox solution
- Distilled water
- Non-chlorinated solvent (as needed; e.g., for sites with expected NAPL)
- Paper towels
- Alconox/Liquinox
- Scrub brushes
- 5-gallon buckets
- Waste labels for drums and buckets
- Full length rubber gloves
- IDW drums (including socket wrench)
General (Boat and Processing)
- Trash bags
- Paper towels
- Duct tape
- Permanent markers (large and small point) and pencils
- Rite in the Rain pen
- Box cutter
- Scissors
- Aluminum foil
- 5-gallon buckets
- Zip ties
- Extension cords (as needed, ie. for electric drill)
- Alligator clips
- Handheld GPS (if needed)
- Rain shelter

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Plans and Forms
- Work Plan, SAP/QAPP, HASP
- Contact information for field staff, PM, and client
- Work permits
- Key Tables, Figures, and Coordinates (on RiR)
- Field forms
- Field notebook
- Tide prediction tables

Sample Handling
- Coolers (extra cooler for ice)
- Ice
- Chain of custody forms and seals
- Sample labels
- Packing tape
- Small/large Ziploc bags for ice and samples
- Sample jars
- Deionized water (for rinsate blanks)

Safety Equipment (default to HASP)
- PID or MX6 and hydrogen sulfide monitor
- Life vest
- Nitrile gloves
- Coveralls or Tyvek
- Steel- or composite-toed boots
- Hard hat
- Safety glasses
- Rain gear
- Work gloves
- First aid kit
- Hand warmers
- Sunglasses and sunscreen
- External battery charger for phone
- Waterproof case for cell phone

CERCLA Sediment Sites (if needed)
- Copies of crew H&S certs
- Flagging/colored tape to delineate work zones
- Bootwash gear for CRZ if needed (tub, brush, sprayer)

F|S STANDARD GUIDELINE

Aquifer Testing

DATE/LAST UPDATE: January 2024

These procedures should be considered standard guidelines and are intended to provide useful guidance when in the field, but are not intended to be step-by-step procedures, as some steps may not be applicable to all projects.

All field staff should be sufficiently trained in the standard guidelines for the sampling method they intend to use and should review and understand these procedures prior to going into the field. It is the responsibility of the field staff to review the standard guidelines with the field manager or project manager and identify any deviations from these guidelines prior to field work. When possible, the project-specific Sampling and Analysis Plan should contain any expected deviations and should be referenced in conjunction with these standard guidelines.

1.0 Scope and Purpose

This standard guideline provides details necessary for conducting constant-rate drawdown (pumping tests) and falling-head slug tests (slug tests). The purpose of these tests is to assess well performance and collect data to estimate aquifer parameters (i.e., transmissivity, hydraulic conductivity, and storage coefficient). These guidelines are designed to be in accordance with ASTM standard procedures D4050-20 and 4044/4044M-15. Typically, a pumping test is the preferred method for estimating aquifer parameters, but a slug test can be used in instances where the hydraulic conductivity of the surrounding geology is low or the test well cannot be pumped.

This standard guideline is intended for basic, short-duration (less than 8 hours) pumping tests utilizing 2- to 4-inch-diameter monitoring wells that are typical at cleanup sites. These basic tests are limited by the pumping well diameter, which constrains the choice of pumps and the maximum pumping rate. The relatively low pumping rate and short duration of the tests contribute to relatively low drawdown. Longer-duration and higher-rate pumping tests may be designed using these principles and other site-specific information. Longer-duration tests (e.g., 24-hour, 72-hour) may be appropriate for specific data collection goals that require greater aquifer stress, such as testing boundary conditions, supporting a transient numerical model calculation, or other specific design purposes. Longer duration tests include additional

considerations, such as maintaining pump power and monitoring the test overnight, that are not considered here.

2.0 Equipment and Supplies

- For a short-duration constant-rate drawdown test:
 - Submersible pump and controller (~1 to 9 gallons per minute [gpm] range is typically the limit for use in 2-inch wells; considerably greater rates are possible using 3-inch-diameter pumps if larger diameter wells are available) with extension cord if near an electrical outlet; with battery and appropriate connectors or generator (without GFCI switch) if not near an outlet. The pump should be equipped with a check or foot valve to prevent water from flowing back into the well once the pump is turned off. Rental pumps typically are not equipped with check valves removed, so it is important to request one from the equipment vendor.
- OR
 - A peristaltic pump with an internal/external battery and appropriate connectors can be used if a submersible pump is expected to produce excessive drawdown in the pumping well. This method has applicability only to very low-producing wells and should generally be used as a last resort because it provides very limited stress on the aquifer.
 - Poly tubing, garden hose with fittings, or flexible hose with camlock fittings (for use with 3-inch-diameter and larger pumps).
 - Silicone tubing, if using a peristaltic pump.
 - In-line “T” setup with two valves for diverting flow (allowing for manual flow measurements), three male barbs, and hose clamps.
 - In-line flow gauge (optional, but recommended for more accurate manual flow measurements), rated for expected flow rates.
 - Stopwatch, watch, phone, or other time-keeping device that can record elapsed time with seconds accuracy.
 - Tube cutters, razor blade, or scissors.
 - Graduated 5-gallon buckets, lids, and clamp.
 - Adequate purge water containers for the anticipated volume of purge water at the pumping well (i.e., 55-gallon drums, tote tanks, or a water truck) if water is contaminated and must be contained. If water can be discharged to the ground, ensure enough tubing or hose to convey water outside of the recharge zone of the pumping well (i.e., at least 200 feet away and downgradient). Consult the project Sampling and Analysis Plan (SAP) for detailed information regarding purge water containerization and/or disposal.

- For a slug test:
 - Slug(s) of known volume, typically a solid polyvinyl chloride (PVC) or stainless steel rod with sufficient weight to sink into the groundwater. The slug diameter should allow for sufficient clearance inside the well to avoid interference with cables as well as prevent the instrument from getting stuck in the well.
 - Rope and/or cord to suspend the slug in the well.
- Water pressure transducer(s) (for pumping tests, sufficient transducers to place into the pumping well and each of its designated observation wells; for slug tests, one transducer for each test if tests are being conducted simultaneously at multiple wells)
- Barometric sensor or data logger (for unvented pressure transducers)
- Transducer cradle and/or USB connector (for transducers suspended by direct-read data cables)
- Field computer with transducer software
- Non-stretch stainless steel or direct-read data cable, crimps, and crimper
- Wire clippers and/or bolt cutter
- Water level meter(s) (for pump tests, sufficient meters to place at the pumping well and each of its designated observation wells; for slug tests, one meter for each test if tests are being conducted simultaneously at multiple wells)
- Tools for opening wells (1/2-inch, 9/16-inch, and 5/8-inch sockets, ratchet, screwdriver)
- Well keys
- Paper towels
- Bailer or pump to drain well box if full of stormwater
- Alconox (or similar decontamination solution), deionized or distilled water, and spray bottles
- Tape measure
- Trash bags
- Shade/rain canopy for inclement weather

Paperwork:

- Field notebook with site maps
- Table of well construction details and/or well logs, if available
- Aquifer testing forms (enclosed)
- Semi-log graph paper for preliminary field aquifer test analyses

- Purge water plan
- Rite-in-the-Rain pens, paper, and permanent markers
- Site-Specific Health and Safety Plan (HASP) and Tailgate Safety Meeting Forms for each day you expect to be on-site
- SAP

Safety Equipment:

- PPE:
 - Boots/waders
 - Safety vest
 - Safety glasses
 - Rain gear
 - Nitrile gloves
 - Work gloves
- Traffic barricades or cones
- Vehicle emergency kit (road flares, fire extinguisher, etc.)
- First aid kit

3.0 Standard Procedures

The following sections describe the procedures for conducting pumping and slug tests. Before entering the field, project considerations including testing equipment and key testing parameters should be discussed with the Project Manager. Any deviations from these procedures should be approved by the Project Manager and fully documented.

3.1 TAILGATE SAFETY MEETING

Conduct a tailgate safety meeting prior to beginning work at the site. The safety meeting should cover the hazards specific to aquifer tests. Typical hazards include the following:

- Test setup and testing
 - Lifting heavy equipment and buckets
 - Splash hazards from water
 - Sharp blades
 - Electrical hazards when working with exposed battery contacts
 - Electrical and fire hazards when using a portable generator

- Site Hazards
 - Traffic
 - Slips, trips, and falls (uneven terrain, wet ground, equipment on site, etc.)
 - Biological (insects, animals, plants)
- Chemical hazards (refer to HASP for site COCs)

Record the meeting attendees and topics discussed on the front page of the tailgate safety meeting form. All attendees should sign the form.

3.2 PUMPING TEST PROCEDURE

A pumping test involves withdrawing/pumping water at a known rate from a pumping well and measuring the response of the aquifer in at least one observation well, which may be the pumping well. The key phases of a pumping test include baseline measurement, initial drawdown, water level stabilization, and recovery periods. While water pressure transducers are the preferred method of measuring water levels, manual water level measurements should also be recorded to compare against transducer measurements and in the event of any electronic data loss. Raw transducer data from pumping tests may need to be corrected for any applicable changes in atmospheric pressure (in the case of unvented transducers) and/or tidal influence. The steps below provide general guidelines for conducting a pumping test, but consult the project SAP for key testing parameters, including the necessity of any preliminary tests, measurement intervals, and test duration. Ideally, there will be multiple staff on-site for the test; one staff can record initial water level measurements, while the other can verify and record the flow rate.

- Open and inspect all pumping and observation monitoring wells and collect initial water level measurements to the nearest 0.01 foot using a decontaminated depth to water meter. Be sure to note the time of each water level measurement.
- Determine the static water level in all monitoring wells by measuring the depth to water periodically over 5 minutes and taking the average of the readings, ensuring to record the measurement time for each reading. If possible, leave depth to water meter probes in each well (suspended 1 to 2 feet above the static water level) for ease of measurement during the test. Ideally, sufficient water level data should be collected in the hours or days prior to the test to allow for identification of ambient trends.
- Place the decontaminated pump and associated equipment (i.e., external battery, pump controller, and/or generator) next to the pumping well. Make appropriate connections so the pump can be powered on. Connect the appropriate size tubing to the pump and lower it into the well casing to a depth as low as possible that is appropriate for the pump design; check manufacturer recommendations for pump intake placement relative to screened interval. For typical 2-inch submersible pumps (e.g., Redi-flo 2), the pump can sit approximately 2 to 3 feet from the bottom of the well. Using a clamp, secure the tubing and pump power cords to the well casing to ensure they do not shift during the test. Document the estimated depth of the pump

placement and connect the pump tubing to an in-line, decontaminated “T” or similar device with valves to divert flow for manual flow rate measurements. Connect a discharge line to the “T” and direct the discharge tubing to a 55-gallon drum or other receptacle to contain the purge water. Set a graduated 5-gallon bucket below the third “T” connection, which can be used for manual flow rate measurements. An in-line flow meter and/or totalizer is preferred and can be (1) installed as part of the “T” setup and (2) used in place of manual measurements once checked for accuracy using manual measurements at test flow rates. Confirming the accuracy of an in-line flow meter can be done during a step-drawdown test. Note that many pumping setups are possible, but this setup is commonly used in aquifer testing for environmental investigations.

- Program and install decontaminated water pressure transducers in both the pumping and observation wells using stainless-steel, Kevlar, or other non-stretchable cable and crimps. Check transducer specifications for recommended deployment depth range, and allow for anticipated drawdown, particularly in the pumping well. For example, a 5-meter transducer can measure accurately when submerged up to 5 meters or about 15 feet; the transducer would typically be set above this maximum depth and below the expected maximum drawdown. Within these constraints, leave as much distance as possible between the transducer and the pump to avoid electrical interference that may interfere with data collection. Transducer logging frequency will depend on the expected initial drawdown rate, duration of the test, and datalogger capacity. High frequency (e.g., intervals of 1 second or less) measurements are generally desirable during the first several minutes of a pumping test. After the first few minutes, a minimum recording frequency of 30 seconds is recommended. Transducers may be programmed for logarithmic intervals to avoid collection of too much high-frequency data, but this increases the importance of timing measurements to the start of the test.
- When unvented transducers are used, install a barometric pressure sensor or data logger either in a protected outdoor location at the site (such as an observation well monument) or suspended in one of the observation wells, making sure that it is above the high water point in the monitoring well. The logger can be crimped to the same cord as the transducer or suspended using a separate stainless steel cord. Barometric pressure logging frequency should be the same as the transducer logging frequency. Only one barometric pressure sensor is needed per site.
- Allow water levels in the pumping well to equilibrate following the addition of the pump and transducer. Conduct a step-drawdown test at the pumping well to establish the sustainable yield, or the pumping rate at which the well water-level remains stable following initial drawdown. A step-drawdown test involves withdrawing water from the pumping well for a short period of time (relative to the planned test) at several different steps while measuring depth to water to establish the sustainable yield. The approximate target pumping rates should be specified in the project SAP. Note the start time of each step, and progressively increase the pumping rate, until the

sustainable yield for the pumping well is reached. Conduct each step for a minimum amount of time established in the SAP, which can range from as little as 1 minute to 2 hours, and record water levels in the pumping well at a regular frequency. After the sustainable yield is reached, turn off the pump and allow water level in the pumping well to recover to the pre-step-drawdown test level. Continue to record water levels at regular frequency during the recovery period.

Table 1
Suggested Manual Depth to Water Measurement Interval at the Pumping Well

Elapsed Time (drawdown or recovery)	Measurement Interval
1 minute	1 second
3 minutes	30 seconds
3 to 15 minutes	1 minute
15 to 60 minutes	5 minutes
1 to 2 hours	10 minutes
2 to 3 hours	2 minutes
3 to 15 hours	1 hour
15 to 60 hours	5 hours

- Conduct a constant-rate drawdown test. After the water level in the pumping well has recovered to the pre-step-drawdown test level, turn on the pump and set the flow rate to the sustainable yield rate discerned in the step above. Note the start time and immediately start recording manual water level measurements at the pumping well according to the recommended frequencies in Table 1. Manual water level measurements should also be collected from observation wells at regular intervals specified in the project SAP. If the project SAP does not specify measurement intervals, monitor observation wells at the same or lower frequency than the pumping well, also considering the observed aquifer response at the pumping well. As shown in Table 1, it is important to collect a high frequency of measurements during the initial drawdown and recovery periods.
- During the initial minute of the pumping test, check the flow rate using either a manual measurement or an in-line flow meter and record it on the field form. Throughout the test, flow rate should be recorded at regular intervals (i.e., every 5 or 10 minutes), and ideally should remain within 5% of the sustainable yield for the duration of the test. Note that pump settings may require adjustment to respond to the decrease in flow rate that accompanies drawdown of the pumping well. The pump will require more power to overcome the increasing head over the course of the test.

- Continue to record water level measurements from the pumping and observation wells as well as flow rate for the duration of the test specified in the SAP, adjusting pump rate, if significant water level deviations are observed following the initial drawdown period. If the pumping rate is equal to the sustainable yield, water levels theoretically should stabilize after an initial period of drawdown in the pumping well. The duration of the drawdown portion of the test will depend on test goals and available time and resources. For basic, short-duration pumping tests, which are the focus of this standard guideline, it is common to achieve sufficient water level stabilization within three log cycles to obtain a suitable drawdown and recovery curve to estimate aquifer properties. For tests such as these, therefore, it is recommended that the test be conducted for approximately 100 minutes or until a stable water level is achieved. A preliminary analysis of results can be done to check the test progress using semi-log paper and the time-drawdown Cooper–Jacob straight line method (refer to the solution method for additional details). The length of time should also consider allowing a roughly equivalent period of time for monitoring recovery.
- When the appropriate test duration is reached, turn off the pump, note the stop time, and immediately start recording manual water level measurements at the pumping well according to the recommended frequencies in Table 1. Check to make sure that the pump valve is closed, if applicable, to ensure no backflow into the pumping well. Manual water levels should also be collected at observation wells at regular intervals. Continue to record water levels until the static water level in the pumping well has recovered to within 95% of the pre-pump test water level.
- Remove all equipment from the pumping and observation wells and discard disposable tubing as appropriate. Using the transducer cradle and USB connector, connect the transducers and barometer to a field computer and download data from the duration of the test. Verify that the data has been saved (and backed up) correctly on the field computer before reprogramming and/or redeploying the equipment. Decontaminate field equipment and manage purge water according to the procedures outlined in Sections 4.0 and 5.0, respectively.

3.3 SLUG TEST PROCEDURE

In a slug test, a known volume of water is displaced from a well and the resulting fluctuation of the groundwater level in that well is measured. Note that slug tests may be initiated in many ways including a solid slug (most common) or by pneumatic pressurization. Key phases in a slug test include baseline measurement, initial displacement, and water level stabilization periods. While water pressure transducers are the preferred method of measuring water levels, manual water level measurements should also be recorded to compare against transducer measurements and in the event of any electronic data loss. Raw transducer data from pump tests need to be corrected for any applicable changes in atmospheric pressure and/or tidal influences. Consult the project SAP for test parameters, including measurement intervals and test duration.

- Open and inspect the testing well and collect an initial water level measurement to the nearest 0.01 foot using a decontaminated depth to water meter.

- Determine the static water level in the testing well by measuring the depth to water periodically over 5 minutes and taking the average of the readings. Leave the depth to water meter probe in the well (suspended 1 to 2 feet above the static water level) for measurements during the test. If the monitoring well is 2-inch diameter or smaller, it may be necessary to remove the depth to water probe from the well prior to inserting the slug.
- Program and install a decontaminated water pressure transducer in the testing well using stainless steel or direct-read data cable (or other non-stretchable) and crimps. Check transducer specifications for recommended deployment depth relative to the anticipated maximum water surface (refer to discussion in pumping test description), ensure the transducer is placed below the slug target depth interval, and securely tie off or clamp the transducer cable so that the instrument will not shift during the test. Logging frequency will depend on the hydraulic conductivity of the material being tested (higher hydraulic conductivity = greater logging frequency), but a minimum measurement interval of 1 second is recommended to capture the detailed aquifer response and recovery to the slug.
- When unvented transducers are used, install a barometric pressure sensor or data logger in either the testing well or a nearby location at the site, making sure that logger in a well is suspended above the high-water point. The logger can be crimped to the same cord as the transducer or suspended using a separate stainless steel cord. Only one barometric pressure sensor is needed per site.
- Allow water levels in the testing well to equilibrate following transducer installation. Secure the end of the rope attached to the slug to a nearby static object (i.e., bollard, tree, investigation-derived waste [IDW] drum, or car) to prevent the slug from being lost in the well during the test. As quickly as possible, introduce a decontaminated slug of known volume to the water column until it is completely submerged. Note the time on the field sheet and immediately start taking manual depth to water measurements, noting the time of each reading. It is important to take as many measurements as possible in the early part of the test to accurately define and verify the water level response curve generated by the transducer data. Measurement interval depends on the hydraulic conductivity of the material being tested; material with a high hydraulic conductivity will require more frequent measurements and vice versa. Similar to Table 1, increase the length of time between measurements with increasing test duration, although the exact frequencies of measurement will depend on hydraulic conductivity of the material being tested. Continue measuring and recording depth to water measurements until the water level reaches equilibrium conditions (i.e., within 95% of initial head), which may vary from several minutes to several hours.
- Remove the water level meter, slug, and water pressure transducer and barometer from the well and decontaminate equipment. Using the transducer cradle and USB connector, connect the transducer to a field computer and download data from the duration of the test. Verify that the data has been saved (and backed up) correctly on

the field computer before reprogramming and/or redeploying the equipment. Decontaminate field equipment according to the procedures outlined in Section 4.0.

4.0 Decontamination

All reusable equipment that contacts groundwater should be decontaminated using the processes described in this section prior to moving to the next sampling location.

Slug: A solid slug will be decontaminated following removal from wells by spraying the slug and the entire length of cable that encountered groundwater with an Alconox (or similar)/clean water solution followed by a thorough rinse with distilled or deionized water.

Submersible Pump: Decontaminating the pump requires running the pump in three progressively cleaner grades of water. Attaching a small piece of clean tubing to the top of the pump allows field staff to recirculate water in the buckets.

1. Fill a bucket with approximately 3 gallons or more to sufficiently cover the pump intake of an Alconox (or similar)/clean water solution. Place the pump and the length of the power cord (if applicable) that was in contact with water into the bucket and run the pump for approximately 2 minutes, recirculating the decontamination water and scrubbing the side of the pump with a brush.
2. Fill a second bucket containing approximately 3 gallons or more to sufficiently cover the pump of clean water. Place the pump and cord into this bucket and run the pump for approximately 2 minutes, recirculating the decontamination water.
3. Fill a third bucket with approximately 4 gallons or more to sufficiently cover the pump of distilled or deionized water. Place the pump and cord into this bucket and run the pump for approximately 2 minutes, recirculating the decontamination water.

Transducers: Transducers and associated stainless steel and/or direct-read data cables will be decontaminated following removal from wells by spraying the transducer and the entire length of cable that encountered groundwater with an Alconox (or similar)/clean water solution, followed by a thorough rinse with distilled or deionized water.

Water Level Meters: The water level indicator and tape will be decontaminated between test locations and at the end the day by spraying the entire length of tape that contacted groundwater with an Alconox (or similar)/clean water solution followed by a thorough rinse with distilled or deionized water.

5.0 Investigation-Derived Waste

Unless otherwise specified in the project work plan, water generated during groundwater sampling activities will be contained, transported, disposed of in accordance with applicable laws, and stored in a designated area until transported off-site for disposal.

The approach to handling and disposal of these materials for a typical cleanup site is as follows. For IDW that is containerized, such as purge water, 55-gallon drums (or other smaller sized drums) approved by the Washington State Department of Transportation will be used for temporary storage pending profiling and disposal. Each container holding IDW will be sealed and labeled as to its contents (e.g., “purge water”), the dates on which the wastes were placed in the container, the owner’s name and contact information for the field person who generated the waste, and the site name. As pump tests generally yield substantial amounts of purge water, a water/vacuum truck can also be employed to collect and dispose of purge water if a representative sample of the groundwater is available to generate a disposal profile prior to implementing the pump test.

IDW containerized within drums will be characterized relative to applicable waste criteria using data from the sampling locations whenever possible. Material that is designated for off-site disposal will be transported to an off-site facility permitted to accept the waste. Manifests will be used, as appropriate for disposal.

Disposable sampling materials and incidental trash such as paper towels and PPE used in sample processing will be placed in heavy-duty garbage bags or other appropriate containers and disposed of as trash in the municipal collection system.

6.0 Field Documentation

Aquifer test activities will be documented in field sampling forms and/or field notebooks. Information recorded will, at a minimum, include personnel present (including subcontractors or client representatives), purpose of field event, weather conditions, transducer logging frequency, aquifer test start and finish times, depth to water and flow rate measurements, times of depth to water and flow rate measurements, amount of purge water generated, and any deviations from the SAP or this standard guideline. Photographs of the test setup and relevant site conditions should be taken.

7.0 Demobilization

Upon returning to the office, ensure that all equipment is properly cleaned and put away in the field room. Equipment with rechargeable batteries should be plugged in as appropriate. It is preferable to dispose of trash on-site, but any trash left in the field vehicle should be brought upstairs, labeled, and placed in the front production room for building staff to dispose of.

If rented equipment or sample coolers will be placed at the front desk for pickup, clearly label each item with the company picking it up, anticipated pickup time frame, and your contact information so front desk staff can contact you if there are any questions. Notify front desk staff if any items require a signature at pickup.

Within 1 week of returning from the field, the field lead for the event should review field notes, sampling forms, and tailgate safety meeting forms with the PM. Following PM review and

approval, field notes will be scanned and saved to the project folder. Hard copies should be filed. The PM will provide copies of near miss and incident reports to the Safety Program Manager

8.0 References

ASTM International. 2015. *Standard Test Method for (Field Procedure) for Instantaneous Change in Head (Slug) Test for Determining Hydraulic Properties of Aquifers*. D4044/D4044M-15. September.

_____. 2020. Standard Test Method for (Field Procedure) for Withdrawal and Injection Well Testing for Determining Hydraulic Properties of Aquifer Systems. D4050-20. January.

Washington State Department of Ecology. 2020. *Water Resources Program Guidance: Aquifer Test Procedures*. Publication 20-11-093. October. Contact information revised April 2023.

U.S. Environmental Protection Agency. 1993. *Ground Water Issue: Suggested Operating Procedures for Aquifer Pumping Tests*. Office of Solid Waste and Emergency Response. EPA/540/S-93/503. February.

_____. 1994. *Slug Tests*. SOP #2046. 3 October.

Enclosures: Pumping Test Field Form

 Slug Test Field Form

AQUIFER TESTING FIELD FORM – PUMPING TEST

Date: _____

Field Personnel:

Test Data

Pumping well ID: _____

Well diameter/screened interval: _____

Observation well IDs: _____

Well diameter/screened interval: _____

Pump and depth: _____

Transducer(s), depth(s), and serial #(s): _____

Purge water discharge location: _____

Test setup comments and conditions:

Start pumping (time **to nearest second**): _____

Stop pumping (time **to nearest second**): _____

Time	Control Well Depth to Water (DTW) (feet)	Discharge Rate (gallons per minute)	DTW (feet)	DTW (feet)	DTW (feet)	DTW (feet)	Comments
Baseline							

Preliminary Yield/Step Testing

Drawdown

[illegible]

AQUIFER TESTING FIELD FORM – PUMPING TEST

[illegible]

Recovery

[illegible]

AQUIFER TESTING FIELD FORM – SLUG TEST

Date: _____

Field Personnel: _____

Project: _____

Task: _____

Test Data

Slug test well ID: _____

Well screened interval: _____

Transducer(s), depth(s), and serial #(s): _____

Slug 1 length: _____ Slug 2 length: _____ Slug 3 length: _____

Test setup comments and conditions: _____

Time	Depth to Water (DTW in feet) before test	Time	DTW (feet) after slug in 1	Time	DTW (feet) after slug out 1	Time	DTW (feet) after slug in 2	Comments/ indicate 95% stabilization
Test 1								
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
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_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
Test 2								
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
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_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____

AQUIFER TESTING FIELD FORM – SLUG TEST

Date: _____

Field Personnel: _____

Project: _____

Task: _____

Test Data

Slug Test Well ID: _____

Well Screened Interval: _____

Transducer(s) and depth(s): _____

Slug 1 Length: _____ Slug 2 Length: _____ Slug 3 Length: _____

Test setup comments and conditions: _____

Time	Depth to Water (DTW) (in feet (ft)) before test	Time	DTW (ft) after slug in 1	Time	DTW (ft) after slug out 1	Time	DTW (ft) after slug in 2	Comments/ indicate 95% stabilization
Test 3								
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
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Test 4								
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Pressure Transducer Installation and Monitoring

DATE/LAST UPDATE: March 2020

1.0 SCOPE

This Standard Operating Procedure (SOP) summarizes the general procedures and practices staff use to install pressure transducers in monitoring wells, stilling wells, or other locations. The transducers are primarily used to measure and record head measurements. The purpose of these procedures is to describe transducer installation and data recovery and to facilitate planning of the field effort. These techniques should be followed where applicable, although site-specific conditions or project-specific plans may require adjustments in the methods described.

Staff deploying transducers should also consult and follow applicable health and safety plans, companion documents, and SOPs.

2.0 DISCUSSION

Pressure transducer data loggers are used to measure and record changes in pressure indicative of water level or potentiometric surface in groundwater or water level of surface water. Data loggers may also record temperature or other data.

3.0 EQUIPMENT AND SUPPLIES

This section describes equipment specific to installation of transducers. This section does not address general field gear beyond the immediate tasks described below.

Personal Field Gear

- Eye protection
- Leather gloves
- Hip/chest waders with wading boots (stilling well or porewater locations)
- Personal flotation device (stilling well or porewater locations)

Field Gear and Equipment

- Water level indicator

- Thin-gauge stainless-steel cable or Kevlar cord
- Clips and cable clamps
- Screwdriver set with commonly used head types and sizes
- Assorted stainless-steel screws, nuts, and bolts
- Duct tape
- Assorted pliers
- ¼-inch standard and metric socket set plus assorted stainless-steel nuts and bolts
- Crescent wrenches
- Wire clippers
- 12-foot engineer's hand tape
- Wire-reinforced zip ties, various lengths
- Indelible ink pen
- Polyethylene bags for transducers
- Propylene glycol or distilled water if installing transducers in corrosive or freeze-prone locations
- Pressure transducers
- Barometric transducer
- Optical reader connection for transducers
- Laptop
- Clip board

4.0 PRESSURE TRANSDUCER PROCEDURES

Pressure transducer (transducer) installation includes two primary steps: transducer setup and installation in the well concurrent with water level measurement.

4.1 Pressure Transducer Setup

All transducers used in the study should record water level measurements at the same frequency and at the same interval. For example, if a 10-minute interval is used, all transducers should measure at :10, :20, and :30 each hour. Inconsistent transducer recording times result in data processing issues.

If multiple recording intervals are used at the site, they should be set up to be common time multiples so that they record at overlapping times. For example, 15 minute and hour intervals set

to record on the hour would be compatible while a 17-minute and 1-hour interval would not be compatible.

A barometric transducer should be set up to record at the same interval as the rest of the monitoring network.

The setup process varies by manufacturer, but generally follows these steps:

1. Start computer and attach transducer reading device (optical reader, direct read cable, etc.).
2. Connect the transducer to the reading device and use the software to confirm connection.
3. Use the software to set up a future start time on an even increment of the selected interval. It is important that the intervals record at the same time on all devices. This is most easily done by setting a future start at the next even increment.
4. Double check the programmed interval, battery life remaining, start date, and start time. If all is correct, remove the transducer and set with gear for field deployment.

Hint: it is often most efficient to set up all of the transducers to be deployed in a day at the same time with a future start date and time that is at the beginning of the field effort. This prevents having to bring a laptop to well locations to do the startup procedure. The data points collected before deployment are easily removed in data processing.

4.2 Pressure Transducer Installation

Installation includes secure placement of the transducer in the well at a target depth below top of casing, and collecting a manual water level measurement for transducer calibration.

1. Open the well and set the well cap aside in a clean location.
2. Record the transducer serial number, transducer range (5m, 10m, etc.), well ID, date, time, and target depth on field form.
3. The target depth should be below the expected low water level during the transducer deployment and shallower than the transducer's range below the high-water level during the deployment.
4. Attach the stainless-steel cable to the transducer.
5. Record a manual water level on data sheets. Remove the sounder from the well.
6. Hold the transducer and end of the sounder together and place into the well. Lower both into the well together using the sounder markings to track the transducer set depth.
7. When the transducer is at the intended set depth, attach the stainless-steel cable to the well cap.

8. Collect a second depth to water measurement with the sounder, and record the depth to water, date, and time in the field notes. Note that this is collected at the transducer install time. If the water level is inconsistent with the first measurement, collect additional water levels at 1- to 3-minute intervals until water levels have stabilized.
9. The final water level should be collected as close as possible to a time at which the transducer has been set to automatically record a measurement.
10. Close the well.
11. Confirm that the serial number, date, time, set depth, and water level have all been recorded in field notes.

The barometric transducer should be installed in a protected location within the study area. The transducer should not be installed in a conditioned building because the HVAC system in the structure could distort barometric pressure readings. Installing in a shed or outside in a vented protective box is acceptable. The installation date, time, location, and transducer serial number should be recorded upon installation. A photograph of the installation location is recommended if installed in a location that is not obvious from written description.

4.3 Pressure Transducer Removal

1. Open the well and set the well cap aside in a clean location. Record the time in field notes; the transducer will be at a different elevation upon opening. If the transducer is about to collect an automatic measurement, wait until after the measurement time to open the well.
2. Collect a manual water level measurement, wait 2 minutes and collect a second measurement. If readings show a trend, collect additional measurements until water levels have stabilized.
3. Remove the transducer from the well by pulling on the stainless-steel cable.
4. Record the transducer serial number, transducer range, date, time, and observations of transducer corrosion or plugging in field notes.
5. Either follow the manufacturer protocol for downloading data from the transducer, or take the unit back to the office for bulk downloading.
6. If data are downloaded in the field, record the download in the field notes, and check data for obvious signs of transducer failure (spurious results, etc.). Replace the transducer if the unit is not recording reliable data.
7. Replace the unit in the well by slowly lowering on the stainless-steel wire.
8. Collect a final depth to water measurement with the sounder, and record the depth to water, date, and time in the field notes.
9. Close the well.

4.4 Pressure Transducer Data Recovery

1. Start computer and attach transducer reading device (optical reader, direct read cable, etc.).
2. Connect the transducer to the reading device and use the software to confirm connection.
3. Use the software to download the data to the computer. The output data file name should include the well ID, transducer serial number, and download date.
4. If the transducer is to be redeployed, confirm battery levels, and clear transducer memory if needed for the expected deployment.
5. Set a future start following the setup instructions in Section 4.1.

4.5 Deployment in Corrosive or Freeze-Prone Locations

Transducers deployed in chemically corrosive environments may be partially protected through use of a fluid-filled sleeve. The fluid filled sleeve will transmit pressures and allow accurate water level measurements while providing protection. Wells with pH less than 6 are considered corrosive for the purpose of this section.

The protective sleeve will be a polyethylene (LDPE) bag slightly larger than the transducer. For corrosive environments, the bag will be filled with distilled water. For freeze prone locations, the bag will be filled with a propylene glycol solution.¹ The transducer is placed in the bag and the bag is sealed around the upper transducer housing with at least three cable ties. The bag should fit loosely around the transducer, have minimal or no airspace, and not be pressurized/tight upon completion. The ends should be cut off of the cable ties.

¹ Propylene glycol is non-toxic.

Phase 1 Remedial Investigation Work Plan

Cosmo Specialty Fibers Site

Appendix C Quality Assurance Project Plan

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List of Abbreviations

Abbreviation	Definition
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSM	Conceptual site model
DQI	Data quality indicator
Ecology	Washington State Department of Ecology
EDD	Electronic data deliverable
EIM	Environmental Information Management
IDW	Investigation-derived waste
LCS	Laboratory control sample
MDL	Method detection limit
MS	Matrix spike
MSD	Matrix spike duplicate
Phase 1 RIWP	Phase 1 Remedial Investigation Work Plan
PM	Project Manager
QA	Quality assurance
QAPP	Quality Assurance Project Plan

Abbreviation	Definition
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
QC	Quality control
RCRA	Resource Conservation and Recovery Act
RL	Reporting limit
RPD	Relative percent difference
SAP	Sampling and Analysis Plan
SCUM	Sediment Cleanup User's Manual
SDG	Sample delivery group
Site	Cosmo Specialty Fibers, Inc., Site
SMS	Sediment management standards
SOP	Standard operating procedure
USEPA	U.S. Environmental Protection Agency
Weyerhaeuser	Weyerhaeuser NR Company

1.0 Introduction

This Quality Assurance Project Plan (QAPP) is presented as an appendix to the Phase 1 Remedial Investigation Work Plan (Phase 1 RIWP) for the Cosmo Specialty Fibers, Inc., Site (Site) in Cosmopolis, Washington. It describes the quality assurance (QA) objectives, methods, and proposed field sampling procedures to characterize nature and extent of contamination in environmental media to support the development and refinement of the conceptual site model (CSM) and remedial alternative, in accordance with the Washington State Department of Ecology (Ecology) Guidelines for Preparing QAPPs for Environmental Studies (December 2016a) and Sediment Sampling and Analysis Plan (SAP) Appendix (February 2008), the Guidance for Preparation of Quality Assurance Project Plans (USEPA 2006) and requirements of the U.S. Environmental Protection Agency (USEPA) Contract Laboratory Program.

The Phase 1 RIWP was prepared on behalf of Weyerhaeuser NR Company (Weyerhaeuser) and describes the overall proposed RI activities, schedules, and project management strategies including roles and responsibilities, site history and conditions, and a CSM in accordance with the Model Toxics Control Act and, where applicable, Sediment Management Standards (SMS). The work is being conducted in accordance with an Agreed Order (No. 23839) between Weyerhaeuser and Ecology.

The Site is an industrial facility. The facility is currently inactive and has not been mothballed, and the current owner has indicated that future resumption of Site operations is under consideration. There are actively leaking storage tanks within and adjacent to the Main Mill Complex buildings. Field staff are restricted from entering any buildings on-site and from lingering in the vicinity of the Main Mill Complex buildings for longer than necessary.

1.1 DOCUMENT ORGANIZATION

This QAPP provides detailed laboratory methods and protocols for all anticipated types of data collection. QAPP addenda may be prepared if additional data types not detailed in this plan are determined to be needed after completion of part or all groundwater, surface water, sediment, soil, and soil gas sampling.

This QAPP is organized into the following sections:

- Section 2.0—Project Organization and Responsibilities
- Section 3.0—Data Generation and Acquisition
- Section 4.0—Assessment and Oversight
- Section 5.0—Data Validation and Usability
- Section 6.0—References

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2.0 Project Organization and Responsibilities

The following sections describe the responsibilities of QA and quality control (QC) team members for fulfillment of the QAPP. The contact information for key project team members is included in the Table B.1 of the SAP.

2.1 QUALITY ASSURANCE/QUALITY CONTROL

The QA/QC coordinator, or their designee, will be responsible for coordination between the field and laboratory programs, as well as overseeing data validation, project QA activities, and communication with the analytical laboratories. This role will be filled by a Floyd|Snider QA/QC specialist who is independent from the analytical laboratories and field staff responsible for generating the data.

Analytical laboratories will be responsible for chemical analyses and will ensure that submitted samples are handled and analyzed in accordance with the analytical testing procedures and QA/QC requirements, as well as the any other requirements specified in this QAPP. The laboratories will provide certified precleaned sample containers and preservatives, as appropriate, and prepare a data report containing analytical and QA/QC results. The laboratory Project Manager (PM) will oversee laboratory operations, including receipt of samples, chemical analyses, and laboratory report preparation. They will prepare and review laboratory reports and case narratives describing any discrepancies that occurred during chemical analyses. They will also notify the laboratory QA/QC coordinator of any problems as soon as they are identified.

EcoChem, Inc., in Seattle, Washington will provide independent third-party review and USEPA Stage 2B and Stage 4 validations of all sediment dioxin/furan results.

Additionally, the QA/QC coordinator or their designee will oversee entry of all the data into Floyd|Snider's proprietary database and perform data management and queries. The QA/QC coordinator or designee will ensure all validated data are submitted to the Ecology's Environmental Information Management (EIM) system in accordance with WAC 173-340-840(5) and Ecology's Toxics Cleanup Program Policy 840: Data Submittal Requirements (Ecology 2016b) within 30 days of Ecology's final approval of the associated report.

2.2 DOCUMENTATION AND RECORDS

This QAPP will be approved by the Floyd|Snider PM, the Weyerhaeuser PM, and all laboratory and data validation contractor PMs. The document will be maintained and updated by the Floyd|Snider PM, who will be responsible for distribution of the approved document and any updated versions to key project contacts and team members. The Weyerhaeuser PM may distribute this QAPP to project stakeholders at their discretion. The contact information for key project team members is included in Table B.1 of the SAP.

Floyd|Snider will store all project records in a secure manner. Each project team member is responsible for filing all project information and records according to internal Floyd|Snider requirements. All electronic data will be maintained in a database in a designated directory at Floyd|Snider.

2.2.1 Laboratory Records

The analytical laboratories will retain all analytical records. Additionally, Floyd|Snider will retain a copy of analytical data in the internal project files. Laboratory data packages will include those items necessary to complete data validation. Elements to be reported in the laboratory data packages are listed in Section 5.1.

All instrument data will be fully restorable at the laboratory from electronic backup. The laboratory will be required to maintain records relevant to project sample analyses for a minimum of 7 years. The PM is responsible for determining and communicating specific requirements for record maintenance if they are different than the default. Data validation reports will be maintained within the Floyd|Snider internal project files with the laboratory data packages.

Each laboratory employs an internal QA manager who is responsible for ensuring that laboratory standard operating procedures (SOPs) are followed and laboratory staff perform routine audits for SOP compliance; routine audits are required for state accreditation. The Floyd|Snider PM or Weyerhaeuser PM may request to review records of SOP compliance.

The analytical laboratories will submit data electronically, in the Floyd|Snider standard electronic data deliverable (EDD) format. Guidelines for EDDs will be communicated to the analytical laboratories by the QA/QC coordinator or database manager.

All electronic data submittals must be tab-delimited text files that include all results, method detection limits (MDLs; as applicable), and reporting limits (RLs) consistent with those provided in the laboratory report. If laboratory replicate analyses are conducted on a single submitted field sample, the laboratory sample identifier must distinguish each replicate analysis.

2.2.2 Data Management and Reduction

The Floyd|Snider database manager will oversee data management and reduction in coordination with the PM and task manager or field coordinator. Once all required data are confirmed to be received and validated, the database manager will load all records to Floyd|Snider's electronic database accessed using Microsoft Access software. The database is maintained on the Floyd|Snider server and is backed up with a hard disc. The database manager will manage data exports and will confirm that data are assembled in the required deliverable format with appropriate qualifiers.

3.0 Data Generation and Acquisition

3.1 SAMPLING DESIGN AND METHODS

The Phase 1 remedial investigation approach is described in the Phase 1 RIWP. Sampling procedures and methods are described in the SAP (Appendix B of the Phase 1 RIWP), and health and safety requirements are described in the site-specific Health and Safety Plan (Appendix D of the Phase 1 RIWP).

3.2 SAMPLE ANALYSIS

Soil, groundwater, and surface water samples will be analyzed using methods that meet the minimum RLs/MDLs specified in Tables C.1 and C.2. Sediment samples will be analyzed using methods capable of achieving the SMS criteria (WAC 173-204-563), with minimum RLs/MDLs specified in Table C.3.

Field duplicates will be analyzed concurrently for all constituents analyzed in their respective parent samples. Equipment blanks will be collected once per field event for each type of nondedicated sampling equipment used for each sampled media and will be analyzed for the same constituents as the associated environmental samples. Trip blanks will be analyzed for the same gasoline-range organics or volatile organic compound analyte list as respective samples within the same cooler.

Samples for characterization of investigation-derived waste (IDW) for disposal purposes will be analyzed in accordance with the Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation, and Liability Act. IDW samples will be analyzed for compounds regulated under RCRA and CERCLA including RCRA 8 metals, dioxins/furans, polychlorinated biphenyls, herbicides, and semivolatile organic compounds. Alternatively, IDW may be characterized using data from environmental sample analyses, as appropriate.

3.3 ANALYTICAL METHODS

Laboratory analytical methods were selected to ensure that the samples can be compared to the criteria presented in Tables C.1, C.2, and C.3. The laboratory quantitation limits including RLs and MDLs for the selected analytical methods are also presented in Tables C.1, C.2, and C.3.

3.4 DATA QUALITY OBJECTIVES AND CRITERIA

Field and laboratory data quality objectives include obtaining data that are technically sound and properly documented, having been evaluated against established criteria for the principal data quality indicators (DQIs; i.e., precision, bias, accuracy, representativeness, completeness, comparability, and sensitivity). Evaluation of the principal DQIs is summarized in the following sections. Data QA/QC criteria (also known as measurement quality objectives) and frequencies are presented in Tables C.4, C.5, and C.6.

Project-specific data quality objectives are established in Section 6.0 of the Phase 1 RIWP and are presented in detail in Table 6.1 of the Phase 1 RIWP.

3.4.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, precision is a quantitative measure of the variability of a group of measurements compared to their average values. Precision is assessed by performing multiple analyses, such as laboratory duplicate or field duplicate samples, and is defined as the relative percent difference (RPD) between results. Precision will be evaluated for both laboratory and field duplicate samples and calculated as follows.

$$RPD = \frac{(C_1 - C_2) \times 100\%}{\frac{(C_1 + C_2)}{2}}$$

Where:

RPD = relative percent difference

C₁ = larger of the two observed values

C₂ = smaller of the two observed values

Laboratory duplicate sample precision criteria and frequency requirements are presented in Tables C.4, C.5, and C.6. Field duplicate precision will be screened against an RPD of 50% for all samples, however data will not be qualified based on this evaluation. For precision calculations (i.e., for calculating RPD) the RL will be used when a nondetect result is included in the evaluation. Additionally, the result/s based on the final dilution will be used in the calculation (i.e., values flagged as estimated greater than a given concentration, which are superseded with subsequent sample dilutions, will not be used).

3.4.2 Accuracy and Bias

Accuracy is an expression of the degree to which a measured or computed value represents the true value. Bias is “the systematic or persistent distortion of a measurement process that causes error in one direction” (USEPA 2002a). Analytical bias and accuracy may be assessed by analyzing “spiked” samples with known concentrations, such as laboratory control samples (LCSs), blank spikes, and standard reference materials. Additionally, matrix spike (MS) samples can be analyzed to provide accuracy or bias information in the actual sample matrix. Precision criteria and frequency requirements are presented in Tables C.4, C.5, and C.6. Accuracy will be evaluated as percent recovery (%R) and will be calculated as follows.

$$\%R = 100\% \times \frac{(S - U)}{C_{sa}}$$

Where:

%R = percent recovery

S = measured concentration in the spiked aliquot

U = measured concentration in the unspiked aliquot

C_{sa} = actual concentration of spike added

For accuracy calculations (i.e., for calculating %R), nondetect results will be assigned a value of zero. Additionally, the results based on the final dilution will be used in the calculation (i.e., values flagged as estimated greater than a given concentration, which are superseded with subsequent sample dilutions, will not be used).

3.4.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent an environmental condition. This DQI is addressed by the design of the sampling plan. A list of analytes has been identified to provide a comprehensive assessment of known or potential contaminants. Care has been taken in the design of the sampling program to ensure that sample locations are properly selected, sufficient numbers of samples are collected to accurately reflect conditions at the locations, and samples are representative of the sampling locations specified in the SAP. Sufficient volumes of samples will be collected at each sampling location to minimize bias or errors associated with sample particle size and heterogeneity.

Representativeness in laboratory data will be assessed by evaluating holding time compliance and the results of the method blanks, equipment blanks, trip blanks, and instrument blanks.

3.4.4 Completeness

Completeness is defined as the number of acceptable data points relative to the total number of data points and is also a measure of the amount of validated data reported versus the expected amount of data (the amount of data collected). Completeness will be assessed for each sample medium. The QA/QC objective for completeness for all components of this project is 90% (Table C.4). Data that were qualified as estimated because the QA/QC criteria were not met will be considered valid for the purpose of assessing completeness. Data that have been qualified as estimated will be further reviewed for usability. Data that were qualified as rejected will not be considered valid for their intended use or for the purpose of assessing completeness. If a sample medium has an unacceptable completeness percentage (less than 90%), original samples will be re-analyzed if sufficient sample volume is available, archived samples will be analyzed if appropriate, or additional samples will be obtained (if feasible). The equation used to calculate completeness is as follows:

$$\text{Completeness} = \frac{\text{number of valid measurements}}{\text{total number of data points planned}} \times 100$$

3.4.5 Comparability

Comparability is a qualitative parameter expressing the confidence with which one dataset can be compared to another. To ensure that results are comparable, samples will be analyzed using USEPA methods, Standard Methods, ASTM International methods, and/or other acceptable method protocols. Calibration and reference standards will be traceable to certified standards, and standard data reporting formats will be employed.

3.4.6 Sensitivity

Analytical sensitivity is the minimum concentration of an analyte above which a data user can be reasonably confident that the analyte was reliably detected and quantified. For this investigation, the MDL or estimated detection limit will be used as the measure of sensitivity for each analyte.

3.5 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Guidance for QA/QC is derived from the protocols developed for USEPA's Test Methods for the Evaluation of Solid Waste: Physical/Chemical Methods (USEPA 1986), the USEPA National Functional Guidelines (USEPA 2020a, 2020b, and 2020c), and cited methods.

The field coordinator or field personnel will assess and implement field QC procedures as required in this QAPP.

3.5.1 Laboratory Sample Tracking

At each laboratory, a unique sample identifier will be assigned to each sample. The laboratory will ensure that a sample tracking record follows each sample through all stages of laboratory processing. The sample tracking record must contain, at a minimum, the name/initials of individuals responsible for performing the analyses, dates of sample extraction/preparation and analysis, and types of analyses being performed. The analytical laboratories will meet the sample handling requirements and follow the procedures described in the following sections.

3.5.2 Laboratory Sample Handling and Holding Times

Samples will be stored in accordance with the conditions specified in the methods or laboratory SOPs. Samples transferred to other laboratories will be packed in coolers on ice and delivered via courier service or shipped on ice in coolers at temperatures of <6 degrees Celsius, not frozen. The temperature inside each cooler will be checked by the laboratory upon receipt of the samples. The laboratory will specifically note any coolers that are not sufficiently cold upon receipt.

All samples will be handled to prevent contamination and sample loss. Holding times will vary by analysis and are summarized in Tables C.7 and C.8.

Archive samples will be stored frozen as allowed by the analytical method (refer to Tables C.7 and C.8). Sample material will be disposed of after hold times expire, following written authorization from the Floyd|Snider PM. The Floyd|Snider PM may elect to hold archived samples past the specified hold time as needed to gather the additional project data.

3.5.3 Laboratory Quality Assurance/Quality Control

Laboratory results will be evaluated by reviewing analytical results of method blanks, LCSs, certified reference materials, MS/MS duplicate (MSD) samples, duplicate samples, internal

standards, calibrations, and performance evaluation samples, as specified by the analytical methods.

All samples will be diluted and reanalyzed if target compounds are detected at levels that exceed their respective established calibration ranges. Any required cleanups will be conducted prior to the dilutions. Reanalyses will be performed if surrogate, internal standard, or spike recoveries are outside of the QA parameters. QC samples may be reanalyzed if results are not within control limits and it cannot be determined that the sample matrix is the cause.

3.5.3.1 Sample Delivery Groups

A sample delivery group (SDG) is defined by the laboratory and is generally considered 20 samples, or a group of samples from the same sampling period received at the laboratory on the same day. Although an SDG may span 2 weeks, all holding times specific to each analytical method will be met for each sample in the SDG.

3.5.3.2 Method Blanks

Method blanks are analyzed to assess possible laboratory contamination at all stages of sample preparation and analysis. A minimum of one method blank will be analyzed for every 20 samples or as requested by the method.

3.5.3.3 Laboratory Control Samples

LCSs are prepared from a clean matrix source using the same process as project samples and are spiked with known amounts of the target compounds. The recoveries of the compounds are used as a measure of the accuracy of the test methods. A minimum of one LCS will be analyzed for every 20 samples or as required by the method.

3.5.3.4 Matrix Spikes and Matrix Spike Duplicates

The analysis of MS and MSD samples provides information on the extraction efficiency of the method for the sample matrix and is used to evaluate the precision of the method. A minimum of one MS and one MSD will be analyzed for every 20 samples for all applicable analyses when sufficient sample volume is available. In some instances, a laboratory duplicate may be analyzed in place of a MS or MSD. A laboratory duplicate sample may be analyzed in place of MSD samples, as allowed by the analytical method. MS/MSD samples will be collected as field QC samples as described in Section 3.10 of the SAP.

3.5.3.5 Laboratory Duplicates

Laboratory duplicate samples provide information on the precision of the analysis and are useful in assessing potential sample heterogeneity and matrix effects. Laboratory duplicates are subsamples of the original sample that are prepared and analyzed as separate samples.

A minimum of one laboratory duplicate sample will be analyzed for every 20 samples per select analytical methods, when sufficient sample volume is available.

3.5.3.6 Surrogates

All samples, including laboratory QC samples (blanks, LCSs, MS/MSDs, and duplicate samples), analyzed for organic analytes will be spiked with appropriate surrogate compounds. Surrogate recoveries will be reported by the analytical laboratories; however, no sample results will be corrected for recovery using these values. One surrogate spike will be analyzed per sample for organic analyses.

3.5.3.7 Internal Standards

Internal standards may be used for calibrating and quantifying organic compounds and metals. If internal standards are required by the method, all calibration, QC, and project samples will be spiked with the same concentration of the selected internal standards. Internal standard recoveries and retention times must be within method criteria, laboratory criteria, or both.

3.5.3.8 Labeled Compounds

All project samples analyzed for dioxins/furans will be spiked with a known amount of surrogate or labeled compound, as defined in the analytical methods. The labeled compounds and the dioxins/furans present in the sample respond similarly to the effects of extraction, sample concentration, and gas chromatography. Sample data will be corrected based on the recovery of the labeled compound used for quantification.

3.6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

Inspection and maintenance of field and laboratory equipment are important to determine the quality of sampling and analysis results.

3.6.1 Field Equipment Maintenance and Calibration and Frequency

Field equipment for sampling that requires maintenance or calibration includes the following: pH probes, specific conductivity probes, turbidity meters, reduction–oxidation potential probes, and dissolved oxygen probes.

Field equipment will be maintained and calibrated in accordance with the procedures described in the operations manuals supplied by the manufacturer at the intervals recommended in the manual. The manufacturers' manuals will accompany each instrument for use during equipment calibration and to support troubleshooting. Equipment maintenance information will be documented in the instrument's maintenance log. Equipment calibration performed by field staff will be documented in a calibration log. The calibration log will include at minimum, the equipment type and model number, date and time, project name, the calibration results, and the initials of the calibrator. Any discrepancies or calibration failures will be noted in the calibration

log and corrected prior to sampling. During the sampling event, any discrepancies or calibration failures will be noted in the field notes and corrected prior to continuing sampling. Maintenance and calibration records will be verified prior to each sampling event by the field coordinator.

3.6.2 Laboratory Instruments Calibration and Frequency

Laboratory equipment will be maintained and calibrated according to the manufacturers' recommendations, the laboratory QA plan, SOPs, and standard methodologies. Calibrations will be performed on each analytical instrument prior to analysis. Calibrations are performed at a frequency determined by the analytical method and/or the laboratory SOP. The analysis must stop if the calibration does not meet the specified criteria. The analysis may resume after corrective actions have been taken to meet the method specifications. All project samples analyzed by an instrument found to be out of compliance must be reanalyzed. Laboratories will be responsible for their own preventative maintenance and calibration of laboratory equipment.

3.7 DATA MANAGEMENT AND REPORTING

Analytical chemistry results will be provided by the laboratory in PDF and EDD formats. Data packages will be returned within the time frame specified in the service agreement contract between Floyd|Snider and each laboratory, with a duration not to exceed 20 business days, unless delays are otherwise communicated to and approved by the Floyd|Snider PM. The data packages will be reviewed to ensure that the correct analyses were performed for each sample submitted and that all analyses requested on the chain-of-custody forms were performed. If discrepancies are noted, the QA/QC coordinator will be notified and will promptly follow up with the laboratory to resolve any issues. After completion of data validation, the digital files will be used to generate the appropriate report tables.

Laboratory data, which are electronically provided and loaded into Floyd|Snider's electronic database, will undergo a check against the laboratory data deliverable. Data will be validated or reviewed manually, and qualifiers, if assigned, will be entered manually. All manually entered data will be verified by a secondary review performed by Floyd|Snider staff. As a final review, after entry into the database, the EDD data will be compared to the field information (e.g., station/location identifiers, sample identifiers, requested analyses) previously entered into the database to confirm that all requested analytical data have been received.

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4.0 Assessment and Oversight

The project field activities will be overseen by the Floyd|Snider PM and laboratory activities will be overseen by the laboratory PM. Once data are received from the laboratory, a number of QC procedures will be followed to evaluate data quality and attainment of the data QA/QC objectives and criteria. Specific procedures will be followed to assess the principal DQIs.

4.1 LABORATORY OVERSIGHT AND CORRECTIVE ACTIONS

Laboratory audits and performance inspections consist of on-site reviews of QA systems and equipment. Laboratory audits will not be conducted as part of this study; however, the laboratory will provide reports from laboratory audits performed as part of general operations to the QA/QC coordinator upon request. The laboratory will provide written details of all method modifications planned prior to project commencement.

The laboratory is required to comply with its SOPs. The laboratory PM will be responsible for ensuring that appropriate corrective actions are initiated as required for compliance with this QAPP. All laboratory personnel will be responsible for reporting problems that may compromise the quality of the data. If QC results exceed the laboratory control limits, the analyst will identify and correct the anomaly before continuing with the sample analyses, if possible. If the issue cannot be overcome with standard corrective action (e.g., reparation and reanalysis), the causes of the exceedance and corrective actions will be described in the data package narrative. If the exceedance is gross or widespread, the Floyd|Snider PM and project QA/QC coordinator will be notified immediately, and the appropriate action will be decided.

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5.0 Data Validation and Usability

5.1 DATA REVIEW

Floyd|Snider will review the laboratory reports for internal consistency, transmittal errors, laboratory protocols, and adherence to the objectives specified in this QAPP.

A USEPA Stage 2A Data Quality Review will be performed as described in this section on all soil, groundwater, and surface water chemistry results, including dioxin/furan results. A USEPA Stage 2B data validation will be performed on all sediment chemistry results excluding a subset of dioxin/furan results, as recommended by the Sediment Cleanup User's Manual (SCUM; Ecology 2025). A USEPA Stage 4 Full Validation will be performed by EcoChem one representative sediment dioxin/furan SDG, as determined by the QA/QC coordinator, and a USEPA Stage 2B data validation will be performed on all remaining sediment dioxin/furan samples, as recommended by SCUM. The results of the Data Quality Review will be summarized in a Phase 1 Data Validation Memorandum.

A Stage 2A Data Quality Review (Summary Validation) includes the following:

- Evaluation of package completeness
- Verification that sample numbers and analyses match those requested on the chain-of-custody form
- Review of method-specified preservation and sample holding times
- Verification that the required detection limits and RLs have been achieved
- Verification that the field and laboratory duplicates, MS/MSDs, and LCSs were analyzed at the proper frequency
- Verification of analytical precision and accuracy via replicate analysis and analyte recoveries
- Verification that the surrogate compound analyses have been performed and meet QC criteria
- Verification that the laboratory method blanks are free of contaminants

Stage 2B Summary Validation includes all elements of a Stage 2A validation with the addition of the review of instrument performance. Initial calibration, continuing calibration, tuning, sensitivity, and degradation are evaluated.

Stage 4 Full Validation includes evaluation of all QC elements from Stage 2B Summary Validation as identified above, plus the recalculation of instrument and sample results from the raw data, and full evaluation of the instrument outputs for confirmation of correct identification and quantitation of analytes (e.g., peak integrations, use of appropriate labeled compounds, retention times, ion ratios, and interferences).

5.1.1 Database and EIM Submittal

All validated data will be entered into Floyd|Snider's proprietary database to perform data management and queries. In compliance with the Agreed Order, all new sampling data generated during the remedial investigation will be submitted to Ecology's EIM system in accordance with WAC 173-340-840(5) and Ecology's Toxics Cleanup Program Policy 840: Data Submittal Requirements (Ecology 2016b). Only validated data will be entered into the EIM database within 30 days of Ecology's final approval of the associated report. Raw laboratory data will be provided to Ecology upon request.

5.2 VALIDATION METHODS AND RECONCILIATION WITH USER REQUIREMENTS

Data validation programs have been established in accordance with USEPA guidance (USEPA 2002a). Data validation will be based on the QA/QC criteria as recommended in the methods identified in this QAPP and in the USEPA's National Functional Guidelines (USEPA 2020a, 2020b, 2020c) and environmental data verification and validation guidance (USEPA 2002b).

Data usability and any deviations that may have affected the quality of the data, as well as the basis of application of qualifiers, will be included in the final reporting of the data. Any required corrective actions based on the evaluation of the analytical data will be determined by the laboratory PMs, Floyd|Snider PM, and data validators in consultation.

6.0 References

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- _____. 2006. *EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5*. Office of Environmental Information. Washington, DC. March 2001, reissued May 2006.
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- Washington State Department of Ecology (Ecology). 2008. *Sediment Sampling and Analysis Plan Appendix: Guidance on the Development of Sediment Sampling and Analysis Plans Meeting the Requirements of the Sediment Management Standards (Chapter 173-204 WAC)*. Publication No. 03-09-043. February.
- _____. 2016a. *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*. Publication No. 04-03-030. Originally published July 2004. Revised December 2016.
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Phase 1 Remedial Investigation Work Plan

Cosmo Specialty Fibers Site

Appendix C

Tables

Table C.1
Quality Assurance Project Plan Analyte List for Soil ⁽¹⁾

Analyte	CAS No.	Analysis Method	Unit	ARL		Eurofins		Screening Level	Screening Level Basis
				MDL	RL	MDL	RL		
Conventionals									
Total Organic Carbon	TOC	USEPA 9060 modified	%	0.02	0.02	0.000785	0.002	NE	--
pH	pH	USEPA 9045D	pH	--	--	--	--	NE	--
Metals									
Aluminum	7429-90-5	USEPA 6020B	mg/kg	10	20	6.6	30	33,000	Natural Background
Arsenic ⁽²⁾	7440-38-2	USEPA 6020B	mg/kg	0.1	0.2	0.1	0.5	7.3	Natural Background
Barium	7440-39-3	USEPA 6020B	mg/kg	0.25	0.5	0.228	1	250	Natural Background
Cadmium	7440-43-9	USEPA 6020B	mg/kg	0.05	0.1	0.077	0.8	0.77	Natural Background
Chromium ⁽³⁾	7440-47-3	USEPA 6020B	mg/kg	0.4	0.5	0.288	1	48	Natural Background
Copper	7440-50-8	USEPA 6020B	mg/kg	0.35	0.5	0.506	2	36	Natural Background
Iron	7439-89-6	USEPA 6020B	mg/kg	10	20	19.8	40	36,000	Natural Background
Lead	7439-92-1	USEPA 6020B	mg/kg	0.068	0.1	0.106	0.5	25	Protection of GW Leaching to Freshwater
Manganese	7439-96-5	USEPA 6020B	mg/kg	0.25	0.5	0.582	1.2	1,100	Natural Background
Mercury ⁽⁴⁾	7439-97-6	USEPA 7471B	mg/kg	0.00525	0.025	0.0196	0.03	0.070	Natural Background
Selenium	7782-49-2	USEPA 6020B	mg/kg	0.5	1	0.286	1.1	0.78	Natural Background
Silver	7440-22-4	USEPA 6020B	mg/kg	0.1	0.2	0.02	0.2	0.61	Natural Background
Zinc	7440-66-6	USEPA 6020B	mg/kg	3	6	1.61	5.1	85	Natural Background
Total Petroleum Hydrocarbons									
Gasoline-range organics ⁽⁵⁾	GRO	NWTPH-Gx	mg/kg	2.5	5	3.83	8	30	MTCA Method B/A
Diesel-range organics	DRO	NWTPH-Dx	mg/kg	5	5	12.3	50	200	Site Specific TEE Unrestricted
Oil-range organics	ORO	NWTPH-Dx	mg/kg	10	10	17.5	50	2,000	MTCA Method B/A
Total DRO & ORO ⁽⁶⁾	T_DRO&ORO (U=0)	Summed Value	mg/kg	--	--	--	--	200	Site Specific TEE Unrestricted
Extractable Petroleum Hydrocarbons (EPH)									
EPH aliphatic C8-C10	EPH_C8-C10-ALIP	NWEPH	mg/kg	2	2	NA	NA	NE	--
EPH aliphatic C10-C12	EPH_C10-C12-ALIP	NWEPH	mg/kg	2	2	3.1	5	NE	--
EPH aliphatic C12-C16	EPH_C12-C16-ALIP	NWEPH	mg/kg	2	2	2.5	5	NE	--
EPH aliphatic C16-C21	EPH_C16-C21-ALIP	NWEPH	mg/kg	2	2	4.3	5	NE	--
EPH aliphatic C21-C34	EPH_C21-C34-ALIP	NWEPH	mg/kg	2	2	3.5	5	NE	--
EPH aromatic C8-C10	EPH_C8-C10-AROM	NWEPH	mg/kg	2	2	NA	NA	NE	--
EPH aromatic C10-C12	EPH_C10-C12-AROM	NWEPH	mg/kg	2	2	2.5	5	NE	--
EPH aromatic C12-C16	EPH_C12-C16-AROM	NWEPH	mg/kg	2	2	2.5	5	NE	--
EPH aromatic C16-C21	EPH_C16-C21-AROM	NWEPH	mg/kg	2	2	3.7	5	NE	--
EPH aromatic C21-C34	EPH_C21-C34-AROM	NWEPH	mg/kg	2	2	3.5	5	NE	--
Volatile Petroleum Hydrocarbons (VPH)									
VPH aliphatic C5-C6	VPH_C5-C6-ALIP	NWVPH	mg/kg	9	9	1.15	5	NE	--
VPH aliphatic C6-C8	VPH_C6-C8-ALIP	NWVPH	mg/kg	9	9	1.25	5	NE	--
VPH aliphatic C8-C10	VPH_C8-C10-ALIP	NWVPH	mg/kg	9	9	1.29	5	NE	--
VPH aliphatic C10-C12	VPH_C10-C12-ALIP	NWVPH	mg/kg	9	9	NA	NA	NE	--
VPH aromatic C8-C10	VPH_C8-C10-AROM	NWVPH	mg/kg	9	9	0.86	5	NE	--
VPH aromatic C10-C12	VPH_C10-C12-AROM	NWVPH	mg/kg	9	9	NA	NA	NE	--
VPH aromatic C12-C13	VPH_C12-C13-AROM	NWVPH	mg/kg	9	9	NA	NA	NE	--
Volatile Organic Compounds									
Benzene	71-43-2	USEPA 8260D	mg/kg	0.0005	0.001	0.0038	0.02	0.00015	Protection of GW Leaching to Freshwater
Ethylbenzene	100-41-4	USEPA 8260D	mg/kg	0.0005	0.001	0.0091	0.04	0.0059	Protection of GW Leaching to Freshwater
Toluene	108-88-3	USEPA 8260D	mg/kg	0.0005	0.001	0.0135	0.06	0.023	Protection of GW Leaching to Freshwater
Xylene (meta & para)	108-38-3/106-42-3	USEPA 8260D	mg/kg	0.001	0.002	0.0071	0.04	0.96	Protection of GW
Xylene (ortho)	95-47-6	USEPA 8260D	mg/kg	0.0005	0.001	0.005	0.04	0.84	Protection of GW

Table C.1
Quality Assurance Project Plan Analyte List for Soil ⁽¹⁾

Analyte	CAS No.	Analysis Method	Unit	ARL		Eurofins		Screening Level	Screening Level Basis
				MDL	RL	MDL	RL		
Volatile Organic Compounds (cont.)									
Xylene (total) ⁽⁷⁾	1330-20-7	Summed Value	mg/kg	--	--	--	--	0.030	Protection of GW Leaching to Freshwater
cis-1,2-Dichloroethene	156-59-2	USEPA 8260D	mg/kg	0.0005	0.001	0.0126	0.06	0.0052	Protection of GW
Tetrachloroethene	127-18-4	USEPA 8260D	mg/kg	0.0005	0.001	0.0053	0.04	0.0013	Protection of GW Leaching to Freshwater
trans-1,2-Dichloroethene	156-60-5	USEPA 8260D	mg/kg	0.001	0.001	0.0146	0.06	0.032	Protection of GW
Trichloroethene	79-01-6	USEPA 8260D	mg/kg	0.0005	0.001	0.0103	0.04	0.00011	Protection of GW Leaching to Freshwater
Vinyl chloride	75-01-4	USEPA 8260D	mg/kg	0.0005	0.001	0.0187	0.1	0.0000062	Protection of GW Leaching to Freshwater
1,1-Dichloroethane	75-34-3	USEPA 8260D	mg/kg	0.0005	0.001	0.0092	0.04	0.0026	Protection of GW
1,2-Dibromoethane	106-93-4	USEPA 8260D	mg/kg	0.0005	0.001	0.0038	0.02	0.000018	Protection of GW
Methyl-tert-butyl ether	1634-04-4	USEPA 8260D	mg/kg	0.0005	0.001	0.006	0.04	0.0072	Protection of GW
n-Hexane	110-54-3	USEPA 8260D	mg/kg	0.001	0.001	NA	NA	1.8	Protection of GW
1,1,1,2-Tetrachloroethane	630-20-6	USEPA 8260D	mg/kg	0.0005	0.001	0.005	0.02	0.00063	Protection of GW
1,1,1-Trichloroethane	71-55-6	USEPA 8260D	mg/kg	0.001	0.001	0.0046	0.04	0.084	Protection of GW
1,1,2,2-Tetrachloroethane	79-34-5	USEPA 8260D	mg/kg	0.0005	0.001	0.0076	0.02	0.000037	Protection of GW Leaching to Freshwater
1,1,2-Trichloroethane	79-00-5	USEPA 8260D	mg/kg	0.001	0.002	0.0074	0.02	0.00013	Protection of GW Leaching to Freshwater
1,1-Dichloroethene	75-35-4	USEPA 8260D	mg/kg	0.0005	0.001	0.0123	0.04	0.0025	Protection of GW
1,1-Dichloropropene	563-58-6	USEPA 8260D	mg/kg	0.0005	0.001	0.0053	0.04	NE	--
1,2,3-Trichlorobenzene	87-61-6	USEPA 8260D	mg/kg	0.0005	0.001	0.0397	0.08	0.011	Protection of GW
1,2,3-Trichloropropane	96-18-4	USEPA 8260D	mg/kg	0.002	0.002	0.0115	0.04	0.00000015	Protection of GW
1,2,4-Trichlorobenzene	120-82-1	USEPA 8260D	mg/kg	0.0025	0.005	0.0426	0.08	0.000070	Protection of GW Leaching to Freshwater
1,2,4-Trimethylbenzene	95-63-6	USEPA 8260D	mg/kg	0.0005	0.001	0.0135	0.04	0.072	Protection of GW
1,2-Dibromo-3-chloropropane	96-12-8	USEPA 8260D	mg/kg	0.0025	0.005	0.0152	0.06	0.000058	Protection of GW
1,2-Dichlorobenzene	95-50-1	USEPA 8260D	mg/kg	0.001	0.001	0.0087	0.04	0.035	SMS Marine SCO
1,2-Dichloroethane	107-06-2	USEPA 8260D	mg/kg	0.0005	0.001	0.0055	0.02	0.0016	Protection of GW
1,2-Dichloropropane	78-87-5	USEPA 8260D	mg/kg	0.0005	0.001	0.0066	0.02	0.00024	Protection of GW Leaching to Freshwater
1,3,5-Trimethylbenzene	108-67-8	USEPA 8260D	mg/kg	0.0005	0.001	0.0076	0.04	0.071	Protection of GW
1,3-Dichlorobenzene	541-73-1	USEPA 8260D	mg/kg	0.0005	0.001	0.0133	0.06	0.0013	Protection of GW Leaching to Freshwater
1,3-Dichloropropane	142-28-9	USEPA 8260D	mg/kg	0.0005	0.001	0.0056	0.06	0.057	Protection of GW
1,4-Dichlorobenzene	106-46-7	USEPA 8260D	mg/kg	0.0005	0.001	0.0108	0.06	0.068	Protection of GW
2,2-Dichloropropane	594-20-7	USEPA 8260D	mg/kg	0.0005	0.001	0.0121	0.04	NE	--
2,4-Dinitrotoluene	121-14-2	USEPA 8260D	mg/kg	0.05	0.1	0.043	0.2	0.000034	Protection of GW Leaching to Freshwater
2,6-Dinitrotoluene	606-20-2	USEPA 8260D	mg/kg	0.05	0.1	0.015	0.15	0.000051	Protection of GW
2-Chlorotoluene	95-49-8	USEPA 8260D	mg/kg	0.0005	0.001	0.0088	0.04	0.11	Protection of GW
2-Hexanone	591-78-6	USEPA 8260D	mg/kg	0.0025	0.005	NA	NA	0.012	Protection of GW
2-Nitroaniline	88-74-4	USEPA 8260D	mg/kg	0.05	0.1	0.015	0.1	0.064	Protection of GW
3,3'-Dichlorobenzidine	91-94-1	USEPA 8260D	mg/kg	0.05	0.1	0.283	0.566	0.000011	Protection of GW Leaching to Freshwater
3-Nitroaniline	99-09-2	USEPA 8260D	mg/kg	0.05	0.1	0.1	0.3	NE	--
4-Chloroaniline	106-47-8	USEPA 8260D	mg/kg	0.05	0.1	0.134	1.5	0.00017	Protection of GW
4-Chlorophenyl phenyl ether	7005-72-3	USEPA 8260D	mg/kg	0.035	0.05	0.0063	0.2	NE	--
4-Chlorotoluene	106-43-4	USEPA 8260D	mg/kg	0.0005	0.001	0.0098	0.04	0.11	Protection of GW
4-Nitroaniline	100-01-6	USEPA 8260D	mg/kg	0.05	0.1	0.05	0.15	0.0017	Protection of GW
Acetone	67-64-1	USEPA 8260D	mg/kg	0.01	0.01	NA	NA	2.1	Protection of GW
Acrolein	107-02-8	USEPA 8260D	mg/kg	0.0025	0.005	NA	NA	0.00029	Protection of GW Leaching to Freshwater
Acrylonitrile	107-13-1	USEPA 8260D	mg/kg	0.005	0.005	NA	NA	0.0000056	Protection of GW Leaching to Freshwater
Bis(2-chloroethyl)ether	111-44-4	USEPA 8260D	mg/kg	0.035	0.05	0.0077	0.1	0.0000073	Protection of GW Leaching to Freshwater
Bromobenzene	108-86-1	USEPA 8260D	mg/kg	0.0005	0.001	0.0042	0.04	0.033	Protection of GW
Bromochloromethane	74-97-5	USEPA 8260D	mg/kg	0.0005	0.001	0.0062	0.04	NE	--

Table C.1
Quality Assurance Project Plan Analyte List for Soil ⁽¹⁾

Analyte	CAS No.	Analysis Method	Unit	ARL		Eurofins		Screening Level	Screening Level Basis
				MDL	RL	MDL	RL		
Volatile Organic Compounds (cont.)									
Bromodichloromethane	75-27-4	USEPA 8260D	mg/kg	0.0005	0.001	0.0055	0.04	0.00023	Protection of GW Leaching to Freshwater
Bromoform	75-25-2	USEPA 8260D	mg/kg	0.0005	0.001	0.0045	0.04	0.0019	Protection of GW Leaching to Freshwater
Bromomethane	74-83-9	USEPA 8260D	mg/kg	0.002	0.002	0.0378	0.1	0.0033	Protection of GW
Carbon disulfide	75-15-0	USEPA 8260D	mg/kg	0.001	0.001	NA	NA	0.25	Protection of GW
Carbon tetrachloride	56-23-5	USEPA 8260D	mg/kg	0.0005	0.001	0.0044	0.02	0.000088	Protection of GW Leaching to Freshwater
Chlorobenzene	108-90-7	USEPA 8260D	mg/kg	0.0005	0.001	0.0048	0.04	0.051	Protection of GW
Chloroethane	75-00-3	USEPA 8260D	mg/kg	0.002	0.002	0.0209	0.08	NE	--
Chloroform	67-66-3	USEPA 8260D	mg/kg	0.0005	0.001	0.0042	0.02	0.0048	Protection of GW
Chloromethane	74-87-3	USEPA 8260D	mg/kg	0.0005	0.001	0.0101	0.06	NE	--
cis-1,3-Dichloropropene	10061-01-5	USEPA 8260D	mg/kg	0.0005	0.001	0.004	0.02	NE	--
Cymene	99-87-6	USEPA 8260D	mg/kg	0.0005	0.001	0.0102	0.04	0.045	Protection of GW
Dibromochloromethane	124-48-1	USEPA 8260D	mg/kg	0.0005	0.001	0.0049	0.02	0.00019	Protection of GW Leaching to Freshwater
Dibromomethane	74-95-3	USEPA 8260D	mg/kg	0.0005	0.001	0.0074	0.04	0.025	Protection of GW
Dichlorodifluoromethane	75-71-8	USEPA 8260D	mg/kg	0.0005	0.001	0.0459	0.25	0.53	Protection of GW
Hexachlorobutadiene	87-68-3	USEPA 8260D	mg/kg	0.005	0.005	0.0239	0.1	0.000011	Protection of GW Leaching to Freshwater
Isopropylbenzene	98-82-8	USEPA 8260D	mg/kg	0.0005	0.001	0.0086	0.04	0.79	Protection of GW
Methyl ethyl ketone	78-93-3	USEPA 8260D	mg/kg	0.0025	0.005	NA	NA	1.4	Protection of GW
Methyl isobutyl ketone	108-10-1	USEPA 8260D	mg/kg	0.0025	0.005	NA	NA	0.19	Protection of GW
Methylene chloride	75-09-2	USEPA 8260D	mg/kg	0.005	0.005	0.026	0.25	0.0015	Protection of GW
n-Butylbenzene	104-51-8	USEPA 8260D	mg/kg	0.0005	0.001	0.0185	0.04	0.71	Protection of GW
Nitrobenzene	98-95-3	USEPA 8260D	mg/kg	0.01	0.02	0.02	0.2	0.0041	Protection of GW Leaching to Freshwater
n-Propylbenzene	103-65-1	USEPA 8260D	mg/kg	0.0005	0.001	NA	NA	0.88	Protection of GW
sec-Butylbenzene	135-98-8	USEPA 8260D	mg/kg	0.0005	0.001	0.0086	0.04	1.3	Protection of GW
Styrene	100-42-5	USEPA 8260D	mg/kg	0.0005	0.001	0.0127	0.04	0.12	Protection of GW
tert-Butylbenzene	98-06-6	USEPA 8260D	mg/kg	0.0005	0.001	0.0077	0.04	1.0	Protection of GW
trans-1,3-Dichloropropene	10061-02-6	USEPA 8260D	mg/kg	0.0005	0.001	0.007	0.04	NE	--
Trichlorofluoromethane	75-69-4	USEPA 8260D	mg/kg	0.001	0.002	0.026	0.08	0.79	Protection of GW
Vinyl acetate	108-05-4	USEPA 8260D	mg/kg	0.005	0.005	NA	NA	2.3	Protection of GW
Semivolatile Organic Compounds									
Benzo(a)anthracene	56-55-3	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00223	0.0055	1.3	SMS Marine SCO
Benzo(a)pyrene	50-32-8	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00192	0.0055	0.000016	Protection of GW Leaching to Freshwater
Benzo(b)fluoranthene	205-99-2	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00116	0.005	NE	--
Benzo(k)fluoranthene	207-08-9	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00174	0.0055	NE	--
Benzofluoranthenes (total) (U=0) ⁽⁸⁾	56832-73-6	USEPA 8270E-SIM	mg/kg	0.0005	0.001	--	--	3.2	SMS Marine SCO
Chrysene	218-01-9	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.0015	0.005	1.4	SMS Marine SCO
Dibenzo(a,h)anthracene	53-70-3	USEPA 8270E-SIM	mg/kg	0.0025	0.005	0.00072	0.0055	0.23	SMS Marine SCO
Indeno(1,2,3-c,d)pyrene	193-39-5	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00219	0.0055	0.60	SMS Marine SCO
cPAHs (MTCA TEQ-HalfND)	BaPEq (U=1/2)	Summed Value	mg/kg	--	--	--	--	0.19	MTCA Method B/A
1-Methylnaphthalene	90-12-0	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00238	0.0055	0.0024	Protection of GW
2-Methylnaphthalene	91-57-6	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00295	0.006	0.088	Protection of GW
Acenaphthene	83-32-9	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00158	0.0055	0.16	Protection of GW Leaching to Freshwater
Acenaphthylene	208-96-8	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00165	0.0055	1.3	SMS Marine SCO
Anthracene	120-12-7	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00191	0.0055	0.96	SMS Marine SCO
Benzo(g,h,i)perylene	191-24-2	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00182	0.0055	0.67	SMS Marine SCO
Fluoranthene	206-44-0	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.0014	0.005	0.30	Protection of GW Leaching to Freshwater
Fluorene	86-73-7	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00129	0.0055	0.080	Protection of GW Leaching to Freshwater

Table C.1
Quality Assurance Project Plan Analyte List for Soil ⁽¹⁾

Analyte	CAS No.	Analysis Method	Unit	ARL		Eurofins		Screening Level	Screening Level Basis
				MDL	RL	MDL	RL		
Semivolatile Organic Compounds (cont.)									
Naphthalene	91-20-3	USEPA 8270E-SIM	mg/kg	0.0006	0.0012	0.00162	0.005	0.24	Protection of GW
Phenanthrene	85-01-8	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00163	0.005	1.5	SMS Marine SCO
Pyrene	129-00-0	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00104	0.0055	0.55	Protection of GW Leaching to Freshwater
Total HPAH (U=0)	T_HPAH (U=0)	Summed Value	mg/kg	--	--	--	--	12	SMS Marine SCO
Total LPAH (U=0)	T_LPAH (U=0)	Summed Value	mg/kg	--	--	--	--	5.2	SMS Marine SCO
Total PAH (U=0)	T_PAH (U=0)	Summed Value	mg/kg	--	--	--	--	17	SMS Freshwater SCO
2,4,5-Trichlorophenol	95-95-4	USEPA 8270E	mg/kg	0.05	0.1	0.0081	0.2	0.57	Protection of GW Leaching to Freshwater
2,4,6-Trichlorophenol	88-06-2	USEPA 8270E	mg/kg	0.05	0.1	0.033	0.15	0.00017	Protection of GW Leaching to Freshwater
2,4-Dichlorophenol	120-83-2	USEPA 8270E	mg/kg	0.05	0.1	0.028	0.205	0.0043	Protection of GW Leaching to Freshwater
2,4-Dimethylphenol	105-67-9	USEPA 8270E	mg/kg	0.05	0.1	0.06	0.205	0.029	SMS Marine SCO
2,4-Dinitrophenol	51-28-5	USEPA 8270E	mg/kg	0.1	0.2	0.585	2	0.0029	Protection of GW Leaching to Freshwater
2-Chloronaphthalene	91-58-7	USEPA 8270E	mg/kg	0.01	0.02	0.005	0.025	0.28	Protection of GW Leaching to Freshwater
2-Chlorophenol	95-57-8	USEPA 8270E	mg/kg	0.02	0.02	0.004	0.2	0.010	Protection of GW Leaching to Freshwater
2-Methylphenol	95-48-7	USEPA 8270E	mg/kg	0.01	0.02	0.0098	0.15	0.063	SMS Marine SCO
2-Nitrophenol	88-75-5	USEPA 8270E	mg/kg	0.01	0.02	0.019	0.2	NE	--
3- & 4-Methylphenol	15831-10-4	USEPA 8270E	mg/kg	NA	NA	0.015	0.2	0.26	SMS Freshwater SCO
4,6-Dinitro-o-cresol	534-52-1	USEPA 8270E	mg/kg	0.1	0.2	0.1	1	0.0013	Protection of GW
4-Chloro-3-methylphenol	59-50-7	USEPA 8270E	mg/kg	0.05	0.1	0.033	0.15	0.028	Protection of GW Leaching to Freshwater
4-Methylphenol	106-44-5	USEPA 8270E	mg/kg	0.015	0.02	NA	NA	0.26	SMS Freshwater SCO
4-Nitrophenol	100-02-7	USEPA 8270E	mg/kg	0.05	0.1	0.254	2	7.0	Site Specific TEE Unrestricted
Benzoic acid	65-85-0	USEPA 8270E	mg/kg	0.1	0.2	1.22	4	0.65	SMS Marine SCO
Benzyl alcohol	100-51-6	USEPA 8270E	mg/kg	0.02	0.02	0.256	1	0.057	SMS Marine SCO
Bis(2-chloroethoxy)methane	111-91-1	USEPA 8270E	mg/kg	0.01	0.02	0.018	0.2	0.014	Protection of GW
Bis(2-ethylhexyl)phthalate	117-81-7	USEPA 8270E	mg/kg	0.04	0.05	0.071	0.6	0.0050	Protection of GW Leaching to Freshwater
Bis-chloroisopropyl ether	108-60-1	USEPA 8270E	mg/kg	NA	NA	0.0061	0.2	0.00023	Protection of GW
Butyl benzyl phthalate	85-68-7	USEPA 8270E	mg/kg	0.01	0.02	0.051	0.2	0.00018	Protection of GW Leaching to Freshwater
Carbazole	86-74-8	USEPA 8270E	mg/kg	0.01	0.02	0.0073	0.15	0.90	SMS Freshwater SCO
Dibenzofuran	132-64-9	USEPA 8270E	mg/kg	0.02	0.02	0.0059	0.15	0.076	Protection of GW
Diethylphthalate	84-66-2	USEPA 8270E	mg/kg	0.035	0.05	0.022	0.4	0.074	Protection of GW Leaching to Freshwater
Dimethyl phthalate	131-11-3	USEPA 8270E	mg/kg	0.01	0.02	0.005	0.15	0.071	SMS Marine SCO
Di-n-butyl phthalate	84-74-2	USEPA 8270E	mg/kg	0.01	0.02	0.047	0.5	0.015	Protection of GW Leaching to Freshwater
Di-n-octyl phthalate	117-84-0	USEPA 8270E	mg/kg	0.01	0.02	0.089	0.2	0.039	SMS Freshwater SCO
Hexachlorobenzene	118-74-1	USEPA 8270E	mg/kg	0.02	0.02	0.015	0.05	0.00000040	Protection of GW Leaching to Freshwater
Hexachlorocyclopentadiene	77-47-4	USEPA 8270E	mg/kg	0.05	0.1	0.0077	0.1	0.0017	Protection of GW Leaching to Freshwater
Hexachloroethane	67-72-1	USEPA 8270E	mg/kg	0.01	0.02	0.0043	0.15	0.0000097	Protection of GW Leaching to Freshwater
Isophorone	78-59-1	USEPA 8270E	mg/kg	0.015	0.02	0.0084	0.15	0.0095	Protection of GW Leaching to Freshwater
N-Nitroso-di-n-propylamine	621-64-7	USEPA 8270E	mg/kg	0.015	0.02	0.022	0.2	0.0000025	Protection of GW Leaching to Freshwater
N-Nitrosodiphenylamine	86-30-6	USEPA 8270E	mg/kg	0.01	0.02	0.008	0.06	0.0018	Protection of GW Leaching to Freshwater
PBDE-003	101-55-3	USEPA 8270E	mg/kg	0.02	0.02	0.0091	0.2	NE	--
Pentachlorophenol	87-86-5	USEPA 8270E	mg/kg	0.05	0.1	0.269	0.55	0.0000018	Protection of GW Leaching to Freshwater
Phenol	108-95-2	USEPA 8270E	mg/kg	0.01	0.02	0.023	0.15	0.12	SMS Freshwater SCO
Herbicides									
2-(2-Methyl-4-chlorophenoxy) propionic acid	93-65-2	USEPA 8321B	mg/kg	NA	NA	0.00326	0.0125	0.0054	Protection of GW
2,4,5-Trichlorophenoxyacetic acid	93-76-5	USEPA 8321B	mg/kg	NA	NA	0.00357	0.01	0.063	Protection of GW
2,4-Dichlorophenoxyacetic acid	94-75-7	USEPA 8321B	mg/kg	NA	NA	0.00315	0.0125	0.022	Protection of GW
MCPA	94-74-6	USEPA 8321B	mg/kg	NA	NA	0.00335	0.0125	0.0025	Protection of GW
Silvex	93-72-1	USEPA 8321B	mg/kg	NA	NA	0.00322	0.01	0.023	Protection of GW

Table C.1
Quality Assurance Project Plan Analyte List for Soil ⁽¹⁾

Analyte	CAS No.	Analysis Method	Unit	ARL		Eurofins		Screening Level	Screening Level Basis
				MDL	RL	MDL	RL		
Polychlorinated Biphenyls (PCBs)									
Aroclor 1016	12674-11-2	USEPA 8082A	mg/kg	0.002	0.004	0.0074	0.02	0.00032	Protection of GW Leaching to Freshwater
Aroclor 1221	11104-28-2	USEPA 8082A	mg/kg	0.002	0.004	0.012	0.02	NE	--
Aroclor 1232	11141-16-5	USEPA 8082A	mg/kg	0.002	0.004	0.0049	0.02	NE	--
Aroclor 1242	53469-21-9	USEPA 8082A	mg/kg	0.002	0.004	0.008	0.02	NE	--
Aroclor 1248	12672-29-6	USEPA 8082A	mg/kg	0.002	0.004	0.007	0.02	NE	--
Aroclor 1254	11097-69-1	USEPA 8082A	mg/kg	0.002	0.004	0.009	0.02	0.000014	Protection of GW Leaching to Freshwater
Aroclor 1260	11096-82-5	USEPA 8082A	mg/kg	0.002	0.004	0.0074	0.02	0.018	Protection of GW
Aroclor 1262	37324-23-5	USEPA 8082A	mg/kg	0.002	0.004	NA	NA	NE	--
Aroclor 1268	11100-14-4	USEPA 8082A	mg/kg	0.002	0.004	NA	NA	NE	--
Total PCB Aroclors (U=0)	T_PCB (U=0)	Summed Value	mg/kg	--	--	--	--	0.00000055	Protection of GW Leaching to Freshwater
Dioxins/Furans									
2,3,7,8-TCDD	1746-01-6	USEPA 1613B	ng/kg	0.15	1	0.25	1	5.20	Natural Background
1,2,3,7,8-PeCDD	40321-76-4	USEPA 1613B	ng/kg	0.17	1	1.25	5	NE	--
1,2,3,4,7,8-HxCDD	39227-28-6	USEPA 1613B	ng/kg	0.17	1	1.25	5	NE	--
1,2,3,6,7,8-HxCDD	57653-85-7	USEPA 1613B	ng/kg	0.18	1	1.25	5	NE	--
1,2,3,7,8,9-HxCDD	19408-74-3	USEPA 1613B	ng/kg	0.22	1	1.25	5	NE	--
1,2,3,4,6,7,8-HpCDD	35822-46-9	USEPA 1613B	ng/kg	0.56	2.5	1.25	5	NE	--
OCDD	3268-87-9	USEPA 1613B	ng/kg	4.6	10	3.61	10	NE	--
2,3,7,8-TCDF	51207-31-9	USEPA 1613B	ng/kg	0.058	1	0.368	1	NE	--
1,2,3,7,8-PeCDF	57117-41-6	USEPA 1613B	ng/kg	0.24	1	1.39	5	NE	--
2,3,4,7,8-PeCDF	57117-31-4	USEPA 1613B	ng/kg	0.22	1	1.25	5	NE	--
1,2,3,4,7,8-HxCDF	70648-26-9	USEPA 1613B	ng/kg	0.28	1	1.58	5	NE	--
1,2,3,6,7,8-HxCDF	57117-44-9	USEPA 1613B	ng/kg	0.2	1	1.38	5	NE	--
1,2,3,7,8,9-HxCDF	72918-21-9	USEPA 1613B	ng/kg	0.19	1	1.32	5	NE	--
2,3,4,6,7,8-HxCDF	60851-34-5	USEPA 1613B	ng/kg	0.17	1	1.29	5	NE	--
1,2,3,4,6,7,8-HpCDF	67562-39-4	USEPA 1613B	ng/kg	0.21	1	1.25	5	NE	--
1,2,3,4,7,8,9-HpCDF	55673-89-7	USEPA 1613B	ng/kg	0.24	1	1.25	5	NE	--
OCDF	39001-02-0	USEPA 1613B	ng/kg	1.1	2.5	2.5	10	NE	--
Dioxins/Furans (MTCA TEQ-HalfND)	DF_TEQ (U=1/2)	Summed Value	ng/kg	--	--	--	--	5.20	Natural Background

Notes:

- Not available or not applicable.
- 1 All laboratory limits are subject to change based on final dry weight corrections.
- 2 Criteria populated for inorganic arsenic. When criteria are developed for arsenic(III) and arsenic(V), the criterion selected for use is the more stringent criterion between those developed for arsenic(III) and arsenic(V).
- 3 When criteria for total chromium are not available, criteria developed for chromium(III) are used as surrogate. This is appropriate at sites where there are no known or suspected sources of chromium(VI).
- 4 Criteria populated for inorganic mercury.
- 5 Criteria are developed for gasoline-range organics for use in two scenarios: when benzene is present, or when benzene is absent. In this table, criteria selected for use assume benzene is present.
- 6 Ecology recommends applying direct contact criteria developed for DRO to the total DRO & ORO result. Qualitative (i.e., no residual saturation) criteria must also be met.
- 7 Xylenes are typically analyzed and reported by laboratories as m,p-xylene and o-xylene; these values are summed and reported as total xylenes. The most stringent criterion between criteria developed for m,p-xylene, o-xylene, and total xylenes was selected as the relevant criterion.
- 8 Benzofluoroanthenes are typically analyzed and reported by laboratories as benzo(b)fluoranthene and benzo(k)fluoranthene; these values are summed and reported as total benzofluoranthenes. The most stringent criterion between criteria developed for benzo(b)fluoranthene, benzo(k)fluoranthene, and total benzofluoranthenes was selected as the relevant criterion.

Abbreviations:

ARL Analytical Resources, LLC	LPAH Low molecular weight polycyclic aromatic hydrocarbon	PBDE Polybrominated diphenyl ether
CAS Chemical Abstracts Service	MCPA 2-Methyl-4-chlorophenoxyacetic acid	PeCDD Pentachlorodibenzo- <i>p</i> -dioxin
cPAH Carcinogenic polycyclic aromatic hydrocarbon	MDL Method detection limit	PeCDF Pentachlorodibenzofuran
DRO Diesel-range organics	mg/kg Milligrams per kilogram	RL Reporting limit
Ecology Washington State Department of Ecology	NA Not available	SCO Sediment Cleanup Objective
GW Groundwater	NE Not established	SMS Sediment Management Standards
HPAH High molecular weight polycyclic aromatic hydrocarbon	ng/kg Nanograms per kilogram	TCDD Tetrachlorodibenzo- <i>p</i> -dioxin
HpCDD Heptachlorodibenzo- <i>p</i> -dioxin	OCDD Octachlorodibenzo- <i>p</i> -dioxin	TCDF Tetrachlorodibenzofuran
HpCDF Heptachlorodibenzofuran	OCDF Octachlorodibenzofuran	TEE Terrestrial Ecological Evaluation
HxCDD Hexachlorodibenzo- <i>p</i> -dioxin	ORO Oil-range organics	TEQ Toxic equivalent
HxCDF Hexachlorodibenzofuran	PAH Polycyclic aromatic hydrocarbon	

Table C.2
Quality Assurance Project Plan Analyte List for Groundwater and Surface Water ⁽¹⁾

Analyte	CAS No.	Analysis Method	Unit	ARL		Eurofins		Screening Level	Screening Level Basis
				MDL	RL	MDL	RL		
Conventionals									
Total Organic Carbon	TOC	USEPA 9060A	mg/L	0.5	0.5	0.38	1	NE	--
Total Dissolved Solids	TDS	SM 2540C	mg/L	NA	NA	10	10	NE	--
Total Suspended Solids ⁽²⁾	TSS	SM 2540D	mg/L	NA	NA	2	2	NE	--
Alkalinity	ALK	SM 2310	mg/L	NA	NA	NA	NA	NE	--
Hardness	HARD	SM 2340B	mg/L	NA	NA	NA	NA	NE	--
Ammonia	7664-41-7	SM 4500-NH3	mg/L	0.04	0.04	0.161	0.2	0.035	Soil to Surface Water Pathway—Marine Water
Nitrate (as Nitrogen)	14797-55-8	USEPA 300.0	mg/L	0.053	0.2	0.09	0.2	10	Federal MCL
Nitrite (as Nitrogen)	14797-65-0	USEPA 300.0	mg/L	0.043	0.2	0.07	0.4	1.0	Federal MCL
Sulfate	14808-79-8	USEPA 300.0	mg/L	0.362	1	0.8	1.5	NE	--
Sulfide	18496-25-8	SM 4500-S2	mg/L	0.05	0.05	0.0279	0.05	NE	--
Total and Dissolved Metals ⁽³⁾									
Aluminum	7429-90-5	USEPA 6020B	µg/L	10	20	28.9	200	180	Soil to Surface Water Pathway—Fresh Water
Arsenic	7440-38-2	USEPA 6020B	µg/L	0.1	0.2	1.02	5	4.9	Natural Background
Barium	7440-39-3	USEPA 6020B	µg/L	0.25	0.5	1.06	10	1,000	Soil to Surface Water Pathway—Fresh Water
Cadmium	7440-43-9	USEPA 6020B	µg/L	0.05	0.1	0.185	2	0.19	Protection of Marine Sediment
Chromium ⁽⁴⁾	7440-47-3	USEPA 6020B	µg/L	0.375	0.5	0.865	5	72	Protection of Freshwater Sediment
Copper	7440-50-8	USEPA 6020B	µg/L	0.2	0.5	3.02	10	1.2	Soil to Surface Water Pathway—Fresh Water
Iron	7439-89-6	USEPA 6020B	µg/L	27	36	66.7	500	1,000	Soil to Surface Water Pathway—Fresh Water
Lead	7439-92-1	USEPA 6020B	µg/L	0.1	0.2	0.2	2.5	0.90	Protection of Marine Sediment
Manganese	7439-96-5	USEPA 6020B	µg/L	0.53	1	2.3	10	50	Soil to Surface Water Pathway—Fresh Water
Mercury ⁽⁵⁾	7439-97-6	USEPA 7470A	µg/L	0.013	0.1	0.083	0.3	0.012	Soil to Surface Water Pathway—Fresh Water
Selenium	7782-49-2	USEPA 6020B	µg/L	0.5	1	10.3	40	1.5	Soil to Surface Water Pathway—Fresh Water
Silver	7440-22-4	USEPA 6020B	µg/L	0.1	0.2	0.125	2	0.17	Soil to Surface Water Pathway—Fresh Water
Zinc	7440-66-6	USEPA 6020B	µg/L	3	6	4.64	35	24	Soil to Surface Water Pathway—Fresh Water
Total Petroleum Hydrocarbons									
Gasoline-range organics ⁽⁶⁾	GRO	NWTPH-Gx	µg/L	50	100	73	150	800	MTCA Method B/A
Diesel-range organics ⁽⁷⁾	DRO	NWTPH-Dx/NWTPH-Dx SG	µg/L	100	100	91	200	500	MTCA Method B/A
Oil-range organics ⁽⁷⁾	ORO	NWTPH-Dx/NWTPH-Dx SG	µg/L	200	200	130	350	500	MTCA Method B/A
Total DRO & ORO ⁽⁸⁾	T_DRO&ORO (U=0)	Summed Value	µg/L	--	--	--	--	500	MTCA Method B/A
Volatile Organic Compounds									
Benzene	71-43-2	USEPA 8260D	µg/L	0.1	0.2	0.47	1	0.44	Soil to Surface Water Pathway—Fresh Water
Ethylbenzene	100-41-4	USEPA 8260D	µg/L	0.1	0.2	0.16	1	12	Soil to Surface Water Pathway—Fresh Water
Toluene	108-88-3	USEPA 8260D	µg/L	0.1	0.2	0.21	1	53	Soil to Surface Water Pathway—Fresh Water
Xylene (meta & para)	108-38-3/106-42-3	USEPA 8260D	µg/L	0.2	0.4	0.27	2	1,600	MTCA Method B/A
Xylene (ortho)	95-47-6	USEPA 8260D	µg/L	0.1	0.2	0.22	1	1,600	MTCA Method B/A
Xylene (total) ⁽⁹⁾	1330-20-7	USEPA 8260D	µg/L	--	--	--	--	57	Soil to Surface Water Pathway—Fresh Water
cis-1,2-Dichloroethene	156-59-2	USEPA 8260D	µg/L	0.1	0.2	0.17	1	16	MTCA Method B/A
Tetrachloroethene	127-18-4	USEPA 8260D	µg/L	0.1	0.2	0.43	1	2.4	Soil to Surface Water Pathway—Fresh Water
trans-1,2-Dichloroethene	156-60-5	USEPA 8260D	µg/L	0.1	0.2	0.18	1	77	Protection of Vapor Intrusion
Trichloroethene	79-01-6	USEPA 8260D	µg/L	0.1	0.2	0.27	1	0.30	Soil to Surface Water Pathway—Fresh Water
Vinyl chloride	75-01-4	USEPA 8260D	µg/L	0.1	0.2	0.29	1	0.020	Soil to Surface Water Pathway—Fresh Water
1,2-Dibromoethane	106-93-4	USEPA 8260D	µg/L	0.1	0.2	0.18	1	0.022	MTCA Method B/A
1,2-Dichloroethane	107-06-2	USEPA 8260D	µg/L	0.1	0.2	0.16	1	0.48	MTCA Method B/A
Methyl-tert-butyl ether	1634-04-4	USEPA 8260D	µg/L	0.25	0.5	0.15	1	24	MTCA Method B/A
n-Hexane	110-54-3	USEPA 8260D	µg/L	0.1	0.2	NA	NA	7.2	Protection of Vapor Intrusion
1,1,1,2-Tetrachloroethane	630-20-6	USEPA 8260D	µg/L	0.1	0.2	0.25	1	1.7	MTCA Method B/A

Table C.2
Quality Assurance Project Plan Analyte List for Groundwater and Surface Water ⁽¹⁾

Analyte	CAS No.	Analysis Method	Unit	ARL		Eurofins		Screening Level	Screening Level Basis
				MDL	RL	MDL	RL		
Volatile Organic Compounds (cont.)									
1,1,1-Trichloroethane	71-55-6	USEPA 8260D	µg/L	0.1	0.2	0.18	1	200	Federal MCL
1,1,2,2-Tetrachloroethane	79-34-5	USEPA 8260D	µg/L	0.2	0.2	0.18	1	0.10	Soil to Surface Water Pathway—Fresh Water
1,1,2-Trichloroethane	79-00-5	USEPA 8260D	µg/L	0.2	0.2	0.16	1	0.35	Soil to Surface Water Pathway—Fresh Water
1,1-Dichloroethane	75-34-3	USEPA 8260D	µg/L	0.1	0.2	0.22	1	7.7	MTCA Method B/A
1,1-Dichloroethene	75-35-4	USEPA 8260D	µg/L	0.1	0.2	0.23	1	7.0	Federal MCL
1,1-Dichloropropene	563-58-6	USEPA 8260D	µg/L	0.1	0.2	0.18	1	NE	--
1,2,3-Trichlorobenzene	87-61-6	USEPA 8260D	µg/L	0.5	0.5	0.83	4	6.4	MTCA Method B/A
1,2,3-Trichloropropane	96-18-4	USEPA 8260D	µg/L	0.25	0.5	0.24	1	0.00038	MTCA Method B/A
1,2,4-Trichlorobenzene	120-82-1	USEPA 8260D	µg/L	0.25	0.5	0.67	1	0.036	Soil to Surface Water Pathway—Fresh Water
1,2,4-Trimethylbenzene	95-63-6	USEPA 8260D	µg/L	0.1	0.2	0.57	3	80	MTCA Method B/A
1,2-Dibromo-3-chloropropane	96-12-8	USEPA 8260D	µg/L	0.5	0.5	0.91	3	0.014	MTCA Method B/A
1,2-Dichlorobenzene	95-50-1	USEPA 8260D	µg/L	0.1	0.2	0.19	1	16	Protection of Marine Sediment
1,2-Dichloropropane	78-87-5	USEPA 8260D	µg/L	0.1	0.2	0.23	1	0.71	Soil to Surface Water Pathway—Fresh Water
1,3,5-Trimethylbenzene	108-67-8	USEPA 8260D	µg/L	0.1	0.2	0.58	1	80	MTCA Method B/A
1,3-Dichlorobenzene	541-73-1	USEPA 8260D	µg/L	0.1	0.2	0.19	1	2.0	Soil to Surface Water Pathway—Fresh Water
1,3-Dichloropropane	142-28-9	USEPA 8260D	µg/L	0.1	0.2	0.13	1	160	MTCA Method B/A
1,4-Dichlorobenzene	106-46-7	USEPA 8260D	µg/L	0.2	0.2	0.18	1	5.0	Protection of Vapor Intrusion
2,2-Dichloropropane	594-20-7	USEPA 8260D	µg/L	0.2	0.2	0.36	1	NE	--
2,4-Dinitrotoluene	121-14-2	USEPA 8260D	µg/L	0.5	1	0.1	0.4	0.039	Soil to Surface Water Pathway—Fresh Water
2,6-Dinitrotoluene	606-20-2	USEPA 8260D	µg/L	0.5	1	0.041	0.4	0.058	MTCA Method B/A
2-Chlorotoluene	95-49-8	USEPA 8260D	µg/L	0.1	0.2	0.27	1	160	MTCA Method B/A
2-Hexanone	591-78-6	USEPA 8260D	µg/L	2.5	5	NA	NA	40	MTCA Method B/A
2-Nitroaniline	88-74-4	USEPA 8260D	µg/L	0.5	1	0.1	0.4	160	MTCA Method B/A
3,3'-Dichlorobenzidine	91-94-1	USEPA 8260D	µg/L	0.5	1	1.2	4	0.0031	Soil to Surface Water Pathway—Fresh Water
3-Nitroaniline	99-09-2	USEPA 8260D	µg/L	0.5	1	0.12	0.4	NE	--
4-Chloroaniline	106-47-8	USEPA 8260D	µg/L	0.5	1	0.1	0.4	0.44	MTCA Method B/A
4-Chlorophenyl phenyl ether	7005-72-3	USEPA 8260D	µg/L	0.1	0.2	0.049	0.4	NE	--
4-Chlorotoluene	106-43-4	USEPA 8260D	µg/L	0.1	0.2	0.21	1	160	MTCA Method B/A
4-Nitroaniline	100-01-6	USEPA 8260D	µg/L	0.5	1	0.35	2	4.4	MTCA Method B/A
Acetone	67-64-1	USEPA 8260D	µg/L	5	5	NA	NA	7,200	MTCA Method B/A
Acrolein	107-02-8	USEPA 8260D	µg/L	5	5	NA	NA	1.0	Soil to Surface Water Pathway—Fresh Water
Acrylonitrile	107-13-1	USEPA 8260D	µg/L	0.5	1	NA	NA	0.019	Soil to Surface Water Pathway—Fresh Water
Bis(2-chloroethyl)ether	111-44-4	USEPA 8260D	µg/L	0.1	0.2	0.1	0.4	0.020	Soil to Surface Water Pathway—Fresh Water
Bromobenzene	108-86-1	USEPA 8260D	µg/L	0.1	0.2	0.18	1	64	MTCA Method B/A
Bromochloromethane	74-97-5	USEPA 8260D	µg/L	0.1	0.2	0.21	1	NE	--
Bromodichloromethane	75-27-4	USEPA 8260D	µg/L	0.1	0.2	0.18	1	0.71	MTCA Method B/A
Bromoform	75-25-2	USEPA 8260D	µg/L	0.2	0.2	0.46	1	4.6	Soil to Surface Water Pathway—Fresh Water
Bromomethane	74-83-9	USEPA 8260D	µg/L	1	1	0.35	1	11	MTCA Method B/A
Carbon disulfide	75-15-0	USEPA 8260D	µg/L	0.2	0.2	NA	NA	800	MTCA Method B/A
Carbon tetrachloride	56-23-5	USEPA 8260D	µg/L	0.1	0.2	0.22	1	0.20	Soil to Surface Water Pathway—Fresh Water
Chlorobenzene	108-90-7	USEPA 8260D	µg/L	0.1	0.2	0.22	1	100	Federal MCL
Chloroethane	75-00-3	USEPA 8260D	µg/L	0.2	0.2	0.34	1	15,000	Protection of Vapor Intrusion
Chloroform	67-66-3	USEPA 8260D	µg/L	0.1	0.2	0.11	1	1.2	Protection of Vapor Intrusion
Chloromethane	74-87-3	USEPA 8260D	µg/L	0.5	0.5	0.23	1	150	Protection of Vapor Intrusion
cis-1,3-Dichloropropene	10061-01-5	USEPA 8260D	µg/L	0.1	0.2	0.28	1	NE	--
Cymene	99-87-6	USEPA 8260D	µg/L	0.1	0.2	0.69	1	32	MTCA Method B/A
Dibromochloromethane	124-48-1	USEPA 8260D	µg/L	0.1	0.2	0.46	1	0.52	MTCA Method B/A

Table C.2
Quality Assurance Project Plan Analyte List for Groundwater and Surface Water ⁽¹⁾

Analyte	CAS No.	Analysis Method	Unit	ARL		Eurofins		Screening Level	Screening Level Basis
				MDL	RL	MDL	RL		
Volatile Organic Compounds (cont.)									
Dibromomethane	74-95-3	USEPA 8260D	µg/L	0.1	0.2	0.28	1	80	MTCA Method B/A
Dichlorodifluoromethane	75-71-8	USEPA 8260D	µg/L	0.2	0.2	0.33	1	4.2	Protection of Vapor Intrusion
Hexachloroethane	67-72-1	USEPA 8260D	µg/L	0.1	0.2	0.051	0.6	0.020	Soil to Surface Water Pathway—Fresh Water
Isopropylbenzene	98-82-8	USEPA 8260D	µg/L	0.1	0.2	0.45	1	800	MTCA Method B/A
Methyl ethyl ketone	78-93-3	USEPA 8260D	µg/L	2.5	5	NA	NA	4,800	MTCA Method B/A
Methyl isobutyl ketone	108-10-1	USEPA 8260D	µg/L	2.5	5	NA	NA	640	MTCA Method B/A
Methylene chloride	75-09-2	USEPA 8260D	µg/L	1	1	6.8	15	5.0	Federal MCL
n-Butylbenzene	104-51-8	USEPA 8260D	µg/L	0.2	0.2	0.61	1	400	MTCA Method B/A
Nitrobenzene	98-95-3	USEPA 8260D	µg/L	0.1	0.2	0.043	0.4	10	Soil to Surface Water Pathway—Fresh Water
n-Propylbenzene	103-65-1	USEPA 8260D	µg/L	0.1	0.2	NA	NA	800	MTCA Method B/A
sec-Butylbenzene	135-98-8	USEPA 8260D	µg/L	0.1	0.2	0.27	1	800	MTCA Method B/A
Styrene	100-42-5	USEPA 8260D	µg/L	0.1	0.2	0.41	1	100	Federal MCL
tert-Butylbenzene	98-06-6	USEPA 8260D	µg/L	0.1	0.2	0.34	2	800	MTCA Method B/A
trans-1,3-Dichloropropene	10061-02-6	USEPA 8260D	µg/L	0.1	0.2	0.46	1	NE	--
Trichlorofluoromethane	75-69-4	USEPA 8260D	µg/L	0.2	0.2	0.21	1	120	Protection of Vapor Intrusion
Vinyl acetate	108-05-4	USEPA 8260D	µg/L	0.2	0.2	NA	NA	8,000	MTCA Method B/A
Other Volatile Organic Compounds									
Methane	74-82-8	RSK 175	µg/L	0.654	1.31	0.109	1	NE	--
Ethane	74-84-0	RSK 175	µg/L	0.615	1.12	0.276	1	NE	--
Ethylene	74-85-1	RSK 175	µg/L	0.57	1.14	0.253	1	NE	--
Semivolatile Organic Compounds									
Benzo(a)anthracene	56-55-3	USEPA 8270E-SIM	µg/L	0.01	0.01	0.014	0.05	0.00016	Soil to Surface Water Pathway—Fresh Water
Benzo(a)pyrene	50-32-8	USEPA 8270E-SIM	µg/L	0.01	0.01	0.022	0.1	0.000016	Soil to Surface Water Pathway—Fresh Water
Benzo(b)fluoranthene	205-99-2	USEPA 8270E-SIM	µg/L	0.01	0.01	0.022	0.1	0.00016	Soil to Surface Water Pathway—Fresh Water
Benzo(k)fluoranthene	207-08-9	USEPA 8270E-SIM	µg/L	0.01	0.01	0.012	0.05	0.0016	Soil to Surface Water Pathway—Fresh Water
Benzofluoranthenes (total) (U=0) ⁽¹⁰⁾	56832-73-6	Summed Value	µg/L	0.01	0.01	--	--	NE	--
Chrysene	218-01-9	USEPA 8270E-SIM	µg/L	0.01	0.01	0.037	0.1	0.0098	Protection of Freshwater Sediment
Dibenzo(a,h)anthracene	53-70-3	USEPA 8270E-SIM	µg/L	0.01	0.01	0.015	0.1	0.000016	Soil to Surface Water Pathway—Fresh Water
Indeno(1,2,3-c,d)pyrene	193-39-5	USEPA 8270E-SIM	µg/L	0.01	0.01	0.014	0.05	0.00016	Soil to Surface Water Pathway—Fresh Water
cPAHs (MTCA TEQ-HalfND)	BaPEq (U=1/2)	Summed Value	µg/L	--	--	--	--	0.000016	Soil to Surface Water Pathway—Fresh Water
1-Methylnaphthalene	90-12-0	USEPA 8270E-SIM	µg/L	0.01	0.01	0.033	0.1	0.17	Protection of Vapor Intrusion
2-Methylnaphthalene	91-57-6	USEPA 8270E-SIM	µg/L	0.01	0.01	0.039	0.2	32	MTCA Method B/A
Acenaphthene	83-32-9	USEPA 8270E-SIM	µg/L	0.01	0.01	0.014	0.1	20	Protection of Marine Sediment
Acenaphthylene	208-96-8	USEPA 8270E-SIM	µg/L	0.01	0.01	0.009	0.05	NE	--
Anthracene	120-12-7	USEPA 8270E-SIM	µg/L	0.01	0.01	0.022	0.1	8.2	Protection of Marine Sediment
Benzo(g,h,i)perylene	191-24-2	USEPA 8270E-SIM	µg/L	0.01	0.01	0.012	0.05	NE	--
Fluoranthene	206-44-0	USEPA 8270E-SIM	µg/L	0.01	0.01	0.054	0.2	0.020	Protection of Freshwater Sediment
Fluorene	86-73-7	USEPA 8270E-SIM	µg/L	0.005	0.01	0.017	0.1	10	Soil to Surface Water Pathway—Fresh Water
Naphthalene	91-20-3	USEPA 8270E-SIM	µg/L	0.01	0.01	0.163	0.5	8.8	Protection of Vapor Intrusion
Phenanthrene	85-01-8	USEPA 8270E-SIM	µg/L	0.01	0.01	0.037	0.1	NE	--
Pyrene	129-00-0	USEPA 8270E-SIM	µg/L	0.01	0.01	0.033	0.1	0.015	Protection of Freshwater Sediment
Total HPAH (U=0)	T_HPAH (U=0)	Summed Value	µg/L	--	--	--	--	NE	--
Total LPAH (U=0)	T_LPAH (U=0)	Summed Value	µg/L	--	--	--	--	NE	--
Total PAH (U=0)	T_PAH (U=0)	Summed Value	µg/L	--	--	--	--	NE	--
2,4,5-Trichlorophenol	95-95-4	USEPA 8270E	µg/L	0.5	1	0.1	0.4	300	Soil to Surface Water Pathway—Fresh Water
2,4,6-Trichlorophenol	88-06-2	USEPA 8270E	µg/L	0.5	1	0.1	0.6	0.25	Soil to Surface Water Pathway—Fresh Water
2,4-Dichlorophenol	120-83-2	USEPA 8270E	µg/L	0.5	1	0.06	0.4	10	Soil to Surface Water Pathway—Fresh Water

Table C.2
Quality Assurance Project Plan Analyte List for Groundwater and Surface Water ⁽¹⁾

Analyte	CAS No.	Analysis Method	Unit	ARL		Eurofins		Screening Level	Screening Level Basis
				MDL	RL	MDL	RL		
Semivolatile Organic Compounds (cont.)									
2,4-Dimethylphenol	105-67-9	USEPA 8270E	µg/L	0.5	1	0.048	2	11	Protection of Marine Sediment
2,4-Dinitrophenol	51-28-5	USEPA 8270E	µg/L	1	2	1	5	10	Soil to Surface Water Pathway—Fresh Water
2-Chloronaphthalene	91-58-7	USEPA 8270E	µg/L	0.1	0.2	0.054	0.4	100	Soil to Surface Water Pathway—Fresh Water
2-Chlorophenol	95-57-8	USEPA 8270E	µg/L	0.1	0.2	0.047	0.4	15	Soil to Surface Water Pathway—Fresh Water
2-Methylphenol	95-48-7	USEPA 8270E	µg/L	0.1	0.2	0.1	0.4	35	Protection of Marine Sediment
2-Nitrophenol	88-75-5	USEPA 8270E	µg/L	0.5	1	0.057	0.4	NE	--
3- & 4-Methylphenol	15831-10-4	USEPA 8270E	µg/L	NA	NA	0.046	0.8	150	Protection of Freshwater Sediment
4,6-Dinitro-o-cresol	534-52-1	USEPA 8270E	µg/L	1	2	1	4	1.3	MTCA Method B/A
4-Chloro-3-methylphenol	59-50-7	USEPA 8270E	µg/L	0.5	1	0.1	0.4	36	Soil to Surface Water Pathway—Fresh Water
4-Methylphenol	106-44-5	USEPA 8270E	µg/L	0.1	0.2	NA	NA	150	Protection of Freshwater Sediment
4-Nitrophenol	100-02-7	USEPA 8270E	µg/L	0.5	1	3	10	NE	--
Benzoic acid	65-85-0	USEPA 8270E	µg/L	1	2	0.6	3	2,200	Protection of Marine Sediment
Benzyl alcohol	100-51-6	USEPA 8270E	µg/L	0.1	0.2	0.041	0.4	140	Protection of Marine Sediment
Bis(2-chloroethoxy)methane	111-91-1	USEPA 8270E	µg/L	0.1	0.2	0.048	0.4	48	MTCA Method B/A
Bis(2-ethylhexyl)phthalate	117-81-7	USEPA 8270E	µg/L	0.2	0.2	1.18	5	0.045	Soil to Surface Water Pathway—Fresh Water
Bis-chloroisopropyl ether	108-60-1	USEPA 8270E	µg/L	0.1	0.2	0.059	0.4	0.63	MTCA Method B/A
Butyl benzyl phthalate	85-68-7	USEPA 8270E	µg/L	0.1	0.2	0.2	0.6	0.013	Soil to Surface Water Pathway—Fresh Water
Carbazole	86-74-8	USEPA 8270E	µg/L	0.1	0.2	0.1	0.4	NE	--
Dibenzofuran	132-64-9	USEPA 8270E	µg/L	0.1	0.2	0.045	0.4	4.3	Protection of Freshwater Sediment
Diethylphthalate	84-66-2	USEPA 8270E	µg/L	0.1	0.2	0.1	0.4	200	Soil to Surface Water Pathway—Fresh Water
Dimethyl phthalate	131-11-3	USEPA 8270E	µg/L	0.1	0.2	0.056	0.4	160	Protection of Marine Sediment
Di-n-butyl phthalate	84-74-2	USEPA 8270E	µg/L	0.1	0.2	0.33	2	8.0	Soil to Surface Water Pathway—Fresh Water
Di-n-octyl phthalate	117-84-0	USEPA 8270E	µg/L	0.1	0.2	0.068	0.4	0.055	Protection of Freshwater Sediment
Hexachlorobenzene	118-74-1	USEPA 8270E	µg/L	0.1	0.2	0.042	0.4	0.0000050	Soil to Surface Water Pathway—Fresh Water
Hexachlorobutadiene	87-68-3	USEPA 8270E	µg/L	0.5	0.5	0.67	3	0.010	Soil to Surface Water Pathway—Fresh Water
Isophorone	78-59-1	USEPA 8270E	µg/L	0.1	0.2	0.1	0.4	27	Soil to Surface Water Pathway—Fresh Water
N-Nitroso-di-n-propylamine	621-64-7	USEPA 8270E	µg/L	0.1	0.2	0.059	0.4	0.0044	Soil to Surface Water Pathway—Fresh Water
Hexachlorocyclopentadiene	77-47-4	USEPA 8270E	µg/L	0.5	1	0.1	2	1.0	Soil to Surface Water Pathway—Fresh Water
N-Nitrosodiphenylamine	86-30-6	USEPA 8270E	µg/L	0.1	0.2	0.1	0.4	0.62	Soil to Surface Water Pathway—Fresh Water
PBDE-003	101-55-3	USEPA 8270E	µg/L	0.1	0.2	0.043	0.4	NE	--
Pentachlorophenol	87-86-5	USEPA 8270E	µg/L	0.5	1	0.73	3	0.0020	Soil to Surface Water Pathway—Fresh Water
Phenol	108-95-2	USEPA 8270E	µg/L	0.1	0.2	0.047	0.6	98	Protection of Freshwater Sediment
Polychlorinated Biphenyls (PCBs)									
Aroclor 1016	12674-11-2	USEPA 8082A	µg/L	0.005	0.01	0.061	0.45	0.0030	Soil to Surface Water Pathway—Fresh Water
Aroclor 1221	11104-28-2	USEPA 8082A	µg/L	0.005	0.01	0.075	0.45	NE	--
Aroclor 1232	11141-16-5	USEPA 8082A	µg/L	0.005	0.01	0.063	0.45	NE	--
Aroclor 1242	53469-21-9	USEPA 8082A	µg/L	0.005	0.01	0.059	0.45	NE	--
Aroclor 1248	12672-29-6	USEPA 8082A	µg/L	0.005	0.01	0.052	0.45	NE	--
Aroclor 1254	11097-69-1	USEPA 8082A	µg/L	0.005	0.01	0.036	0.45	0.00010	Soil to Surface Water Pathway—Fresh Water
Aroclor 1260	11096-82-5	USEPA 8082A	µg/L	0.005	0.01	0.061	0.45	0.022	MTCA Method B/A
Aroclor 1262	37324-23-5	USEPA 8082A	µg/L	0.005	0.01	NA	NA	NE	--
Aroclor 1268	11100-14-4	USEPA 8082A	µg/L	0.005	0.01	NA	NA	NE	--
Total PCB Aroclors (U=0)	T_PCB (U=0)	Summed Value	µg/L	--	--	--	--	0.0000070	Soil to Surface Water Pathway—Fresh Water

Table C.2
Quality Assurance Project Plan Analyte List for Groundwater and Surface Water⁽¹⁾

Analyte	CAS No.	Analysis Method	Unit	ARL		Eurofins		Screening Level	Screening Level Basis
				MDL	RL	MDL	RL		
Dioxins/Furans									
2,3,7,8-TCDD	1746-01-6	USEPA 1613B	µg/L	0.0000013	0.00001	0.00000371	0.00001	0.00000000500	Soil to Surface Water Pathway—Fresh Water
1,2,3,7,8-PeCDD	40321-76-4	USEPA 1613B	µg/L	0.000004	0.00001	0.0000125	0.00005	NE	--
1,2,3,4,7,8-HxCDD	39227-28-6	USEPA 1613B	µg/L	0.0000041	0.00001	0.0000125	0.00005	NE	--
1,2,3,6,7,8-HxCDD	57653-85-7	USEPA 1613B	µg/L	0.0000038	0.00001	0.0000125	0.00005	NE	--
1,2,3,7,8,9-HxCDD	19408-74-3	USEPA 1613B	µg/L	0.0000034	0.00001	0.0000125	0.00005	NE	--
1,2,3,4,6,7,8-HpCDD	35822-46-9	USEPA 1613B	µg/L	0.000006	0.00001	0.0000125	0.00005	NE	--
OCDD	3268-87-9	USEPA 1613B	µg/L	0.000039	0.00005	0.0000509	0.0001	NE	--
2,3,7,8-TCDF	51207-31-9	USEPA 1613B	µg/L	0.0000012	0.00001	0.00000278	0.00001	NE	--
1,2,3,7,8-PeCDF	57117-41-6	USEPA 1613B	µg/L	0.0000042	0.00001	0.0000125	0.00005	NE	--
2,3,4,7,8-PeCDF	57117-31-4	USEPA 1613B	µg/L	0.000004	0.00001	0.0000125	0.00005	NE	--
1,2,3,4,7,8-HxCDF	70648-26-9	USEPA 1613B	µg/L	0.0000038	0.00001	0.0000125	0.00005	NE	--
1,2,3,6,7,8-HxCDF	57117-44-9	USEPA 1613B	µg/L	0.0000039	0.00001	0.0000125	0.00005	NE	--
1,2,3,7,8,9-HxCDF	72918-21-9	USEPA 1613B	µg/L	0.0000036	0.00001	0.0000184	0.00005	NE	--
2,3,4,6,7,8-HxCDF	60851-34-5	USEPA 1613B	µg/L	0.0000035	0.00001	0.0000125	0.00005	NE	--
1,2,3,4,6,7,8-HpCDF	67562-39-4	USEPA 1613B	µg/L	0.000011	0.00002	0.0000125	0.00005	NE	--
1,2,3,4,7,8,9-HpCDF	55673-89-7	USEPA 1613B	µg/L	0.0000036	0.00001	0.0000125	0.00005	NE	--
OCDF	39001-02-0	USEPA 1613B	µg/L	0.000016	0.00002	0.000025	0.0001	NE	--
Dioxins/Furans (MTCA TEQ-HalfND)	DF TEQ (U=1/2)	Summed Value	µg/L	--	--	--	--	0.00000000500	Soil to Surface Water Pathway—Fresh Water

Notes:

- Not available or not applicable.
- 1 All laboratory limits are subject to change based on final dry weight corrections.
- 2 Only surface water samples will be analyzed for TSS.
- 3 PSLs will be applied to the appropriate regulated fraction during the RI.
- 4 When criteria for total chromium are not available, criteria developed for chromium(III) are used as surrogate. This is appropriate at sites where there are no known or suspected sources of chromium(VI).
- 5 Criteria populated for inorganic mercury.
- 6 Criteria are developed for gasoline-range organics for use in two scenarios: when benzene is present, or when benzene is absent. In this table, criteria selected for use assume benzene is present.
- 7 All samples analyzed by NWTPH-Dx will be extracted both with and without silica-gel cleanup.
- 8 Ecology recommends applying direct contact criteria developed for DRO to the total DRO & ORO result. Qualitative (i.e., no residual saturation) criteria must also be met.
- 9 Xylenes are typically analyzed and reported by laboratories as m,p-xylene and o-xylene; these values are summed and reported as total xylenes. The most stringent criterion between criteria developed for m,p-xylene, o-xylene, and total xylenes was selected as the relevant criterion.
- 10 Benzofluoranthenes are typically analyzed and reported by laboratories as benzo(b)fluoranthene and benzo(k)fluoranthene; these values are summed and reported as total benzofluoranthenes. The most stringent criterion between criteria developed for benzo(b)fluoranthene, benzo(k)fluoranthene, and total benzofluoranthenes was selected as the relevant criterion.

Abbreviations:

ARL Analytical Resources, LLC	NA Not available
CAS Chemical Abstracts Service	NE Not established
cPAH Carcinogenic polycyclic aromatic hydrocarbon	OCDD Octachlorodibenzo- <i>p</i> -dioxin
DRO Diesel-range organics	OCDF Octachlorodibenzofuran
Ecology Washington State Department of Ecology	ORO Oil-range organics
HPAH High molecular weight polycyclic aromatic hydrocarbon	PAH Polycyclic aromatic hydrocarbon
HpCDD Heptachlorodibenzo- <i>p</i> -dioxin	PBDE Polybrominated diphenyl ether
HpCDF Heptachlorodibenzofuran	PeCDD Pentachlorodibenzo- <i>p</i> -dioxin
HxCDD Hexachlorodibenzo- <i>p</i> -dioxin	PeCDF Pentachlorodibenzofuran
HxCDF Hexachlorodibenzofuran	PSL Preliminary screening level
LPAH Low molecular weight polycyclic aromatic hydrocarbon	RI Remedial Investigation
MCL Maximum contaminant level	RL Reporting limit
MDL Method detection limit	TCDD Tetrachlorodibenzo- <i>p</i> -dioxin
µg/L Micrograms per liter	TCDF Tetrachlorodibenzofuran
mg/L Milligrams per liter	TEQ Toxic equivalent
MTCA Model Toxics Control Act	TSS Total suspended solids

Table C.3

Quality Assurance Project Plan Analyte List for Sediment ⁽¹⁾

				ARL		Eurofins		Freshwater	Marine SMS	Marine SMS
Analyte	CAS No.	Analysis Method	Unit	MDL	RL	MDL	RL	SMS SCO	SCO	AET SCO
Geotechnical										
Grain size, gravel	GSF_PSEP_GRVL	PSEP 1986	%	0.1	0.1	0.1	0.1	NE	NE	NE
Grain size, sand	GSF_PSEP_SAND	PSEP 1986	%	0.1	0.1	0.1	0.1	NE	NE	NE
Grain size, silt	GSF_PSEP_SILT	PSEP 1986	%	0.1	0.1	0.1	0.1	NE	NE	NE
Grain size, clay	GSF_PSEP_CLAY	PSEP 1986	%	0.1	0.1	0.1	0.1	NE	NE	NE
Conventionals										
Total Organic Carbon	TOC	USEPA 9060 modified	%	0.02	0.02	0.000785	0.002	NE	NE	NE
Ammonia	7664-41-7	SM 4500-NH3	mg/kg	0.4	0.4	66.3	100	230	NE	NE
Sulfide	18496-25-8	SM 4500-S2	mg/kg	1	1	0.164	0.5	39	NE	NE
Metals										
Aluminum	7429-90-5	USEPA 6020B	mg/kg	10	20	6.6	30	NE	NE	NE
Arsenic	7440-38-2	USEPA 6020B	mg/kg	0.1	0.2	0.1	0.5	14	57	57
Barium	7440-39-3	USEPA 6020B	mg/kg	0.25	0.5	0.228	1	NE	NE	NE
Cadmium	7440-43-9	USEPA 6020B	mg/kg	0.05	0.1	0.077	0.8	2.1	5.1	5.1
Chromium	7440-47-3	USEPA 6020B	mg/kg	0.4	0.5	0.288	1	72	260	260
Copper	7440-50-8	USEPA 6020B	mg/kg	0.35	0.5	0.506	2	400	390	390
Iron	7439-89-6	USEPA 6020B	mg/kg	10	20	19.8	40	NE	NE	NE
Lead	7439-92-1	USEPA 6020B	mg/kg	0.068	0.1	0.106	0.5	360	450	450
Manganese	7439-96-5	USEPA 6020B	mg/kg	0.25	0.5	0.582	1.2	NE	NE	NE
Mercury	7439-97-6	USEPA 7471B	mg/kg	0.00525	0.025	0.0196	0.03	0.66	0.41	0.41
Nickel	7440-02-0	USEPA 6020B	mg/kg	0.5	0.5	0.193	0.5	26	NE	NE
Selenium	7782-49-2	USEPA 6020B	mg/kg	0.5	1	0.286	1.1	11	NE	NE
Silver	7440-22-4	USEPA 6020B	mg/kg	0.1	0.2	0.02	0.2	0.57	6.1	6.1
Zinc	7440-66-6	USEPA 6020B	mg/kg	3	6	1.61	5.1	3,200	410	410
Total Petroleum Hydrocarbons										
Diesel-range organics	DRO	NWTPH-Dx	mg/kg	5	5	12.3	50	340	NE	NE
Oil-range organics	ORO	NWTPH-Dx	mg/kg	10	10	17.5	50	3,600	NE	NE
Total DRO & ORO	T_DRO&ORO (U=0)	Summed Value	mg/kg	--	--	--	--	340	NE	NE
Volatile Organic Compounds										
Benzene	71-43-2	USEPA 8260D	mg/kg	0.0005	0.001	0.0038	0.02	NE	NE	NE
Ethylbenzene	100-41-4	USEPA 8260D	mg/kg	0.0005	0.001	0.0091	0.04	NE	NE	NE
Toluene	108-88-3	USEPA 8260D	mg/kg	0.0005	0.001	0.0135	0.06	NE	NE	NE
Xylene (meta & para)	108-38-3/106-42-3	USEPA 8260D	mg/kg	0.001	0.002	0.0071	0.04	NE	NE	NE
Xylene (ortho)	95-47-6	USEPA 8260D	mg/kg	0.0005	0.001	0.005	0.04	NE	NE	NE
Xylene (total)	1330-20-7	Summed Value	mg/kg	--	--	--	--	NE	NE	NE
cis-1,2-Dichloroethene	156-59-2	USEPA 8260D	mg/kg	0.0005	0.001	0.0126	0.06	NE	NE	NE
Tetrachloroethene	127-18-4	USEPA 8260D	mg/kg	0.0005	0.001	0.0053	0.04	NE	NE	NE
trans-1,2-Dichloroethene	156-60-5	USEPA 8260D	mg/kg	0.001	0.001	0.0146	0.06	NE	NE	NE
Trichloroethene	79-01-6	USEPA 8260D	mg/kg	0.0005	0.001	0.0103	0.04	NE	NE	NE
Vinyl chloride	75-01-4	USEPA 8260D	mg/kg	0.0005	0.001	0.0187	0.1	NE	NE	NE
1,1-Dichloroethane	75-34-3	USEPA 8260D	mg/kg	0.0005	0.001	0.0092	0.04	NE	NE	NE
1,2-Dibromoethane	106-93-4	USEPA 8260D	mg/kg	0.0005	0.001	0.0038	0.02	NE	NE	NE
Methyl-tert-butyl ether	1634-04-4	USEPA 8260D	mg/kg	0.0005	0.001	0.006	0.04	NE	NE	NE
Semivolatile Organic Compounds										
Benzo(a)anthracene	56-55-3	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00223	0.0055	NE	110	1.3
Benzo(a)pyrene	50-32-8	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00192	0.0055	NE	99	1.6
Benzo(b)fluoranthene	205-99-2	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00116	0.005	NE	NE	NE
Benzo(k)fluoranthene	207-08-9	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00174	0.0055	NE	NE	NE
Benzo[fluoranthenes (total) (U=0)	56832-73-6	USEPA 8270E-SIM	mg/kg	0.0005	0.001	--	--	NE	230	3.2
Chrysene	218-01-9	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.0015	0.005	NE	110	1.4
Dibenzo(a,h)anthracene	53-70-3	USEPA 8270E-SIM	mg/kg	0.0025	0.005	0.00072	0.0055	NE	12	0.23
Indeno(1,2,3-c,d)pyrene	193-39-5	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00219	0.0055	NE	34	0.60
cPAHs (MTCA TEQ-HalfND)	BaPEq (U=1/2)	Summed Value	mg/kg	--	--	--	--	NE	99	1.6
1-Methylnaphthalene	90-12-0	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00238	0.0055	NE	NE	NE
2-Methylnaphthalene	91-57-6	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00295	0.006	NE	38	0.67
Acenaphthene	83-32-9	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00158	0.0055	NE	16	0.50
Acenaphthylene	208-96-8	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00165	0.0055	NE	66	1.3
Anthracene	120-12-7	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00191	0.0055	NE	220	0.96
Benzo(g,h,i)perylene	191-24-2	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00182	0.0055	NE	31	0.67
Fluoranthene	206-44-0	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.0014	0.005	NE	160	1.7
Fluorene	86-73-7	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00129	0.0055	NE	23	0.54
Naphthalene	91-20-3	USEPA 8270E-SIM	mg/kg	0.0006	0.0012	0.00162	0.005	NE	99	2.1
Phenanthrene	85-01-8	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00163	0.005	NE	100	1.5
Pyrene	129-00-0	USEPA 8270E-SIM	mg/kg	0.0005	0.001	0.00104	0.0055	NE	1,000	2.6
Total HPAH (U=0)	T_HPAH (U=0)	Summed Value	mg/kg	--	--	--	--	NE	960	12
Total LPAH (U=0)	T_LPAH (U=0)	Summed Value	mg/kg	--	--	--	--	NE	370	5.2
Total PAH (U=0)	T_PAH (U=0)	Summed Value	mg/kg	--	--	--	--	17	NE	NE
1,2,4-Trichlorobenzene	120-82-1	USEPA 8270E	mg/kg	0.01	0.02	0.006	0.05	NE	0.81	0.031
1,2-Dichlorobenzene	95-50-1	USEPA 8270E	mg/kg	0.01	0.02	0.005	0.05	NE	2.3	0.035
1,4-Dichlorobenzene	106-46-7	USEPA 8270E	mg/kg	0.01	0.02	0.083	0.05	NE	3.1	0.11
Hexachlorobutadiene	87-68-3	USEPA 8270E	mg/kg	0.01	0.02	0.015	0.05	NE	3.9	0.011
2,4,5-Trichlorophenol	95-95-4	USEPA 8270E	mg/kg	0.05	0.1	0.0081	0.2	NE	NE	NE
2,4,6-Trichlorophenol	88-06-2	USEPA 8270E	mg/kg	0.05	0.1	0.033	0.15	NE	NE	NE
2,4-Dichlorophenol	120-83-2	USEPA 8270E	mg/kg	0.05	0.1	0.028	0.205	NE	NE	NE
2,4-Dimethylphenol	105-67-9	USEPA 8270E	mg/kg	0.05	0.1	0.06	0.205	NE	0.029	0.029
2,4-Dinitrophenol	51-28-5	USEPA 8270E	mg/kg	0.1	0.2	0.585	2	NE	NE	NE
2-Chloronaphthalene	91-58-7	USEPA 8270E	mg/kg	0.01	0.02	0.005	0.025	NE	NE	NE
2-Chlorophenol	95-57-8	USEPA 8270E	mg/kg	0.02	0.02	0.004	0.2	NE	NE	NE
2-Methylphenol	95-48-7	USEPA 8270E	mg/kg	0.01	0.02	0.0098	0.15	NE	0.063	0.063
2-Nitrophenol	88-75-5	USEPA 8270E	mg/kg	0.01	0.02	0.019	0.2	NE	NE	NE
3- & 4-Methylphenol	15831-10-4	USEPA 8270E	mg/kg	NA	NA	0.015	0.2	0.26	0.67	0.67
4,6-Dinitro-o-cresol	534-52-1	USEPA 8270E	mg/kg	0.1	0.2	0.1	1	NE	NE	NE
4-Chloro-3-methylphenol	59-50-7	USEPA 8270E	mg/kg	0.05	0.1	0.033	0.15	NE	NE	NE
4-Methylphenol	106-44-5	USEPA 8270E	mg/kg	0.015	0.02	NA	NA	0.26	0.67	0.67
4-Nitrophenol	100-02-7	USEPA 8270E	mg/kg	0.05	0.1	0.254	2	NE	NE	NE
Benzoic acid	65-85-0	USEPA 8270E	mg/kg	0.1	0.2	1.22	4	2.9	0.65	0.65
Benzyl alcohol	100-51-6	USEPA 8270E	mg/kg	0.02	0.02	0.256	1	NE	0.057	0.057
Bis(2-chloroethoxy)methane	111-91-1	USEPA 8270E	mg/kg	0.01	0.02	0.018	0.2	NE	NE	NE
Bis(2-ethylhexyl)phthalate	117-81-7	USEPA 8270E	mg/kg	0.04	0.05	0.071	0.6	0.50	47	1.3

Table C.3

Quality Assurance Project Plan Analyte List for Sediment ⁽¹⁾

Analyte	CAS No.	Analysis Method	Unit	ARL		Eurofins		Freshwater SMS SCO	Marine SMS SCO	Marine SMS AET SCO
				MDL	RL	MDL	RL			
Semivolatile Organic Compounds (cont.)										
Bis-chloroisopropyl ether	108-60-1	USEPA 8270E	mg/kg	NA	NA	0.0061	0.2	NE	NE	NE
Butyl benzyl phthalate	85-68-7	USEPA 8270E	mg/kg	0.01	0.02	0.051	0.2	NE	4.9	0.063
Carbazole	86-74-8	USEPA 8270E	mg/kg	0.01	0.02	0.0073	0.15	0.90	NE	NE
Dibenzofuran	132-64-9	USEPA 8270E	mg/kg	0.02	0.02	0.0059	0.15	0.20	15	0.54
Diethylphthalate	84-66-2	USEPA 8270E	mg/kg	0.035	0.05	0.022	0.4	NE	61	0.20
Dimethyl phthalate	131-11-3	USEPA 8270E	mg/kg	0.01	0.02	0.005	0.15	NE	53	0.071
Di-n-butyl phthalate	84-74-2	USEPA 8270E	mg/kg	0.01	0.02	0.047	0.5	0.38	220	1.4
Di-n-octyl phthalate	117-84-0	USEPA 8270E	mg/kg	0.01	0.02	0.089	0.2	0.039	58	6.2
Hexachlorobenzene	118-74-1	USEPA 8270E	mg/kg	0.02	0.02	0.015	0.05	NE	0.38	0.022
Hexachlorocyclopentadiene	77-47-4	USEPA 8270E	mg/kg	0.05	0.1	0.0077	0.1	NE	NE	NE
Hexachloroethane	67-72-1	USEPA 8270E	mg/kg	0.01	0.02	0.0043	0.15	NE	NE	NE
Isophorone	78-59-1	USEPA 8270E	mg/kg	0.015	0.02	0.0084	0.15	NE	NE	NE
N-Nitroso-di-n-propylamine	621-64-7	USEPA 8270E	mg/kg	0.015	0.02	0.022	0.2	NE	NE	NE
N-Nitrosodiphenylamine	86-30-6	USEPA 8270E	mg/kg	0.01	0.02	0.008	0.06	NE	11	0.028
Pentachlorophenol	87-86-5	USEPA 8270E	mg/kg	0.05	0.1	0.269	0.55	1.2	0.36	0.36
Phenol	108-95-2	USEPA 8270E	mg/kg	0.01	0.02	0.023	0.15	0.12	0.42	0.42
Polychlorinated Biphenyls (PCBs)										
Aroclor 1016	12674-11-2	USEPA 8082A	mg/kg	0.002	0.004	0.0074	0.02	NE	NE	NE
Aroclor 1221	11104-28-2	USEPA 8082A	mg/kg	0.002	0.004	0.012	0.02	NE	NE	NE
Aroclor 1232	11141-16-5	USEPA 8082A	mg/kg	0.002	0.004	0.0049	0.02	NE	NE	NE
Aroclor 1242	53469-21-9	USEPA 8082A	mg/kg	0.002	0.004	0.008	0.02	NE	NE	NE
Aroclor 1248	12672-29-6	USEPA 8082A	mg/kg	0.002	0.004	0.007	0.02	NE	NE	NE
Aroclor 1254	11097-69-1	USEPA 8082A	mg/kg	0.002	0.004	0.009	0.02	NE	NE	NE
Aroclor 1260	11096-82-5	USEPA 8082A	mg/kg	0.002	0.004	0.0074	0.02	NE	NE	NE
Aroclor 1262	37324-23-5	USEPA 8082A	mg/kg	0.002	0.004	NA	NA	NE	NE	NE
Aroclor 1268	11100-14-4	USEPA 8082A	mg/kg	0.002	0.004	NA	NA	NE	NE	NE
Total PCB Aroclors (U=0)	T_PCB (U=0)	Summed Value	mg/kg	--	--	--	--	0.11	12	0.13
Dioxins/Furans										
2,3,7,8-TCDD	1746-01-6	USEPA 1613B	ng/kg	0.15	1	0.25	1	NE	NE	NE
1,2,3,7,8-PeCDD	40321-76-4	USEPA 1613B	ng/kg	0.17	1	1.25	5	NE	NE	NE
1,2,3,4,7,8-HxCDD	39227-28-6	USEPA 1613B	ng/kg	0.17	1	1.25	5	NE	NE	NE
1,2,3,6,7,8-HxCDD	57653-85-7	USEPA 1613B	ng/kg	0.18	1	1.25	5	NE	NE	NE
1,2,3,7,8,9-HxCDD	19408-74-3	USEPA 1613B	ng/kg	0.22	1	1.25	5	NE	NE	NE
1,2,3,4,6,7,8-HpCDD	35822-46-9	USEPA 1613B	ng/kg	0.56	2.5	1.25	5	NE	NE	NE
OCDD	3268-87-9	USEPA 1613B	ng/kg	4.6	10	3.61	10	NE	NE	NE
2,3,7,8-TCDF	51207-31-9	USEPA 1613B	ng/kg	0.058	1	0.368	1	NE	NE	NE
1,2,3,7,8-PeCDF	57117-41-6	USEPA 1613B	ng/kg	0.24	1	1.39	5	NE	NE	NE
2,3,4,7,8-PeCDF	57117-31-4	USEPA 1613B	ng/kg	0.22	1	1.25	5	NE	NE	NE
1,2,3,4,7,8-HxCDF	70648-26-9	USEPA 1613B	ng/kg	0.28	1	1.58	5	NE	NE	NE
1,2,3,6,7,8-HxCDF	57117-44-9	USEPA 1613B	ng/kg	0.2	1	1.38	5	NE	NE	NE
1,2,3,7,8,9-HxCDF	72918-21-9	USEPA 1613B	ng/kg	0.19	1	1.32	5	NE	NE	NE
2,3,4,6,7,8-HxCDF	60851-34-5	USEPA 1613B	ng/kg	0.17	1	1.29	5	NE	NE	NE
1,2,3,4,6,7,8-HpCDF	67562-39-4	USEPA 1613B	ng/kg	0.21	1	1.25	5	NE	NE	NE
1,2,3,4,7,8,9-HpCDF	55673-89-7	USEPA 1613B	ng/kg	0.24	1	1.25	5	NE	NE	NE
OCDF	39001-02-0	USEPA 1613B	ng/kg	1.1	2.5	2.5	10	NE	NE	NE
Dioxins/Furans (MTCA TEQ-HalfND)	DF_TEQ (U=1/2)	Summed Value	ng/kg	--	--	--	--	NE	NE	NE

Notes:

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Not available or not applicable.

Criteria expressed on an OC-normalized basis

1

All laboratory limits are subject to change based on final dry weight corrections.

- Abbreviations:
- AET Apparent Effects Threshold
- ARL Analytical Resources, LLC
- CAS Chemical Abstracts Service
- cPAH Carcinogenic polycyclic aromatic hydrocarbon
- DRO Diesel-range organics
- HPAH High molecular weight polycyclic aromatic hydrocarbon
- HpCDD Heptachlorodibenzo-*p* -dioxin
- HpCDF Heptachlorodibenzofuran
- HxCDD Hexachlorodibenzo-*p* -dioxin
- HxCDF Hexachlorodibenzofuran
- LPAH Low molecular weight polycyclic aromatic hydrocarbon
- MDL Method detection limit
- mg/kg Milligrams per kilogram
- MTCA Model Toxics Control Act
- NE Not established
- ng/kg Nanograms per kilogram
- OCDD Octachlorodibenzo-*p* -dioxin
- OCDF Octachlorodibenzofuran
- ORO Oil-range organics
- PAH Polycyclic aromatic hydrocarbon
- PeCDD Pentachlorodibenzo-*p* -dioxin
- PeCDF Pentachlorodibenzofuran
- RL Reporting limit
- SCO Sediment Cleanup Objective
- SMS Sediment Management Standards
- TCDD Tetrachlorodibenzo-*p* -dioxin
- TCDF Tetrachlorodibenzofuran
- TEQ Toxic equivalent

Table C.4
Quality Assurance/Quality Control Criteria

Parameter	QA/QC Criteria		
	Precision	Accuracy	Completeness
Solids/Sediments			
Total solids	±25%	--	90%
TOC	±25%	70%–130%	90%
pH	±25%	--	90%
Metals/mercury	±25%	70%–130%	90%
TPH	±35%	50%–150%	90%
VOCs	±35%	50%–150%	90%
SVOCs	±35%	50%–150%	90%
Pesticides/Herbicides	±35%	50%–150%	90%
PCB Aroclors	±35%	50%–150%	90%
Dioxins/furans	±35%	50%–150%	90%
Waters			
TOC	±20%	75%–125%	90%
TSS/TDS	±20%	--	90%
Nitrogen	±20%	75%–125%	90%
Sulfate	±20%	75%–125%	90%
Sulfide	±20%	75%–125%	90%
Metals/mercury	±20%	75%–125%	90%
TPH	±30%	60%–140%	90%
VOCs	±30%	60%–140%	90%
SVOCs	±30%	60%–140%	90%
PCB Aroclors	±30%	60%–140%	90%
Dioxins/furans	±30%	60%–140%	90%

Note:

-- Not available or not applicable.

Abbreviations:

PCB Polychlorinated biphenyl
 QA/QC Quality assurance/quality control
 SVOC Semivolatile organic compound
 TDS Total dissolved solids
 TOC Total organic carbon
 TPH Total petroleum hydrocarbons
 TSS Total suspended solids
 VOC Volatile organic compound

Table C.5
Quality Assurance/Quality Control Frequency for Solid Media

Parameter	Method Blank	Laboratory Control Samples	Matrix Spike	Matrix Spike Duplicate ⁽¹⁾	Laboratory Duplicate	Surrogate Spike	Field Duplicate	Equipment Blank	Trip Blank
Grain size	--	--	--	--	--	--	1 per 20 samples	--	--
Total solids	--	--	--	--	1 per batch	--		--	--
TOC	1 per batch	1 per batch	1 per batch	--		--		--	
Metals/mercury				1 per batch		--		--	--
Total DRO & ORO					--	Every sample		--	
GRO					--			--	
SVOCs					--			--	
VOCs				--	--				
Dioxins/furans			--	--	1 per batch			--	
PCB Aroclors			1 per batch	1 per batch	--			--	
Pesticides					--			--	
Herbicides					--			--	

Notes:

-- Not available or not applicable.

1 Field duplicates may be analyzed in place of matrix spike duplicates.

Abbreviations:

DRO Diesel-range organics
 GRO Gasoline-range organics
 ORO Oil-range organics
 PCB Polychlorinated biphenyl
 SVOC Semivolatile organic compound
 TOC Total organic carbon
 VOC Volatile organic compound

Table C.6
Quality Assurance/Quality Control Frequency for Water

Parameter	Method Blank	Laboratory Control Samples	Matrix Spike	Matrix Spike Duplicate ⁽¹⁾	Laboratory Duplicate	Surrogate Spike	Field Duplicate	Equipment Blank	Trip Blank
TSS/TDS	--	--	--	--	--	--	1 per 20 samples	--	--
Total solids	--	--	--	--	1 per batch	--		--	--
TOC	1 per batch	1 per batch	1 per batch	--		--		--	
Metals/mercury				1 per batch		Every sample		--	--
Total DRO & ORO					--			--	
GRO					--			--	
SVOCs					--			--	
VOCs				--	--				
Dioxins/furans			--	--	1 per batch	--			
PCB Aroclors			1 per batch	1 per batch	--	--			

Note:

1 Duplicates may be analyzed in place of matrix spike duplicates.

Abbreviations:

DRO Diesel-range organics
 GRO Gasoline-range organics
 ORO Oil-range organics
 PCB Polychlorinated biphenyl
 SVOC Semivolatile organic compound
 TOC Total organic carbon
 TSS Total suspended solids
 VOC Volatile organic compound

Table C.7
Container and Preservation Criteria for Solid Media

Analyte	Method	Sample Handling		
		Container/ Preservative	Holding Time	Sample Preservation Technique
Total organic carbon	USEPA 9060	4-oz WMG	28 days	Cool <6 °C
		4-oz WMG	6 months	Freeze -18 °C
Total solids	SM 2450-G	4-oz WMG	14 days	Cool <6 °C
			6 months	Freeze -18 °C
pH	USEPA 9045D	4-oz WMG	28 days	Cool <6 °C
Metals	USEPA 6020A	4-oz WMG	6 months	6 months
			1 year	Freeze -18 °C
Mercury	USEPA 7471		28 days	Cool <6 °C
Total DRO & ORO	NWTPH-Dx	4-oz WMG	14 days to extraction; 40 days to analyze	Cool <6 °C
GRO	NWTPH-Gx	4-oz WMG	14 days	Cool <6 °C
BTEX	USEPA 8021B	4-oz WMG	14 days to extraction; 40 days to analyze	Cool <6 °C
VOCs	USEPA 8260D	4-oz WMG, 3x 40-mL VOA vials	14 days	Methanol and sodium bisulfate; Cool <6 °C
PAHs	USEPA 8270E/SIM	4-oz WMG	14 days to extraction; 40 days to analyze	Cool <6 °C
			1 year	Freeze -18 °C
SVOCs	USEPA 8270E	4-oz WMG	14 days to extraction; 40 days to analyze	Cool <6 °C
			1 year	Freeze -18 °C
Pesticides	USEPA 8081B	4-oz WMG	14 days to extraction; 40 days to analyze	Cool <6 °C
Herbicides	USEPA 8151	4-oz WMG	14 days to extraction; 40 days to analyze	Cool <6 °C
Total PCB Aroclors	USEPA 8082A	4-oz WMG	14 days to extraction; 40 days to analyze	Cool <6 °C
			1 year	Freeze -18 °C
Dioxins/furans	USEPA 1613B	4-oz amber WMG	1 year to extract; 40 days to analyze	Cool <6 °C
				Freeze -18 °C

Abbreviations:

°C Degrees Celsius
 BTEX Benzene, toluene, ethylbenzene, ar
 DRO Diesel-range organics
 GRO Gasoline-range organics
 mL Milliliters
 ORO Oil-range organics
 oz Ounces

PAH Polycyclic aromatic hydrocarbon
 PCB Polychlorinated biphenyl
 SVOC Semivolatile organic compound
 VOA Volatile organic analysis
 VOC Volatile organic compound
 WMG Wide-mouthed glass

Table C.8
Container and Preservation Criteria for Water

Analyte	Method	Sample Handling		
		Container/ Preservative	Holding Time	Sample Preservation Technique
Total organic carbon	USEPA 9060	250-mL HDPE	28 days	H ₂ SO ₄ ; Cool <6 °C
			1 year	Freeze -18 °C
Total suspended solids	SM 2540D	1-L HDPE	7 days	Cool <6 °C
Total dissolved solids	SM 2540C	1-L HDPE	7 days	Cool <6 °C
Alkalinity	SM 2320B	250-mL HDPE	14 days	Cool <6 °C
Sulfate	USEPA 300.0	250-mL HDPE	28 days	HCl; Cool <6 °C
Sulfide	SM 4500-S2		28 days	HCl; Cool <6 °C
Nitrate	USEPA 300.0		28 days	H ₂ SO ₄ ; Cool <6 °C
Nitrite				
Metals	USEPA 6020B	250-mL HDPE	6 months	HNO ₃ ; Cool <6 °C
Mercury	USEPA 7470		28 days	
Hardness	SM 2340B		6 months	Cool <6 °C
Ammonia	SM 4500-NH3	250-mL HDPEE	28 days	H ₂ SO ₄ ; Cool <6 °C
Total sulfides	SM 4500-S2	500-mL HDPE	7 days	Zinc acetate; Cool <6 °C
GRO	NWTPH-Gx	2x 40-mL VOA vials	14 days	HCl, Cool <6°C
DRO & ORO	NWTPH-Dx	2x 500-mL amber glass	7 days to extract; 40 days to analyze	HCl, Cool <6°C
VOCs	USEPA 8260D	3x 40-mL VOA vials	14 days	HCl; Cool <6 °C
SVOCs	USEPA 8270E/SIM	2x 1-L amber glass	7 days to extract; 40 days to analyze	Cool <6°C
Total PCB Aroclors	USEPA 8082A	2x 1-L amber glass	none	Cool <6 °C
Dioxins/furans	USEPA 1613B	2x 1-L amber glass	1 year	Cool <6 °C
				Freeze -18 °C

Abbreviations:

°C Degrees Celsius
DRO Diesel-range organics
GRO Gasoline-range organics
HDPE High-density polyethylene
L Liters
mL Milliliters

ORO Oil-range organics
PCB Polychlorinated biphenyl
SVOC Semivolatile organic compound
VOA Volatile organic analysis
VOC Volatile organic compound

Phase 1 Remedial Investigation Work Plan

Cosmo Specialty Fibers Site

Appendix D Health and Safety Plan

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List of Abbreviations

Abbreviation	Definition
ANSI	American National Standards Institute
APP	Accident Prevention Plan
AST	Aboveground storage tank
BTEX	Benzene, toluene, ethylbenzene, and xylenes
COC	Contaminant of concern
COI	Contaminant of interest
cPAH	Carcinogenic polycyclic aromatic hydrocarbon
D/F	Dioxin/furan
Ecology	Washington State Department of Ecology
EDB	Ethylene dibromide
EDC	Ethylene dichloride
HASP	Health and Safety Plan
HSO/SS	Health and Safety Officer/Site Supervisor
IDW	Investigation-derived waste
LEL	Lower explosive level
mph	Miles per hour
MTBE	Methyl <i>tert</i> -butyl ether
OSHA	Occupational Safety and Health Act

Abbreviation	Definition
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PCP	Pentachlorophenol
Phase 1 RIWP	Phase 1 Remedial Investigation Work Plan
PID	Photoionization detector
PM	Project Manager
PPE	Personal protective equipment
ppm	Parts per million
RI	Remedial investigation
ROW	Right-of-way
Site	Cosmo Specialty Fibers, Inc., Site
SSO	Site Safety Officer
TCE	Trichloroethene
VOC	Volatile organic compound
Weyerhaeuser	Weyerhaeuser NR Company

1.0 Plan Objectives and Applicability

This Health and Safety Plan (HASP) has been written to comply with the standards prescribed by the Occupational Safety and Health Act (OSHA) and the Washington Industrial Safety and Health Act.

The purpose of this HASP is to establish site-specific protection standards and mandatory safe practices and procedures for all personnel involved with remedial investigation (RI) field activities at the Cosmo Specialty Fibers, Inc., Site (Site), in Cosmopolis, Washington. It has been prepared as a supplement to Floyd|Snider's Accident Prevention Plan (APP; Attachment D.1).

This HASP establishes standard operating procedures and provides for contingencies that may be implemented during field work activities. This HASP consists of Site and facility descriptions, a summary of work activities, the identification and evaluation of chemical and physical hazards, monitoring procedures, a description of Site zones, decontamination and disposal practices, and emergency procedures.

The provisions and procedures outlined in this HASP apply to all Floyd|Snider personnel on-site. Contractors, subcontractors, other oversight personnel, and all other persons involved in the field work activities described herein are required to develop and comply with their own HASP or Job Safety Analysis but must also comply with the requirements of this HASP on job sites managed by Floyd|Snider. All Floyd|Snider staff conducting field activities are required to read this HASP and indicate that they understand its contents by signing the Health and Safety Officer/Site Supervisor's (HSO/SS's) copy of this plan prior to conducting field work activities. A copy of this plan must be maintained on-site at all times by the HSO/SS.

This HASP is based on information that was available as of the date indicated on the title page. Additional hazards not specifically addressed by this HASP may exist at the work site or may be created as a result of site activities. Should project personnel identify a site condition that is not addressed by this HASP and have any questions or concerns about site conditions, they should immediately notify the HSO/SS, and work shall be paused to assess any new hazards. If any new hazards identified can be mitigated or controlled, work can proceed and the HASP will be revised, if appropriate.

The HSO/SS has field responsibility for ensuring that the HASP adequately protects worker health and safety and is properly implemented. In this capacity, the HSO/SS will conduct regular site inspections and has the authority to make health and safety decisions that may not be specifically outlined in this HASP based on site conditions. If the HSO/SS leaves the Site while work is in progress, an alternate Site Safety Officer (SSO) will be designated. Personnel responsibilities are further described in the APP.

This HASP was reviewed by the Project Manager (PM) and the HSO/SS prior to commencement of work activities.

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2.0 Background Information

2.1 SITE BACKGROUND

The Site consists of three primary areas: (1) the Main Mill Complex, (2) the Wood Stave Pipe Corridor, and (3) the Westport Ponds Area (Figure D.1). The Main Mill Complex totals approximately 500 acres and is located at 1701 1st Street in Cosmopolis, Washington, along the Chehalis River. The Westport Ponds Area occupy approximately 50 acres on the north side of Washington State Route 105. The Wood Stave Pipe Corridor consists of an underground pipeline alignment and associated conveyance features that historically conveyed treated mill effluent from the Main Mill Complex to the Westport Ponds Area. The pipeline alignment extends between the Main Mill Complex and the Westport Ponds Area and traverses areas outside Cosmopolis city limits, including under residential neighborhoods in Aberdeen.

The ground surface at the Main Mill Complex is relatively level and paved at the primary mill operations area. Additional pulp mill property extends to the east of the mill operations area and includes the secondary wastewater treatment systems, stockpiles associated with mill operations, vegetated fill areas, drainage features, and gravel roads. At the Westport Ponds, the ground surface is relatively flat, vegetated, and has minor topography fluctuations. Along the Wood Stave Pipe Corridor, the ground surface is primarily flat asphalt roadways.

The Main Mill Complex is bordered to the west by Highway 101, commercial properties, and residential neighborhoods; south of the Site is Union Pacific railroad tracks running roughly parallel to Highway 101. Roadways in the vicinity of the main mill are residential, city, and Highway 101. In residential areas, the posted speed limit is 25 miles per hour (mph) with a transition to 55 mph on Highway 101.

The Westport Ponds are adjacent to the Chehalis River near its confluence with Grays Harbor; south of the ponds is State Route 105 and the Bishop Athletic Complex; west of the ponds is undeveloped land and Newskah Creek; and east of the ponds are residential neighborhoods.

Figure D.1
Cosmo Specialty Fibers, Inc., Site Vicinity Location



2.2 OWNERSHIP AND OPERATIONAL TIMELINE

The property has been used for industrial wood products manufacturing for over a century, beginning with lumber milling in the late 1800s and later transitioning to sulfite pulp production under Weyerhaeuser NR Company (Weyerhaeuser). Early operators included the following:

- **1877 to 1879:** Charles Stevens purchased the property in 1877 and constructed a water-powered grist mill, a mill that grinds cereal grain into flour and meal, by 1879.
- **1881 to 1888:** In 1881, Jason and John Fry purchased the grist mill and converted it into a sawmill, marking the area's initial significant lumber milling.
- **1888 to 1892:** Pope & Talbot developed a larger mill at the site, operating under the name Grays Harbor Mill Company.
- **1892 to 1931:** The mill was rebranded as the Grays Harbor Commercial Company in 1892. It served as a significant producer of lumber products until its closure in 1929. The company was formally dissolved in 1931.
- **1948 to 1955:** A smaller sawmill, operated by the United Mill & Logging Co., was present prior to the larger mill operations. This facility included a sawmill, a log intake area on a slough, and additional structures for sorting and processing lumber. The site continued to function as a lumber processing area until preparations for pulp mill construction began under Weyerhaeuser ownership.

Weyerhaeuser Timber Company purchased the underlying property from the Ultican family in 1955 and constructed the pulp mill in 1957. The facility initially produced paper-grade sulfite pulp

and transitioned in 1962 to dissolving and specialty-grade sulfite pulp. In October 2005, Weyerhaeuser announced the mill's closure, citing economic challenges and shifting market demands. Weyerhaeuser then ceased operations in September 2006, and the facility was subsequently mothballed in 2007.

Following cessation of Weyerhaeuser operations in 2005 and formal shutdown of production in 2006, Weyerhaeuser retained ownership of the Cosmopolis mill until 2010, when the mill was sold to an investment group led by The Gores Group. The mill resumed operations in May 2011 under the name Cosmo Specialty Fibers and continued producing dissolving wood pulp and specialty cellulose products including viscose, acetate, ether, and lyocell-grade pulps, through late 2022. During this operational period, the mill reportedly produced 140,000 to 170,000 metric tons of specialty pulp products annually and employed approximately 200 workers in Grays Harbor County. Operations were suspended during the COVID-19 economic slowdown in 2020 but resumed in early 2021. In December 2022, production activities were curtailed and mill operations ceased. Ownership of the property was subsequently transferred to Charlestown Investments, an entity associated with Richard Bassett, through acquisition of Cosmo Specialty Fibers and related holding interests. The mill is not currently operational but has not been officially mothballed to safe and stable conditions. The Main Mill Complex and Westport Ponds areas are not fully secure and break-ins are frequent, as reported by the Washington State Department of Ecology (Ecology) PM. Additional details about the facility and operation history are provided in the Phase 1 Remedial Investigation Work Plan (Phase 1 RIWP).

2.3 SCOPE OF WORK

The Phase 1 field investigation will include the collection of soil, groundwater, surface water, and sediment samples for laboratory analysis, as described in the Phase 1 RIWP. Floyd|Snider will be conducting the field investigation at the Main Mill Complex, the Westport Ponds, and along the Wood Stave Pipe Corridor. The scope of the Phase 1 investigation in the mill operations area within the Main Mill Complex is intentionally limited due to uncertainty regarding future Site use and the potential for mill operations to resume during or after the RI. Although the Site is not currently operational, it has not been mothballed. A restart of operations could introduce new releases or alter Site conditions, potentially affecting the representativeness of investigation results, particularly in the mill operations area. In addition, health and safety considerations associated with deteriorating infrastructure (e.g., leaking tanks, damaged equipment, and loose metal sheeting) may constrain investigation activities. Therefore, sampling locations may be adjusted in the field if safety or access concerns are identified.

The specific objectives of the RI are described in the Phase 1 RIWP and include the following:

- Characterize site stratigraphy, hydrostratigraphy, and groundwater conditions, including tidal influences, to support development of the hydrogeologic conceptual site model.
- Identify potential source areas and evaluate the presence or absence of contamination and potential contaminants of interest (COIs) in Site soil, groundwater, surface water, and sediment.

- Evaluate the vertical and lateral distribution of contamination within fill areas and at fill–native soil interfaces.
- Assess contaminant migration pathways, including soil to groundwater transport, groundwater flow and downgradient migration, and groundwater–surface water interactions.
- Evaluate whether contaminants from upland areas may be migrating to on-site surface water and sediment.
- Identify and prioritize areas requiring additional investigation and inform development of a focused Phase 2 investigation approach.

The investigation will consist of the following tasks, some of which will be completed partially or entirely by subcontractors:

- Conducting a public and private utility survey
- Direct-push soil boring sampling
- Advancing direct-push or hollow-stem auger borings to install monitoring wells
- Conducting a top-of-casing and surface elevation survey of new and existing monitoring wells
- Collecting water level measurements
- Groundwater sampling via monitoring wells and temporary well points installed in Geoprobe borings
- Aquifer testing
- Porewater sampling
- Preparing an interim data report after initial RI field data collection
- Preparing an Agency Review Draft RI report

2.4 SITE CONTAMINANTS OF INTEREST

The COIs at the Site include chlorine from multiple releases, including a chlorine car; chlorine dioxide air releases from the chlorine dioxide liquid storage tank and the bleach plant stack; magnesium oxide from a recovery boiler bypass valve and a 5-hour dust release; sodium hydroxide from caustic storage tanks; equipment containing polychlorinated biphenyls (PCBs); red liquor release to the stormwater system; a spill of acidified water at the Westport Ponds; mill effluent shown to be toxic to bivalves; elevated levels of dioxins and furans at outfalls 001 and 002; repeated spillage of hydraulic and motor oil; diesel fuel spill within the power house area aboveground storage tank (AST) containment; a cracked sulfuric acid tank; chemicals stored within the main mill buildings including spent liquor, cooking acid, sulfuric acid, caustic, methanol, paints, and methyl ethyl ketone, but these areas will not be accessed by Floyd|Snider field personnel. The COI nature and extent is not known, but chemical classes that are expected to be present within soil, groundwater, and surface water include metals, total petroleum hydrocarbons, volatile organic compounds (VOCs), semivolatile organic compounds (including carcinogenic polycyclic aromatic hydrocarbons [cPAHs]), PCBs, dioxins/furans (D/Fs), and select herbicides.

3.0 Emergency Contacts and Information

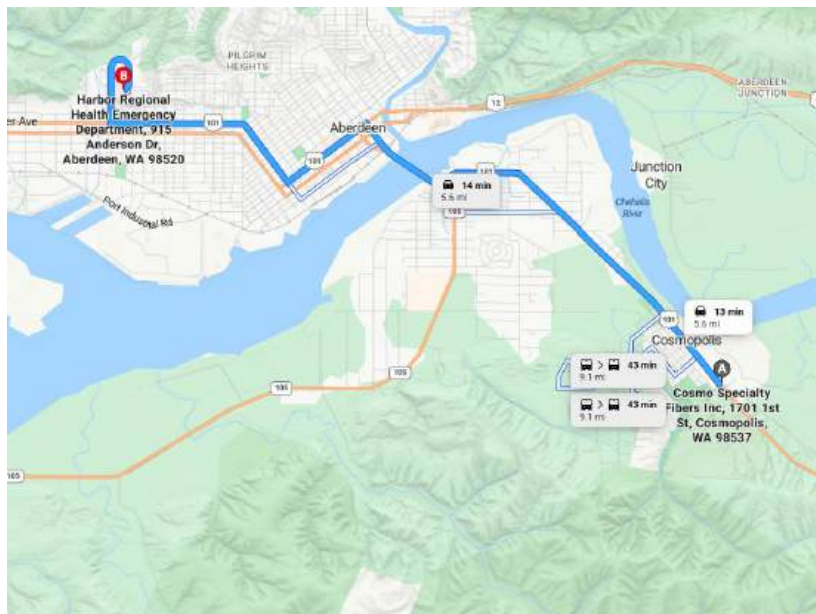
3.1 DIAL 911

In the event of an emergency, dial 911 to reach fire, police, and first aid.

3.2 HOSPITAL AND POISON CONTROL

Nearest Hospital Location and Telephone: (Refer to Figure D.2 for directions and map to the hospital.)	Harbor Regional Health 915 Anderson Drive Aberdeen, Washington (360) 532-8330
Washington Poison Control Center:	(800) 222-1222

**Figure D.2
Hospital Directions**



1. Leave from 1st St/US-101 N
2. Turn right onto United States Highway 101 S/US-101 S
3. Turn left onto E Wishkah St/US-101 N/US-12 W
4. Turn right onto S Alder St/US-101 N
5. Turn right onto Oak St
6. Turn right

3.3 PROVIDE INFORMATION TO EMERGENCY PERSONNEL

All Floyd|Snider project personnel should be prepared to give the following information:

Information to give to Emergency Personnel	
Site Location: (Refer to Figure D.1)	Cosmo Specialty Fibers 1701 1 st Street Cosmopolis, Washington
Number You Are Calling From:	This information can be found on the phone you are calling from.
Type of Accident or Type(s) of Injuries:	Describe accident and/or incident and number of individuals needing assistance.

3.4 UTILITY EMERGENCY CONTACTS

Additional entities that may need to be contacted in the event of an emergency involving damage to a utility include the following:

Grays Harbor PUD Emergency Line (Electric):	(888) 541-5923
Cascade Natural Gas Emergency Line:	(888) 522-1130
Cosmopolis Public Works (Water/Sewer) Emergency Line:	Monday through Friday: (360) 533-4280 Weekend Duty Number: (360) 580-6386 After Hours: (360) 533-8765
Xfinity Emergency Line:	(800) 934-3249

3.5 PROJECT CONTACTS

After contacting emergency response crews as necessary, contact the Floyd|Snider PM, or a Principal, to report the emergency. The Floyd|Snider PM may then contact Weyerhaeuser and/or Ecology as needed, or direct the field staff to do so.

Floyd|Snider Emergency Contacts:

Contact	Office Phone Number	Cell Phone Number
Kara Hitchko, PM	(206) 292-2078	(206) 795-0523
Jessi Massingale, Principal		(206) 683-4307
Amy Booth, HSO/SS		(509) 808-6197
Manique Talaia-Murray, SSO, or designee		To be determined based on field schedule

Weyerhaeuser Emergency Contacts:

Contact	Office Phone Number	Cell Phone Number
Luke Theis	(406) 897-8010	(406) 249-3399

Ecology Emergency Contacts:

Contact	Office Phone Number	Cell Phone Number
Ha Tran	(360) 790-6276	Not applicable

4.0 Hazard Evaluation and Risk Analysis

The typical fire, explosion, and physical hazards likely to be present on the job site, and procedures to control the mitigation of these hazards, are presented in the APP. This HASP presents additional information regarding site-specific hazards, including chemical exposure hazards associated with site COIs or the scope of field activities and analysis of the hazards associated with each site investigation task.

4.1 CHEMICAL EXPOSURE HAZARDS

This section describes potential chemical hazards associated with the field activities being conducted. Based on previous site data, elevated concentrations of the following chemicals may be encountered at the Site.

Main Mill Complex Phase 1 Investigation Area:

- Chlorinated solvents (e.g., trichloroethene [TCE] and breakdown products)
- Caustics and acids (sodium hydroxide, sulfuric acid, hydrochloric acid, and phosphoric acid)
- Sulfur compounds (sulfur dioxide and sulfur dioxide hydrate)
- Combustion byproducts (polycyclic aromatic hydrocarbons [PAHs] and D/Fs)
- Metals (RCRA 8, including lead, silver, copper, and magnesium)
- Organic chemicals (methanol, amines, surfactants, polymers, and defoamers)
- Pulping-related materials and byproducts (magnesium bisulfite liquor, spent sulfite liquor/red liquor, and lignin compounds)
- VOCs including benzene, toluene, ethylbenzene, and xylenes (BTEX); methyl *tert*-butyl ether (MTBE); ethylene dibromide (EDB); and ethylene dichloride (EDC)
- Petroleum-related products (diesel #2 and #6, gasoline, propane, lube oil, and grease) and associated constituents (PAHs, cPAHs, and BTEX)
- Total PCB Aroclors
- Herbicides (e.g., aldrin, dieldrin, chlordane, beta-hexachlorocyclohexane, and toxaphene)

Wood Stave Pipe Corridor Phase 1 Investigation Area:

- Pulp mill wastewater constituents (spent sulfite liquor/red liquor, dissolved organics, and treatment residuals)
- Potential releases of process chemicals conveyed via pipeline

Westport Ponds Area Phase 1 Investigation Area:

- Wastewater treatment chemicals (sodium hydroxide, hypochlorite, polymers, and defoamers)
- Pulping residuals (biological solids, ash, and pulp fiber)
- Metals (RCRA 8)
- Petroleum-related constituents (diesel, TPH, and PAHs/cPAHs)
- PCBs (from historical electrical equipment)
- Total PCB Aroclors
- D/Fs

Main Mill Complex Buildings and Associated Infrastructure:

The following are not expected during the Phase 1 Investigation but may be associated with the Main Mill Complex buildings:

- Oxidizing and bleaching chemicals (chlorine dioxide, hydrogen peroxide, sodium hypochlorite, and sodium chlorate)
- Pulping liquors and byproducts (spent sulfite liquor, lignosulfonates, and organic acids)
- Volatile sulfur compounds (hydrogen sulfide, mercaptans, and dimethyl sulfide)
- Chlorinated organic compounds (chlorinated phenols, absorbable organic halides-related compounds)
- Miscellaneous industrial chemicals (formaldehyde, pentachlorophenol [PCP], phenols, antifreeze, fuel oils, naphthalene, and nitrate/nitrite)
- Process additives (surfactants, polymers, defoamers, and amines)
- Petroleum-related products (diesel #2 and #6, gasoline, propane, lube oil, and grease) and associated constituents (PAHs, cPAHs, and BTEX)

Human health hazards associated with the chemicals expected to be encountered in the Phase 1 investigation areas are presented in the following table. This information covers potential toxic effects that might occur in the event of relatively significant acute and/or chronic exposure. Potential routes of exposure include inhalation, dermal contact, ingestion, and eye contact. The primary exposure route of concern during site work is ingestion of contaminated water, soil, or sediment; however, chemical exposure is considered unlikely and highly preventable. In general, the chemicals that may be encountered at this Site are not expected to be present at concentrations that could result in significant exposures. The types of planned work activities and use of monitoring procedures and protective measures will limit potential exposures at this Site. The use of appropriate personal protective equipment (PPE) and decontamination practices will assist in controlling exposure by means of all pathways to the contaminants of concern (COCs) listed in the following table.

Chemical Hazard	OSHA or DOSH-Permissible Exposure Limits (8-hour TWA/STEL)	Routes of Exposure	Potential Toxic Effects	Maximum Historical Concentration ⁽¹⁾
Lignosulfonates	None established	Inhalation, skin/eye contact, ingestion	Skin irritation, serious eye damage, kidney damage	Not available
Organic acids	None established	Inhalation, skin/eye contact, ingestion	Skin burns, irritation, and eye damage Inhalation can irritate and damage the respiratory tract including nose, throat, and lungs and cause burning pain in the nose and throat, coughing, wheezing, shortness of breath, and pulmonary edema. Fumes can be suffocating. Ingestion can cause severe injury to the digestive tract leading to death.	Not available
Volatile Sulfur Compounds				
Hydrogen sulfide	10 ppm / 15 ppm	Inhalation, skin and/or eye contact	Eye irritation, respiratory system; apnea, coma, convulsions; conjunctivitis, eye pain, lacrimation (discharge of tears), photophobia (abnormal visual intolerance to light), corneal vesiculation; dizziness, headache, lassitude (weakness, exhaustion), irritability, insomnia; gastrointestinal disturbance; liquid: frostbite	Not available
Methyl mercaptan	0.5 ppm / none established	Inhalation, ingestion, skin and/or eye contact	Very little known: compared to hydrogen sulfide toxic effects	Not available

Chemical Hazard	OSHA or DOSH-Permissible Exposure Limits (8-hour TWA/STEL)	Routes of Exposure	Potential Toxic Effects	Maximum Historical Concentration ⁽¹⁾
Volatile Sulfur Compounds (cont.)				
Dimethyl sulfide	10 ppm / none established	Inhalation, skin/eye contact, dermal contact, ingestion	Inhalation causes moderate irritation of upper respiratory system. Contact of liquid with eyes causes moderate irritation. Repeated contact with skin may extract oils and result in irritation. Ingestion causes nausea and irritation of mouth and stomach.	Not available
Chlorine dioxide	0.1 ppm / 0.3 ppm	Inhalation, skin/eye contact, dermal contact, ingestion	Inhalation, ingestion or contact (skin, eyes) with vapors, dusts or substance may cause severe injury, burns or death. Fire may produce irritating and/or toxic gases.	Not available
Sulfur dioxide	2 ppm / 5 ppm	Inhalation, skin/eye contact, dermal contact, ingestion	Eye and respiratory tract irritant. May cause death or permanent injury after very short exposure to small quantities. 1,000 ppm causes death in from 10 minutes to several hours by respiratory depression. Persons with asthma, subnormal pulmonary functions, or cardiovascular disease are at a greater risk.	Not available

Chemical Hazard	OSHA or DOSH-Permissible Exposure Limits (8-hour TWA/STEL)	Routes of Exposure	Potential Toxic Effects	Maximum Historical Concentration ⁽¹⁾
Volatile Sulfur Compounds (cont.)				
Nitrogen oxide	None established / 1 ppm	Inhalation, skin/eye contact, dermal contact, ingestion	Irritate eyes, nose, throat, and lungs; shortness of breath, tiredness, and nausea; rapid burning, spasms, and swelling of tissues in the throat and upper respiratory tract, reduced oxygenation of body tissues, a build-up of fluid in lungs, and death	Not available
Metals				
Chromium(VI)	0.005 mg/m ³ / none established	Inhalation, skin/eye contact, dermal contact, ingestion	Irritation to the lining of the nose; nose ulcers; runny nose; breathing problems, such as asthma, cough, shortness of breath, or wheezing; irritation and ulcers in the stomach and small intestine, and anemia Skin contact can cause skin ulcers. Known carcinogen. Chronic inhalation linked to lung cancer. Can cause reproductive and developmental defects.	Not available
Arsenic	0.002 mg/m ³	Inhalation, skin absorption, ingestion, skin/eye contact	Ulceration of nasal septum; dermatitis; GI disturbances; peripheral neuropathy; respiratory irritation; hyperpigmentation of skin; carcinogenic	Not available

Chemical Hazard	OSHA or DOSH-Permissible Exposure Limits (8-hour TWA/STEL)	Routes of Exposure	Potential Toxic Effects	Maximum Historical Concentration ⁽¹⁾
Metals (cont.)				
Barium	0.5 mg/m ³ / none established	Inhalation, skin absorption, ingestion, skin/eye contact	Inhalation or contact with vapors, substance or decomposition products may cause severe injury or death. May produce corrosive solutions on contact with water. Fire will produce irritating, corrosive and/or toxic gases.	Not available
Cadmium	0.005 mg/m ³ 0.5 mg/m ³	Inhalation, ingestion	Pulmonary edema, cough, chest tight, headache; chills, muscle aches; nausea, vomiting, diarrhea; mild anemia; carcinogenic	Not available
Chromium	None / 0.5 mg/m ³	Inhalation, ingestion, skin/eye contact	Irritation of eyes; sensitization dermatitis	Not available
Lead	0.05 mg/m ³	Inhalation, ingestion, skin/eye contact	Weakness, insomnia, facial pallor, weight loss, constipation, abdominal pain, anemia, tremors, eye irritation, hypotension, central nervous system deficits, reproductive system effects	Not available
Mercury	0.025 mg/m ³ / none established	Inhalation, ingestion, skin/eye contact	Slight muscular tremor; loss of appetite; nausea; diarrhea; neurological impairment, kidney and cardiovascular disturbances	Not available

Chemical Hazard	OSHA or DOSH-Permissible Exposure Limits (8-hour TWA/STEL)	Routes of Exposure	Potential Toxic Effects	Maximum Historical Concentration ⁽¹⁾
Metals (cont.)				
Selenium	0.2 mg/m ³ / none established	Inhalation, ingestion, skin/eye contact	Highly toxic, may be fatal if inhaled, ingested or absorbed through skin; avoid any skin contact. Fire may produce irritating, corrosive and/or toxic gases.	Not available
Silver	0.01 mg/m ³ / none established	Inhalation, dermal contact, ingestion	Breathing problems, lung and throat irritation, stomach pains; skin contact can cause mild allergic reactions: rash, swelling, inflammation	Not available
Aluminum	10 mg/m ³ / none established	Inhalation	Irritation to eyes, skin, respiratory system	Not available
Copper	1 mg/m ³	Inhalation of particulates, ingestion, skin and/or eye contact	Irritation to eyes and respiratory system, cough, dyspnea, wheezing	Not available
Zinc	5 mg/m ³ / 10 mg/m ³	Ingestion	Vomiting, diarrhea, and abdominal pain; liver toxin	Not available
Cobalt	0.02 mg/m ³ / none established	Inhalation, ingestion, skin and/or eye contact	Cough, dyspnea (breathing difficulty), wheezing, decreased pulmonary function; weight loss; dermatitis; diffuse nodular fibrosis; respiratory hypersensitivity, asthma	Not available

Chemical Hazard	OSHA or DOSH-Permissible Exposure Limits (8-hour TWA/STEL)	Routes of Exposure	Potential Toxic Effects	Maximum Historical Concentration ⁽¹⁾
VOCs				
TCE	25 ppm / 100 ppm	Inhalation, ingestion, skin and/or eye contact	Dermatitis; bronchitis; lung, skin, and stomach cancer	Not available
Methane	1000 ppm / none established	Inhalation	Dizziness, irritation, asphyxiation, central nervous system depression, cardiac sensitization Contact with gas, liquefied gas or cryogenic liquids may cause burns, severe injury and/or frostbite	Not available
Benzene	1 ppm / 5 ppm	Inhalation, skin absorption, ingestion, skin/eye contact	Irritation to eyes, skin, mucus membranes; headache; fatigue; blurred vision; dizziness; convulsions; liver, kidney damage; carcinogenic	Not available
Toluene	100 ppm / 150 ppm	Inhalation, skin absorption, ingestion, skin/eye contact	Irritation to eyes, nose, confusion, euphoria, dizziness, headache; dilated pupils; anxiety, muscle fatigue, insomnia; dermatitis; liver, kidney damage	Not available
Ethylbenzene	100 ppm / 125 ppm	Inhalation, ingestion, skin/eye contact	Irritation to eyes, skin, mucus membranes; headache; dermatitis; narcosis, coma	Not available

Chemical Hazard	OSHA or DOSH-Permissible Exposure Limits (8-hour TWA/STEL)	Routes of Exposure	Potential Toxic Effects	Maximum Historical Concentration ⁽¹⁾
VOCs (cont.)				
Xylenes	100 ppm / 150 ppm	Inhalation, skin absorption, ingestion, skin/eye contact	Irritation to eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, anorexia, nausea, vomiting, abdominal pain; dermatitis	Not available
Naphthalene	10 ppm / 15 ppm	Inhalation, ingestion, skin/eye contact, skin absorption	Hemolytic anemia, liver damage, neurological damage, cataracts, potential occupational carcinogen	Not available
MTBE	40 ppm / none established	Inhalation, ingestion, skin/eye contact,	Dizziness or suffocation Contact may irritate or burn eyes or skin. May be harmful if swallowed.	Not available
EDB	20 ppm / none established	Inhalation, ingestion, skin/eye contact, skin absorption	Local inflammation, blisters and ulcers on skin; irritation in lungs and organic injury to liver and kidneys; may be absorbed through skin, carcinogenic	Not available
EDC	1 ppm / 2 ppm	Inhalation, ingestion, skin/eye contact, skin absorption	Inhalation of vapors causes nausea, drunkenness, and depression. Corneal injury, burns, and may be fatal if inhaled, ingested or absorbed through skin	Not available

Chemical Hazard	OSHA or DOSH-Permissible Exposure Limits (8-hour TWA/STEL)	Routes of Exposure	Potential Toxic Effects	Maximum Historical Concentration ⁽¹⁾
Petroleum Products				
Diesel-range organics and oil-range organics	None established	Inhalation, skin/eye contact	Irritation of eyes, reduction in pulmonary function, and effects to central nervous system	Not available
Gasoline-range organics	300 ppm / 500 ppm	Inhalation, skin absorption, ingestion, skin/eye contact	Irritation of eyes, skin, mucus membranes; headache; fatigue; blurred vision; dizziness; slurred speech; confusion; convulsions; liver, kidney damage	Not available
Miscellaneous				
Methanol	200 ppm / 250 ppm	Inhalation, ingestion, skin/eye contact, skin absorption	Severe burns to skin and eyes. Fire will produce irritating, corrosive and/or toxic gases. Vapors may cause dizziness or asphyxiation.	Not available
Phenols	5 ppm / none established	Inhalation, ingestion, skin/eye contact, skin absorption	Eye irritant/lachrymator, increased heart rate, convulsions, kidney/liver damage, death	Not available
Antifreeze	None established	Ingestion, skin/eye contact	Eye irritation, skin irritation, encephalopathy, acute poisoning	Not available
PCBs	1 mg/m ³ / none established	Inhalation, ingestion, skin/eye contact	Burns to skin and eyes, dizziness or asphyxiation, lung damage; carcinogen	Not available

Chemical Hazard	OSHA or DOSH-Permissible Exposure Limits (8-hour TWA/STEL)	Routes of Exposure	Potential Toxic Effects	Maximum Historical Concentration ⁽¹⁾
Miscellaneous (cont.)				
Sodium hydroxide	2 mg/m ³ / none established	Inhalation, ingestion, skin/eye contact	Damage to upper respiratory tract and lungs, mild nose irritation, and pneumonitis; severe damage to mucous membranes; severe scar formation or perforation; severe eye damage	Not available
PCP	0.5 mg/m ³ / none established	Inhalation, ingestion, skin/eye contact	Dust or vapor irritates skin and mucous membranes, causing coughing and sneezing. Ingestion causes loss of appetite, respiratory difficulties, anesthesia, sweating, coma. Overexposure can cause death.	Not available
D/Fs	None established	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation to eyes; allergic dermatitis, chloracne; porphyria; gastrointestinal disturbance; possible reproductive, teratogenic effects In animals: liver, kidney damage; hemorrhage; carcinogen	Not available
Laboratory preservatives (hydrochloric acid, methanol, sodium bisulfate, nitric acid)	Not applicable	Dermal contact, eye contact	Irritation to skin or eyes Avoid contact by proper use of PPE during sample handling and collection.	Not applicable

Note:

1 Maximum historical concentrations were not identified in available records for the site.

Abbreviations:

DOSH Division of Occupational Health and Safety

GI Gastrointestinal

mg/m³ Milligrams per cubic meter

ppm Parts per million

STEL Short-term exposure limit

TWA Time-weighted average

4.2 JOB HAZARD ANALYSIS

This section identifies potential hazards associated with each task listed in Section 2.3 of this HASP. Tasks have been grouped according to the types of potential hazards associated with them.

Work Task	Potential Hazards	Actions to Control Hazards
General work tasks	Vehicle traffic and hazards when working near active operations	Use of signs, signals, and barricades is required. Spotters will be used to monitor traffic during work activities along roadways. Personnel working are required to wear American National Standards Institute (ANSI) class 2 vests or garments within any right-of-way (ROW). Safety vests will be worn at all times while conducting outdoor work. Traffic control plans and permits from the City of Aberdeen or Cosmopolis will be required as needed for any lane closures, work in sidewalks and equipment or truck movement that is against established traffic signals. Avoid working with your back to traffic whenever possible. Be aware of pedestrians, particularly while driving the vehicle across the walking path south of the Westport Ponds.
	Interference from members of the public, vandalism	Work zones shall be large enough to contain all hazards that are anticipated and shall be sufficiently marked. Configure work zones and position equipment to minimize hazards to the public and prevent entry of third parties into the work zone. Stop work if third parties access work zones without authorized entry. Work shall halt until the unauthorized person has been removed from the work area. All personnel will practice limited engagement with visitors. Questions and interactions with the public will be reported to the PM. If a visitor becomes aggressive or agitated, staff will try to deescalate the situation and summon assistance from the field lead.

Work Task	Potential Hazards	Actions to Control Hazards
General work tasks (cont.)	Acidic and alkaline site conditions	Avoid walking through puddles or flooded areas west of the acid plant; the vicinity of the power house, education center, and chip storage experience flooding with low pH. The earth berm in caustic storage AST area should be avoided due to high pH conditions.
	Relic ASTs	Maintain a safe distance from the ASTs; brittle conditions present a chemical exposure hazard.
Load and transport equipment on vehicles	Damage or injury from unsecured cargo	Ensure that all cargo is secured when packing equipment in or out. Prevent movement of equipment while vehicle is in operation.
	Injuries during the removal of work zone delineators	Verify that traffic is clear before removing work zone delineators and/or traffic control devices.
	Musculoskeletal injuries (strain, sprain, broken bones, etc.) from lifting/moving tools and equipment	Use proper lifting techniques and mechanical devices where appropriate. The proper lifting procedure first involves testing the weight of the load by tipping it. If in doubt, ask for help. Do not attempt to lift a heavy load alone. Take a good stance and plant your feet firmly with legs apart, one foot farther back than the other. Make sure you stand on a level area with no slick spots or loose gravel. Use as much of your hands as possible. Push up with your leg muscles. Keep your back straight, almost vertical. Bend at the knees, not at the waist and keep load centered around feet as much as possible. Avoid quick, jerky movements and twisting motions. Never try to lift more than you are accustomed to.
Working in forested/brushy areas	Impact injury from falling branches/debris and hazards including trips, scratches, or cuts from branches and limbs	Scan area for hazard trees/branches (leaning, broken). Note where a leaning tree would fall, and do not work in that area or anywhere under a leaning tree. Clear work area of branches (poking hazards) and trip hazards prior to work.
	Cuts and contusions	Wear eye protection and cut-resistant work gloves (minimum level 2) when clearing branches and overgrowth.

Work Task	Potential Hazards	Actions to Control Hazards
Working in forested/brushy areas (cont.)	Wildlife: bears, elk, other large game	Field teams will be required to have a minimum of 2 members and maintain awareness of surroundings. All staff will have bear spray and air horns. Make noise to alert animals of your presence and do not approach a wild animal under any circumstances. Dispose of all food and trash appropriately. Leave all food in the security of a vehicle while in the field. Immediately report an animal bite, or any aggressive wildlife behavior, as an emergency. If a large animal is encountered with cubs/babies, immediately retreat slowly and calmly to a safe distance. When possible, use a bear guard.
Water level measurements, well surveying activities, well development, utility survey, and groundwater sampling from monitoring wells	Bite/sting from insects inside well monument	Visually check wells for insects or other biological hazards prior to opening. Wear long sleeves and gloves.
	Lacerations or abrasions from removing a well cap (especially if under pressure) or nearby vegetation	Clear work area of branches and trip hazards prior to setting up. Open well cap slowly to depressurize well casing. Stay out of line of fire above well cap.
	Slip, trip, or fall hazards	Steel-toed boots must be worn on-site at all times while heavy equipment is present. Pay attention to footing on uneven or wet terrain and do not run. Keep work areas organized and free from unmarked trip hazards.
	Heat and cold exposure hazards	Refer to Section 5.3 in the APP.
	Exposure to site contaminants in groundwater	Wear proper PPE including safety glasses at all times while on-site. If a pressure washer is used to decontaminate heavy equipment, a face shield will be worn over safety glasses or goggles. Care will be taken during decontamination procedures and groundwater sampling to avoid splashing or dropping equipment into decontamination water.

Work Task	Potential Hazards	Actions to Control Hazards
Soil boring sampling	Overhead hazards, falling and/or sharp objects, bumping hazards, construction equipment	All personnel will wear hard hats at all times when overhead hazards exist, such as during drilling activities and around heavy or large equipment.
	Underground utility damage	Utilities are to be surveyed with a public and private utility locate and marked prior to work.
	Exposure to loud noise	Wear earplugs or protective ear covers when heavy equipment is operating and when a conversational level of speech is difficult to hear at a distance of 3 feet; when in doubt, a sound level meter may be used on-site to document noise exposure.
Monitoring well installation	Underground utility damage	Utilities are to be surveyed with a public and private utility locate and marked prior to work.
Sediment grab sampling	Skin contact with contaminated sediments	Wear modified Level D PPE, or at minimum chemical-resistant safety boots and nitrile inner gloves.
Porewater sampling	Drowning	Refer to work near water.
Work near water	Drowning	Wear a personal floatation device at all times when working in or near water. Carry objects so that the ground is visible in front of your feet at all times; team lift as necessary.
Driving through ponded areas	Hidden obstacles, unstable subgrade, vehicle damage, drowning	Take alternate routes when possible. If crossing ponded areas, verify depth by probing and do not cross if more than 6 inches of water is present. Use 4-wheel drive if available. Do not cross ponding if there is low visibility or unknown depths.

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5.0 Site Controls and Monitoring

The following sections describe site controls and monitoring that will be implemented during site field activities. The HSO/SS, or a designated alternate (SSO), is responsible for inspecting the work area daily and identifying additional hazards. Personnel responsibilities are further described in the APP.

5.1 DAILY SAFETY MEETINGS

A safety meeting will be conducted by the HSO/SS or designated SSO daily prior to the start of work. Additional safety briefings or safety checks should also be performed when switching tasks or whenever new hazards are identified. Safety meetings topics and attendance will be recorded on the Daily Tailgate Safety Meeting and Debrief Form provided in Attachment D.2.

Any good catches or incidents that occur on the job site will be recorded on the Good Catch and Incident Reporting Form provided in Attachment D.3.

5.2 ON-SITE COMMUNICATIONS

On-site communications will be conducted primarily via cellphones. Field staff must work in a buddy system or with a designated contractor. Teams are required to notify the field team lead prior to moving to a new work area. Refer to Phase 1 RIWP Figures 6.1 through 6.3 for the correct geographic terms for specific Site investigation activities.

Handheld radios may be utilized in lieu of, or in conjunction with, cellphones to maintain reliable communication, particularly in areas with limited or inconsistent cellular coverage. When warranted by site conditions or an emergency, additional communication devices such as vehicle horns, foghorns, or whistles may be used to ensure continuous contact between field teams and the field lead.

5.3 EMERGENCY MUSTER POINTS

When working in the Mail Mill Complex area, the muster point will be directly northwest of the main office, adjacent to the Medical & Fitness Center. The Main Mill Complex muster point is shown on Figure D.3.

During work along the Wood Stave Pipe Corridor, the muster point will be designated at the daily tailgate meeting, depending on where work is occurring that day.

During work at the Westport Ponds, the muster points are located near the entrance adjacent to the East Pond and at the gate directly to the east of Pond A. The muster point will be decided based on where work is occurring.

The APP describes required emergency equipment and procedures to be followed in the case of medical emergency; release of a hazardous substance; or other emergencies such as a thunderstorm, vehicle collision, fire, or earthquake.

5.4 WORK AREAS

Field personnel are prohibited from entering any buildings in the Main Mill Complex and should restrict their movements to the extent practicable within the zones displayed on Figure D.3. The Mail Mill Complex property is fenced along most of the property lines with gates restricting entrance to access roads.

Figure D.3
Main Mill Complex Restricted Zones



When working in or near the ROW alongside the Wood Stave Pipe (sidewalks, roadway, and crosswalks), orange cones and/or flagging will be placed around the work area. Work within the roadway will be avoided to the extent possible during investigation activities. If work requires being within a roadway, efforts will be made to minimize the time within the roadway. Vehicles and equipment shall be positioned such that the equipment is between traffic and the personnel, never such that personnel are between traffic and equipment. All work within the ROW will be coordinated with the city and conducted in accordance with an approved Traffic Control Plan.

The Westport Ponds are partially fenced; however, a public walkway runs alongside the ponds and is subject to frequent break-ins. Temporary fencing will be advanced as needed to restrict the movement of the public in work areas in the Westport Ponds Area.

During field activities, an exclusion zone will be established when working with contaminated materials. The exclusion zone will be set up during drilling, sampling, and/or monitoring well installation activities using traffic cones in the vicinity of the drill rig or sampling area, if the work area is adjacent to a residential zone or roadway.

A contaminant reduction zone will be set up at the entry/exit point of the exclusion zone. The contaminant reduction zone will contain the necessary elements to perform personnel and equipment decontamination as described in Section 5.6. The support zone will consist of vehicles and temporary restrooms located outside the fenced perimeter during work.

In the event of a multiday field effort or a late-night finish, all field equipment (high-dollar-value items) must be stored in a locked garage or other locked storage area for the night and should not be left in the vehicle. Field personnel are responsible for restricting access to the fenced portions of the Site and assuring that all persons entering the fenced area are authorized and have been appropriately notified of hazards. A security guard may be hired to restrict unauthorized individuals from entering the investigation area if interference from the public or vandalism becomes a safety issue or interferes with investigation activities.

5.5 PERSONAL PROTECTIVE EQUIPMENT

Work will proceed in standard Level D PPE as described in the APP. PPE should be inspected for defects before each use. Field staff will use clean, disposable nitrile gloves when handling sample material. Chemical protective gloves will be used when working with chemicals, potentially contaminated soil, groundwater, condensate, NAPL, or other materials. The type of glove used is dependent upon the degree of potential chemical exposure: nitrile for contamination less than cleanup levels, laminate film and PVA for more concentrated exposure such as condensate or NAPL. Check manufacturer chemical compatibility charts. ANSI class 2 high-visibility vests or garments are required for work within ROWs, around heavy equipment, and on road shoulders.

5.6 DECONTAMINATION AND WASTE DISPOSAL

Field staff should always follow the best practices for prevention of contamination detailed in the APP.

Large equipment and vehicle decontamination generally consists of dry sweeping to achieve a visually debris-free surface. If dry sweeping is not sufficient to remove visual evidence of debris, equipment will be decontaminated by pressure washing with detergent solution, followed by a potable water rinse. Drill rods will be decontaminated using the above procedure or by steam cleaning. Reusable sampling equipment will be decontaminated in accordance with the Sampling and Analysis Plan and Quality Assurance Project Plan and will include dry-brushing or performing a tap water rinse to remove particles of debris, followed by scrubbing with a biodegradable soap solution (such as Alconox or Liquinox) and a final rinse with distilled water. Disposable sampling equipment will be dry brushed to remove particles of debris then disposed of as municipal solid waste. Personnel decontamination will include a boot wash and removal of disposable gloves/other disposable PPE.

Floyd|Snider and its subcontractors will use safe and prudent waste collection and housekeeping practices to minimize the spread of contamination beyond the work zone and the amount of investigation-derived waste (IDW). The Floyd|Snider HSO/SS will work with site personnel to ensure the proper collection, packaging, and identification of waste materials so that waste materials will be properly disposed of.

IDW will include purged groundwater from the collection of groundwater samples, excess soil and sediment from the collection and processing of soil and sediment grabs and cores, and disposable materials used during fieldwork (e.g., disposable PPE, plastic sheeting, paper towels). Purged groundwater and excess soil and sediment will be collected in 5-gallon buckets or 55-gallon drums and stored on-site until it has been sufficiently characterized for disposal.

All disposable sampling materials and PPE used in sample processing will be placed in heavy-duty garbage bags or other appropriate containers and disposed of as trash in the municipal collection system.

5.7 AIR MONITORING

Air monitoring using a photoionization detector (PID) will be performed if personnel are likely to be exposed to volatile contaminants.

Contaminant concentrations in soil and groundwater at the Site are present at concentrations that are not expected to result in vapor concentrations that exceed allowable OSHA levels. Potential volatile COCs include chlorinated solvents including TCE, methane, BTEX, MTBE, EDB, and EDC in soil or groundwater.

Action levels for air monitoring are presented in the following table with PID calibrated to isobutylene with the correction factor for benzene:

Monitoring Equipment	VOC Concentration	Action
PID with 10.6 eV lamp Measures total organic vapors	Less than 0.47 ppm; less than 2.35 ppm for no longer than 15 minutes	Continue operations in Level D PPE. Work upwind of excavation area when possible.
	Greater than 0.47 ppm and less than 2.35 ppm; intermittent	Leave work area and allow vapor to dissipate; use engineering controls if necessary. Monitor VOC concentration every 5 minutes; resume work once concentrations are less than 0.47 ppm for 15 minutes.
	Greater than 2.35 ppm	Stop operations and evacuate area. Do not resume work until engineering controls are able to maintain VOC concentrations less than 0.47 ppm in breathing space are in place.

Monitoring Equipment	VOC Concentration	Action
GEM Landfill Gas Analyzer or 4-gas meter	If all are true: • Oxygen is >19.5% to <23.5% by volume • Carbon monoxide is <35 ppm • Methane is <1,000 ppm	Continue work. Take readings every 30 to 60 minutes.
Measures oxygen, carbon monoxide, and methane	If any of: • Oxygen is <19.5% or >23.5% by volume • Carbon monoxide is >35 ppm • Methane is >1,000 ppm	Stop work required. ⁽¹⁾ Leave work area and contact PM and SSO for guidance.

Note:

- 1 Contact with the PM and SSO must be made prior to continuance of work. Corrective actions may include temporary work stoppage to allow vapors to dissipate and then returning to work if air monitoring data indicate conditions are less than action levels, forced ventilation of work area, or other engineering or administrative controls to eliminate or minimize exposure.

Abbreviation:

eV Electronvolts

As applicable, organic vapor concentrations shall be monitored in the field with a PID or flame ionization detector. Flammable vapors or gasses are monitored with an oxygen (O₂) and lower explosive level (LEL) instrument (4-gas meter or GEM 5000 Landfill Gas Analyzer). Organic vapor measurements are usually taken in the breathing zone of the worker, whereas O₂ and LEL measurements are taken at the point of operation (e.g., monitoring wellhead). Monitoring with the 4-gas meter must occur during ground-disturbing activities in areas with potential methane hazards, such as the Woodwaste (Knots) Landfill, Rejects Area, wood debris storage/disposal area, former log storage, and hog fuel piles.

PID monitoring will also be conducted continuously during drilling at the Site of work and the nearest downwind perimeter. Once drilling has concluded, monitoring will take place hourly or as outlined in the daily tailgate meeting based on site conditions. Visual monitoring for dust will be conducted by the HSO/SS to ensure that inhalation of contaminated soil particles does not occur. If visible dust is present in the work area, work will cease, and the area will be cleared of staff until the dust settles. Water may be used to suppress any dust clouds generated during work activities.

The HSO/SS will visually inspect the Site during active work at least daily to identify any new potential hazards. If new potential hazards are identified, immediate measures will be taken to eliminate or reduce the risks associated with these hazards.

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6.0 Approvals

Project Manager

Date

Project Health & Safety Officer

Date

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I have read this HASP and understand its contents. I agree to abide by its provisions and will immediately notify the HSO/SS if site conditions or hazards not specifically designated herein are encountered.

[illegible]

Phase 1 Remedial Investigation Work Plan

Cosmo Specialty Fibers Site

Appendix D

Attachment D.1 Accident Prevention Plan

Accident Prevention Plan

April 2026



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List of Abbreviations

Abbreviation	Definition
AED	Automated external defibrillator
APP	Accident Prevention Plan
AQI	Air quality index
COPD	Chronic obstructive pulmonary disease
CPR	Cardiopulmonary resuscitation

Abbreviation	Definition
FFR	Filtering facepiece respirator
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSO/SS	Health and Safety Officer/Site Supervisor
JHA	Job Hazard Analysis
JSA	Job Safety Analysis
L&I	Washington State Department of Labor & Industries
MTCA	Model Toxics Control Act
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Act
PEL	Permissible exposure limit
PM	Project Manager
PPE	Personal protective equipment
RPP	Respiratory Protection Program
SDS	Safety Data Sheet
SSO	Site Safety Officer
USEPA	U.S. Environmental Protection Agency
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act

1.0 Plan Objectives and Applicability

This Accident Prevention Plan (APP) describes the policies and best practices established by Floyd|Snider to ensure the safety of employees to the maximum extent possible when performing their work duties. Employee safety is Floyd|Snider's highest priority. Employees are encouraged to use the Health and Safety department as a resource in identifying potential hazards and the appropriate precautions to address them. While additional safety precautions may impact project schedules and costs, Floyd|Snider will ultimately benefit as accidents are avoided.

This APP has been written to comply with the standards of the Occupational Safety and Health Act (OSHA) and Washington Industrial Safety and Health Act (WISHA) as they pertain to work activities performed by Floyd|Snider.

This APP applies to all employees of Floyd|Snider. It consists of the following components:

- A description of the roles and responsibilities of all Floyd|Snider personnel in ensuring worker safety
- General safety policies for the office and the field job site
- Procedures to follow in an emergency
- Information on common hazards and steps that should be taken to mitigate these hazards
- A description of the basic safety controls that should be implemented on all field job sites
- Training requirements for field staff
- Safety record keeping and reporting requirements and procedures
- Returning to a site after a safety incident

2.0 Roles and Responsibilities

All staff members share responsibility for safety. The roles and responsibilities for Floyd|Snider staff in ensuring company safety are described in the following sections.

2.1 BOARD OF DIRECTORS

The Floyd|Snider Board of Directors consists of the elected senior officers of Floyd|Snider who establish the company's culture of safety. These individuals set policy for the company, including safety policy. The Management Committee, which consists of the Board of Directors and additional shareholder representatives, is also responsible for enforcement of this APP.

2.2 HEALTH AND SAFETY COMMITTEE

The Health and Safety Committee is composed of field and management staff, who meet on a quarterly basis or more frequently if needed to review and update the Floyd|Snider Health and Safety Program. The Health and Safety Committee is responsible for making updates to this APP as approved by the Management Committee. Health and Safety Committee meeting minutes are recorded and made accessible on Floyd|Snider's Health and Safety department page on SharePoint.

2.3 HEALTH AND SAFETY ADMINISTRATOR

The Health and Safety Administrator receives, organizes, and reviews reports of good catches and incidents in the workplace. The Health and Safety Administrator is responsible for the administration of benefits, working with managers to identify OSHA-reportable incidents, and managing the OSHA reporting process. The Health and Safety Administrator is also responsible for documentation of Health and Safety Committee meeting minutes and employee training record keeping. The Health and Safety Administrator is supported by the Board of Directors and the Health and Safety Committee, who are responsible for taking corrective actions when good catches, incidents, and other safety issues identified in this plan occur.

2.4 PROJECT MANAGERS

Project Managers (PMs) reinforce the Floyd|Snider safety culture. During all phases of projects, PMs review health and safety issues and will have authority to allocate resources and personnel to safely accomplish project work.

PMs direct the field personnel at a job site. PMs coordinate with the project Health and Safety Officer/Site Supervisor (HSO/SS) to ensure that the scope of the project and site conditions are accurately documented in all project safety materials and that all Floyd|Snider personnel on-site have received the required safety training and understand the procedures to follow should an incident occur on-site. PMs review safety documentation materials with the HSO/SS at intervals determined prior to the start of field events and report good catches and incidents to the Health and Safety Administrator.

2.5 FIELD HEALTH AND SAFETY OFFICER AND SITE SUPERVISOR

The HSO/SS prepares and/or approves the site Health and Safety Plan (HASP) and any amendments thereof and is responsible for full implementation of all elements of the HASP.

The HSO/SS will advise the PM and project personnel on all potential health and safety issues of the field investigation activities to be conducted at a site. The HSO/SS will specify required exposure monitoring to assess site health and safety conditions, modify the site HASP based on field assessment of health and safety accidents and/or incidents, and recommend corrective action if needed. The HSO/SS will report all accidents and/or incidents to the PM. If the HSO/SS observes unsafe working conditions by Floyd|Snider personnel or any contractor personnel, the HSO/SS will suspend all work until the hazard has been addressed.

The HSO/SS is responsible for conducting daily tailgate safety meetings daily before the start of field work and reporting good catches and incidents as needed. Daily tailgate safety meetings should identify the work to be completed, safety hazards likely to be encountered, good catches from the previous day (for multiple-day field events), and the appropriate work practices needed to minimize exposure to these hazards. Tailgate safety meeting forms are included in the HASP documents and are available in Survey123.

2.6 FIELD SITE SAFETY OFFICER

The field Site Safety Officer (SSO) may be a person dedicated to this task, to assist the HSO/SS during field work activities. The SSO will ensure that all personnel have appropriate personal protective equipment (PPE) on-site and that PPE is properly used. The SSO will assist the HSO/SS in field observation of Floyd|Snider personnel safety. If a health or safety hazard is observed, the SSO shall suspend all work activity. The SSO will conduct on-site safety meetings daily before work commences. All health and safety equipment will be calibrated daily and records kept in the daily field logbook. The SSO may perform exposure monitoring if needed and will ensure that equipment is properly maintained.

2.7 FLOOR WARDENS

Floor Wardens are Floyd|Snider staff members who have volunteered to coordinate Floyd|Snider's response in case of an emergency at Union Square. Floor Wardens are responsible for ensuring that all staff have evacuated the building if an evacuation order is issued by building management and accounting for staff at the emergency muster point. Floor Wardens also post and update emergency evacuation routes and maintain maintenance records for fire extinguishers located at the office. The names of current Floor Wardens are posted in the office above fire extinguishers and on the Floyd|Snider SharePoint home page.

2.8 EQUIPMENT MANAGER

The Equipment Manager is responsible for ensuring that all field equipment, including the company vehicle, is in safe working order and for keeping records of equipment maintenance.

Employees must report any issues with the company vehicle or field equipment to the Equipment Manager. The Equipment Manager will designate an alternate for days when the manager will not be available to assist field staff with urgent equipment or vehicle issues.

2.9 FLOYD|SNIDER PERSONNEL

All Floyd|Snider project personnel will take precautions to prevent accidents and/or incidents from occurring to themselves and others. Employees must read, understand, and sign this APP. Employees will report all incidents and good catches to their PM, HSO/SS, or SSO and inform of any physical conditions that could impact their ability to perform their work.

2.10 EMERGENCY CONTACTS

All Floyd|Snider staff must designate a person outside of the company who may be contacted in case of an emergency in which a staff member requires medical care. Emergency contacts are responsible for making decisions regarding medical treatment in the event that the staff member is incapacitated, or for contacting the individual who has been designated authority by the staff person to make such decisions if they do not have that authority.

Emergency contact information will be provided to the Health and Safety Administrator and updated as needed, at a minimum frequency of once per year. The Health and Safety Administrator is responsible for maintaining emergency contact information in the Floyd|Snider firm contact database and making this information available on the Floyd|Snider SharePoint home page.

3.0 Safety Policies

The safety policies presented in this section have been developed to ensure the safety of all staff. They should be considered the minimum requirements to maintain a safe workplace; staff should be vigilant at all times and take the needed actions to identify and correct unsafe situations.

3.1 GENERAL OFFICE SAFETY

This section describes the policies that have been developed to keep staff safe in all work scenarios, including at the office and on the job site.

3.1.1 Injury Prevention

In office areas, trips and falls are the primary cause of acute injury, and they can be easily prevented. There are many different ways to prevent injury, including, but not limited to:

- Keep all work areas, aisles, and hallways clear at all times.
- Make sure all exits are accessible, clearly marked, and properly illuminated.
- Keep all work and storage areas in a sanitary condition; floors shall be clean and, as much as possible, kept in a dry condition. If floors are wet, they should be marked with signage to notify others.
- Pile or store materials in a stable manner, so that they will not be subject to falling.
- Keep walkways and work areas free of electrical cords.
- Never make repairs to light fixtures unless authorized to do so by a supervisor.
- Use a stepstool when reaching overhead objects.
- Do not lift equipment and materials weighing more than 20 pounds by yourself; ask for help and/or use a hand truck.
- When carrying loads, exercise care to avoid overexertion and strain. Use proper lifting and reaching techniques.
- Use adjustable desk chairs to reduce musculoskeletal injuries; ask for assistance if you are unfamiliar with proper ergonomic adjustments for your desk, computer, and chair.
- Report all unsafe conditions and symptoms of injury to the Health and Safety Administrator.
- Exercise caution in moving about the office.

3.1.2 Administration of Cardiopulmonary Resuscitation and First Aid

Cardiopulmonary resuscitation (CPR) and first aid should only be administered by individuals with the appropriate training. Floyd|Snider makes CPR/automated external defibrillator (AED) and first aid training available to all staff members and requires this training for all field staff members. At least one person on a field site must be trained and have current certification in CPR/first aid. First aid kits compliant with the ANSI Z308.1-2015 Class B standard will be available

at the Floyd|Snider office and at all field sites. First aid kits for field sites additionally include basic medications (aspirin and diphenhydramine), tweezers, a clotting sponge, potable water, outdoor skin cleanser, super glue, adhesive moleskin pads, safety pins, sunblock, insect repellent, medical masks and a printed field staff emergency contact list.

3.1.3 New Employee Orientation

All new employees receive an orientation to the Floyd|Snider Health and Safety Program from a member of the Health and Safety Committee. This orientation is arranged by the assigned mentor for the new employee and includes a review of the materials available on the Health and Safety department home page (APP, HASP templates, good catch and incident forms, daily tailgate forms, training resources, etc.) as appropriate to the employee's role at Floyd|Snider, office and field safety policies, and training and documentation requirements for field and office safety.

3.1.4 Workplace Hostility

Floyd|Snider intends to provide a work environment that is free from intimidation, hostility, or other offenses that are inappropriate. Harassment of any sort—verbal, physical, or visual—will not be tolerated.

Harassment can take many forms. It may be, but is not limited to, words, signs, jokes, pranks, physical or verbal intimidation, physical contact, or violence. Harassment is not necessarily sexual in nature, although these prohibitions against harassment specifically include all forms of sexual harassment.

It is the company's policy to regard sexual harassment and other forms of harassment, as well as the threat of such harassment, as very serious matters and to prohibit them in the workplace by any person and in any form. All staff are required to complete harassment training. Floyd|Snider also makes bystander intervention training available to all staff.

3.2 FIELD SAFETY

This section describes the additional policies developed to keep field staff safe on the job site.

3.2.1 Stop Work Authority

All staff members have Stop Work authority. Stop Work could be a temporary pause in work for a few minutes or a full shutdown of work until unsafe work conditions can be addressed. If unsafe work conditions are encountered and cannot be immediately addressed by the staff on-site, the HSO/SS should report immediately to the PM. Safety hazards may include physical site conditions or dangerous work practices by subcontractors or other workers. The PM will help the field staff to make modifications to the work practices to mitigate the hazard if possible. If the unsafe conditions cannot be mitigated, field staff have the authority to stop all work until the conditions can be properly addressed.

3.2.2 Health and Safety Plan

A site-specific HASP must be prepared and made available to field staff at job sites. A site-specific HASP is required for any activities where field staff may contact contaminated material; activities such as a site visit or oversight where no contact with contaminated material or physical hazards may occur can be completed without a HASP, if approved by the PM. Each site-specific HASP should address both potential physical and chemical hazards on-site and steps taken to mitigate those hazards. The HASP can be updated at any time, especially if conditions change during field events that need to be addressed or mitigated with HASP updates. These updates should be reviewed and approved by the field staff, PM, and Field and Safety Program Manager.

3.2.3 Daily Tailgate Safety Meetings

The HSO/SS is responsible for conducting tailgate safety meetings daily before the start of field work. Tailgate safety meetings should identify the work to be completed, safety hazards likely to be encountered, and the appropriate work practices needed to minimize exposure to these hazards. Tailgate safety meetings must always cover the site-specific procedures to follow in case of an emergency. Good catches must be reported on the Daily Tailgate Safety Meeting Form or Good Catch and Incident Reporting Form and reported to the PM/HSO.

When performing field work, staff should maintain awareness of new or changing hazards at the job site. Staff should always assess then reassess the hazards when changing between tasks or changing the manner in which a task is performed and document meetings and assessments on the Daily Tailgate Safety Meeting Form.

3.2.4 Buddy System

Floyd|Snider employs the buddy system for work at job sites meaning employees are never alone in the field. The buddy system ensures that employees can get help in case of an emergency. Working in the field without another Floyd|Snider employee present may be permissible in the following scenarios:

- When the site is occupied, you are not performing an activity with high risk of injury (e.g., not working in traffic, not entering small spaces or lifting heavy objects), and you are in close proximity of other people capable of responding if you call for help.
- If you are accompanied by a teaming partner or subconsultant who may act as your buddy.
- IF FOR ANY REASON YOU ARE NOT COMFORTABLE WITH THE ASSIGNMENT OR THE CONDITIONS, DISCUSS IT WITH YOUR PM AND ASK FOR A BUDDY.

3.2.5 Check-in Procedure

All employees in the field, whether in groups or alone, will follow the check-in procedure detailed below:

- Notify front desk or your PM when you are leaving for field work. Notification can be by email, phone, or in person.
- Provide an estimated completion time of when you think you will return to the office or head home.
- At the end of the field day, before leaving the site, call the office and let the front desk or your PM (the same person you notified at the beginning of the day) know you are returning to the office or heading home. Ask to be transferred to the PM to discuss how things went.
- If you will not be finished with field work by 5:00 p.m., call the office and let the front desk know you are still in the field and that you will check in with the PM when fieldwork is finished.
- Communicate with the PM when you are finished with work and leaving the site (after 5:00 p.m.).
- If you are in a group of Floyd|Snider employees doing this field work, one person can do this check-in process on behalf of the group.
- If you fail to check in and cannot be reached by cell phone, someone from the office may be sent to locate you, or local authorities may be notified.

3.2.6 Personal Protective Equipment

Field staff must wear the appropriate PPE required in the site-specific HASP. Floyd|Snider provides employees with all required PPE such as steel-toed boots, reflective vest/jacket, hardhat, safety glasses, gloves, ear protection, and first aid kits. Field staff are responsible for wearing the appropriate PPE in accordance with the HASP, keeping their PPE in good condition, and replacing it as needed.

All work will proceed in Level D PPE, which shall include hard hat, protective footwear, hearing protection, eye protection, gloves, and sturdy outer work clothing. Protective footwear must be compliant with ASTM F2413 or the former ANSI Z41 (repealed) standard, with oil- and chemical-resistant soles, and must be securely laced without signs of excessive tread wear. For all work involving potential exposure to soil and groundwater, workers will wear nitrile gloves and Level D PPE. Personal flotation devices will be worn at all times during work in the vicinity of surface water. When working in a remote location, all teams must carry a field first aid kit. The contents of a field first aid kit include basic medications (aspirin and diphenhydramine), sterile dressings, adhesive bandages and tape, wound-cleansing towelettes, sting-relief wipes, antibiotic ointment, butterfly bandages, tweezers, safety pins, and a printed field staff emergency contact list.

All field personnel will be properly fitted for PPE and trained in the use of PPE during initial 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training (refer to Section 7.0 for additional training information). The level of protection will be upgraded by the HSO/SS whenever warranted by conditions present in the work area. The HSO/SS will ensure that

field staff know how to properly use PPE and periodically inspect equipment such as gloves and hard hats for defects.

3.2.7 Confined Spaces

Floyd|Snider field staff are not trained in confined space entry and may not enter permit-required confined spaces. It is considered entry if your head/face breaks the plane of the confined space opening.

Confined spaces are defined as a spaces that have limited or restricted means for entry or exit and are not designed for continuous occupancy. Confined spaces commonly encountered at field sites may include vaults, manholes, pits, and tanks. OSHA designates confined spaces as “permit-required confined spaces” if they exhibit one or more of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere
- Contains material that has the potential to engulf an entrant
- Has walls that converge inward or floors that slope downward and taper into a smaller area that could trap or asphyxiate an entrant
- Contains any other recognized safety or health hazard (e.g., unguarded machinery, exposed wires, extreme heat)

In accordance with OSHA regulations, only personnel with specialized confined space training may enter a permit-required confined space under a confined space entry plan.

3.2.8 Site Safety Check Requirements

The purpose of a site safety check is to proactively identify critical site-wide hazards that are likely to cause safety incidents if they are not immediately addressed. To prevent incidents, all field staff must conduct thorough safety checks each and every time before entering and conducting field work at any site. The goal is to prevent injuries, minimize risks, and ensure that hazards are identified and addressed promptly.

Responsibilities include but are not limited to the following:

- Field staff coordinating insect/pest control inspections, vegetation management, environmental hazard checks, following all safety protocols, and reporting hazards immediately. Field staff must complete a site safety assessment before beginning work to assess terrain, animal/biological hazards, debris, walking hazards, operational and heavy equipment, and potential harassment from bystanders.
- PMs coordinating site security measures, if deemed necessary, and ensure staff are properly trained in hazard identification and response procedures.
- Health and Safety Administrator providing ongoing hazard awareness training for field staff, maintaining and updating safety protocols, and providing training as needed.

3.2.9 What to Do If a Site Safety Check Identifies a Critical Hazard

If a critical hazard is identified during a site safety check, work in the affected area shall be stopped immediately if necessary to prevent injury or damage. Standard Stop Work procedures are followed; the SSO will assess the hazard, determine appropriate corrective actions, and ensure measures are implemented to eliminate or control the risk before work resumes. Corrective actions may include engineering controls, administrative controls, use of additional PPE, or coordination with the PM and Management Committee as needed.

3.2.10 Returning to the Site After a Safety Incident

In the event a safety incident occurs, steps must be taken to ensure that staff members are able to return safely to the site. First, any safety incident must be reported immediately to the SSO, HSO, and PM according to Section 8.2. A safety incident includes, but is not limited to, the following:

- Medical incidents: Insect stings, allergic reactions, cuts, falls, or other on-site injuries
- Environmental hazards: Animal or insect infestations, hazardous materials exposure, or unsafe site conditions
- Security-related events: Aggressive or threatening encounters with members of the public, theft, vandalism, or trespassing

To reduce the risk of a reoccurring safety incident, field staff in coordination with the PM must complete several steps before returning to a site after an incident. If a medical issue arises, first aid must be self-administered or administered by an individual currently certified in CPR/first aid. Staff members may also be transported to urgent care. Emergency services should be called if the injury or reaction is serious. Refer to Section 5.0 for sign and symptoms of a serious injury or reaction.

After the incident report, the SSO or PM may need to inspect the site to determine the root cause of the incident and implement corrective or preventive actions, such as pest control, signage, or coordination with security, including any updates to the HASP. If the incident involves public interference, coordination with local authorities or security services may be required to manage ongoing safety concerns.

Employees who sustain a serious injury requiring care beyond first aid must obtain medical clearance from a licensed healthcare provider before returning to work. Modified or light-duty assignments may be offered during recovery. Employees affected by traumatic or threatening events may also be referred to the Employee Assistance Program (EAP) for counseling and support. More information about the EAP and the Employee Handbook is available on SharePoint on the Human Resources and Benefits page.

Before work resumes, the SSO or PM must confirm that the area where the incident occurred has been inspected if necessary, hazards have been removed or mitigated, and the site is safe to continue with the field event. Involved field staff will then meet with the Health and Safety

Administrator and PM to review the incident, discuss any contributing factors, confirm medical clearance and work restrictions if needed, and review any safety improvements or procedural changes implemented as a result. For example, in the case of insect infestation, it may be necessary to add a bee suit to the HASP and provide training in the use of the bee suit. Field staff are not required to return to the site until adequate safety measures are in place. The decision to return to the site should be a collaborative decision between the HSO/SS, PM, and Principal in Charge.

3.3 RESPIRATORY PROTECTION PROGRAM

The goals of the Respiratory Protection Program (RPP) are to protect employees from potential exposure to respiratory hazards and to ensure compliance with applicable occupational safety and health standards regarding respiratory hazards. Additionally, the RPP provides requirements for the proper selection and use of respiratory protection equipment.

On July 16, 2021, the Washington State Department of Labor & Industries (L&I) adopted an emergency rule to protect workers who are exposed to harmful levels of wildfire smoke (WAC 296-62-085). This RPP conforms to the Washington Administrative Code (WAC) standards for WAC 296-841 Airborne Contaminants and WAC 296-842 Respirators, as well as draft rule WAC 296-65-085 Wildfire Smoke.

3.3.1 Applicability

This RPP applies to respiratory protection used in the field due to impaired ambient air quality when respirator use is not required but may be preferred for comfort. This applies to impaired ambient air quality due to chemical hazards or wildfire smoke. Employees will not be required to perform site work when airborne substances (i.e., site contaminants) are present at concentrations exceeding their OSHA permissible exposure limits (PELs) or if air quality due to wildfire smoke exceeds the Stop Work action threshold and respiratory protection would be required to safely complete the work. Employees may additionally elect to use respirators for comfort purposes to control non-hazardous substances such as nuisance odors.

If there is the potential to exceed a PEL or wildfire smoke action threshold at a site, engineering and administrative controls will be implemented to mitigate the hazard. Project work that cannot be altered by using engineering or administrative controls must be approved by the Management Committee in advance of the scheduled fieldwork.

The RPP is intended to help employees identify conditions that may warrant the voluntary use of a respirator and to support the selection and maintenance (if applicable) of an appropriate respirator. The RPP should be implemented when employees are working in conditions where respiratory hazards may be encountered, such as when working in conditions with wildfire smoke.

3.3.2 Administrator and Employee Responsibility

The RPP administrator is the Health and Safety Committee chair. The RPP administrator oversees the development, execution, and evaluation of the RPP and will ensure procedures are followed, respirator use is monitored, and respirators provide adequate protection when job conditions change. The RPP administrator will ensure appropriate respirators and the associated supplies are provided to employees for voluntary use at no cost to the employee.

Employees voluntarily using respirators have the following responsibilities:

1. Participate in the Floyd|Snider medical monitoring program in accordance with Section 7.1.
2. Use the respirator only for the specific tasks that it was issued for.
3. Seek medical help if wearing a respirator creates negative health effects such as difficulty breathing, dizziness, or anxiety.
4. Care for and maintain respirators as instructed, including following the manufacturer's specific cartridge change-out or respirator replacement schedule.
5. Notify the supervisor of any problems associated with using a respirator. This includes a respiratory hazard that needs further evaluation, if the respirator is not providing adequate protection, and any concerns with the RPP.
6. Monitor air quality while wearing a respirator and calling Stop Work if PELs are exceeded or if the Stop Work action level for wildfire smoke is exceeded.

3.3.3 Use of Respirators

Respirator use by Floyd|Snider employees is done on a voluntary basis and may be done at any time when the use of an approved respirator may increase comfort or provide additional protection when air quality conditions are still within a level considered to be safe for work. Voluntary use of respirators applies only when it has been determined that:

- Such respirator use will not in itself create a hazard.
- Airborne occupational exposures to hazardous chemicals will not exceed applicable PELs.
- Exposure to fine particles called PM2.5 in wildfire smoke does not exceed the Stop Work action level (refer to Table 3.1).
- No airborne biological hazard is present.
- No specification standards require the mandatory use of respirators.

3.3.4 Wildfire Smoke Exposure Control Plan

The Wildfire Smoke Exposure Control Plan is intended to address risks to employees working outside from potential exposure to wildfire smoke. This plan will be in effect whenever wildfires

are present in the region (in Washington State, surrounding states, or British Columbia, Canada) and will continue to be implemented until such a time that wildfire smoke is no longer a health risk as determined by the air quality index (AQI). The greatest risk of wildfire coincides with the dry season from approximately mid-May through mid-October; however, fires can also occur outside of the typical dry season.

Smoke from wildfires contains chemicals, gases, and fine particles that can be harmful to human health. Breathing in smoke can cause immediate health effects such as coughing, trouble breathing, stinging eyes, a scratchy throat, runny nose, irritated sinuses, wheezing and shortness of breath, chest pain, headaches, an asthma attack, tiredness, and fast heartbeat (U.S. Centers for Disease Control and Prevention 2024). The smallest and most harmful particulate matter in wildfire smoke and other air pollutants are PM2.5. PM2.5 are particles that are 2.5 micrometers or less in width. Increases in daily PM2.5 exposure has been linked to premature death in people with heart or lung disease and nonfatal heart attacks (U.S. Environmental Protection Agency [USEPA] 2025). Long-term exposure to PM2.5 is associated with increased rates of lung cancer and heart disease.

Those at increased risk for adverse health effects from wildfire smoke include the following:

- People with lung diseases such as asthma or chronic obstructive pulmonary disease (COPD), including bronchitis and emphysema, and those who smoke
- People with respiratory infections, such as pneumonia, acute bronchitis, bronchiolitis, colds, or flu, or those with or recovering from COVID-19
- People with existing heart or circulatory problems, such as irregular heartbeat, congestive heart failure, coronary artery disease, or angina, and those who have had a heart attack or stroke
- Adults over age 65 and pregnant women
- People with diabetes
- People with other medical or health conditions that can be exacerbated by exposure to wildfire smoke as determined by a physician

Program elements and protocols for wildfire smoke have been developed in accordance with emergency rule WAC 196-62-085 and additionally consider Cal/OSHA Title 8 California Code of Regulations Section 5141.1 regarding Wildfire Smoke.

The Wildfire Smoke Program includes the following elements:

1. Identification of Harmful Exposures (WAC 296-62-08530):

When wildfire smoke is present, the site-specific HSO will monitor the AQI before each shift and periodically thereafter using USEPA's AirNow,¹ available at www.airnow.gov, or a similar state or federal AQI modeling service. The HSO can also monitor real-time air quality using an air quality detector capable of measuring PM_{2.5}. The HSO will take actions consistent with the action levels presented in Table 3.1.

2. Hazard Communication (WAC 296-62-08540):

The HSO will communicate wildfire smoke hazards to employees during the tailgate safety meeting and will record the AQI or PM_{2.5} concentration on the tailgate meeting form when wildfire smoke is present in the air. The HSO will communicate available measures for employees to mitigate wildfire smoke exposure and the symptoms of smoke exposure.

3. Information and Training (WAC 296-62-08550):

Employees will be trained in the information presented in this RPP (refer to Section 3.3.9), consistent with mandatory information presented in WAC 296-62-08590, prior to conducting work in the presence of wildfire smoke.

4. Exposure Symptom Response (WAC 296-62-08560):

Employees displaying adverse symptoms of wildfire smoke exposure must be monitored to determine whether medical attention is necessary and may not be penalized for seeking medical treatment. Symptoms of wildfire smoke exposure most often include persistent coughing, difficulty breathing, and aggravation of existing respiratory conditions such as asthma. Provisions for prompt medical treatment will be established for each job site and reviewed during the tailgate safety meetings.

5. Exposure Controls (WAC 296-62-08560):

Floyd|Snider will reduce workers' exposure to wildfire smoke by using the hierarchy of controls. Controls are encouraged whenever the ambient air concentration of PM_{2.5} is greater than 20.5 micrograms per cubic meter (µg/m³; AQI 69) and required when the concentration of PM_{2.5} is greater than 55.5 µg/m³ (AQI 151).

A. Engineering controls will be implemented where feasible. Such controls include providing enclosed buildings, structures, or vehicles where the air is adequately filtered.

B. If engineering controls are not sufficient to reduce exposure, Floyd|Snider will implement administrative controls. Such controls include relocating work to a

¹ AirNow reports air quality using the official U.S. AQI, a color-coded index designed to communicate whether air quality is healthy or unhealthy. AirNow is a partnership of USEPA; National Oceanic and Atmospheric Administration; National Park Service; National Aeronautics and Space Administration; U.S. Centers for Disease Control and Prevention; and Tribal, state, and local air quality agencies.

location with a lower ambient air concentration of PM 2.5, changing work schedules to a time where the ambient air concentration of PM 2.5 is less, reducing work intensity, and providing additional rest periods.

- C. In addition to the standards provided in the emergency regulation (WAC 296-62-085), Floyd|Snider has developed action levels for wildfire smoke exposure to be followed at job sites. Table 3.1 shows the AQI categories, equivalent PM_{2.5} measurement in micrograms per cubic meter, the level of health concern, and the action required. The HSO will stop work if the AQI for PM_{2.5} is greater than 301 or if it is not possible to conduct field activities safely due to discomfort or decreased visibility.
 - D. Where overnight stays are required in areas that do not have filtered indoor air, additional Floyd|Snider policies apply. If the AQI is forecasted to be greater than 301 overnight, or if the AQI exceeds 500 for several hours, the HSO, Floyd|Snider PM, and client PM will coordinate and decide whether demobilization to an off-site location is necessary.
6. Respiratory Protection (WAC 296-62-08570):
- Floyd|Snider will provide respirators at no cost to all employees for voluntary use in accordance with WAC 296-842 Safety Standards for Respirators. Employees are encouraged to use respirators any time the PM_{2.5} concentration is greater than 20.2 µg/m³ (AQI 69), and especially when the PM_{2.5} concentration is 55.5 µg/m³ (AQI 151) or greater.

Table 3.1
Action Levels for Wildfire Smoke

AQI Categories for PM2.5	PM2.5 (µg/m ³)	Levels of Health Concern	Action ⁽¹⁾
0 to 50	0 to 12.0	Good	• Monitor air quality if wildfire smoke is present. • Stop work if employees have symptoms of smoke exposure.⁽²⁾ All employees have Stop Work authority.
51 to 68	12.1 to 20.1	Moderate	• Monitor air quality. • Stop work if employees have symptoms of smoke exposure.⁽²⁾ All employees have Stop Work authority. • Implement administrative and engineering controls.
69 to 150	20.2 to 55.4	Unhealthy for Sensitive Groups	• Monitor air quality. • Stop work if employees have symptoms of smoke exposure.⁽²⁾ All employees have Stop Work authority. • Implement administrative and engineering controls. • Respirator provided for voluntary use; respirator use is strongly encouraged. • Take frequent breaks in an indoor space with filtered air.
151 to 200	55.5 to 150.4	Unhealthy	• Monitor air quality. • Stop work if employees have symptoms of smoke exposure.⁽²⁾ All employees have Stop Work authority. • Implement administrative and engineering controls. • Respirator provided for voluntary use; respirator use is strongly encouraged. • Provide for frequent breaks—at least once per hour—in an indoor space with filtered air; stop work if an indoor space with filtered air is not available. • Accommodations must have filtered air for multi-day and overnight field events.
201 to 300	150.5 to 250.4	Very Unhealthy	• Monitor air quality. • Stop work if employees have symptoms of smoke exposure.⁽²⁾ All employees have Stop Work authority. • Implement administrative and engineering controls. • Respirator provided for voluntary use; respirator use is strongly encouraged. • Take breaks at least once per hour in an indoor space with filtered air; stop work if an indoor space with filtered air is not available. • Accommodations must have filtered air for multi-day and overnight field events. • Reduce work hours; limit workday to no more than 8 hours on-site.
301 to 500	250.5 to 500.4	Hazardous	• Stop work. • Demobilize to an off-site work location if necessary.

Notes:

- 1 Respirators can be worn at lower AQI levels based on personal preference. Respirators are provided at no cost to employees for use during any air quality conditions.
- 2 Symptoms of wildfire smoke exposure most often include persistent coughing, difficulty breathing, and aggravation of existing respiratory conditions such as asthma.

3.3.5 Selection of Respirators

Employees can voluntarily use a respirator based on personal preference. Floyd|Snider will provide respirators at no cost to all employees for voluntary use in accordance with WAC 296-842 Safety Standards for Respirators. PPE is the last line of defense and should be considered after engineering and administrative controls are implemented.

The only approved respirator types to be used without fit testing are filtering facepiece respirators (FFRs), also known as N95 dust masks. Per WAC 296-842-10200, FFRs are any tight-fitting, half-facepiece, negative-pressure, particulate air purifying respirator with the facepiece composed mainly of filter material. These respirators do not use cartridges or canisters and may have sealing surfaces composed of rubber, silicone, or other plastic-like materials. Employees may elect to use respirators for other voluntary uses such as to control nuisance odors and may additionally elect to use respirators other than FFRs for protection from wildfire smoke if the respirator provides protection from PM_{2.5} equivalent to or greater than an FFR. Use of respirators other than FFRs is subject to fit testing requirements in accordance with the manufacturer specifications. Fit testing, if required for the selected respirator, is provided by Floyd|Snider at no cost to employees.

The National Institute for Occupational Safety and Health (NIOSH) of the U.S. Centers for Disease Control and Prevention certifies N95 respirators including FFRs. A label or statement of certification by NIOSH should appear on the respirator or respirator packaging. KN95 respirators, which are FFRs manufactured to the Chinese particulate filtration standard equivalent to N95, are approved for respiratory protection by the U.S. Food and Drug Administration and may also be used if an adequate supply of NIOSH-approved respirators is not available.

Any employee who experiences any difficulties while wearing a respirator must immediately inform their supervisor. If an employee requests to wear a respirator other than an FFR, they must contact their supervisor to ensure the respirator is appropriate and properly fitted for the user.

3.3.6 Medical Evaluations

All Floyd|Snider field staff participate in a medical monitoring program and are evaluated biennially. This evaluation includes respiratory clearance and accomplishes the goal of medical clearance for this program on a voluntary use basis per WAC 296-842-11005. Workers with breathing problems such as asthma, COPD, or chronic heart and lung disease should communicate these conditions to their doctor to determine whether it is safe for them to voluntarily wear an FFR or other type of protection at work. Respirators restrict breathing and can put stress on the heart and lungs, which may worsen health symptoms.

3.3.7 Respirator Fit and Seal Check

Proper fit is necessary to get the most protection from a respirator. Fit testing is not required for FFRs, so employees are not required to participate in fit testing; however, fit testing can be provided at employee request. Note that facial hair, piercings, or facial abnormalities may disqualify an employee from using certain types of tight-fitting respirators. Shaving facial hair is recommended, but not required, for voluntary FFR use. Employees who choose to use a tight-fitting elastomeric respirator (half- or full-face respirators) will require fit testing and additional training, which Floyd|Snider will provide at no cost to employees.

FFRs should fit according to the manufacturer's instructions. Elastic straps, a moldable nosepiece, or adhesive may be used to aid in sealing. A seal check should be performed after fitting the respirator to the face, using the following procedure:

1. Cover the respirator with both hands and exhale. If air leaks where the respirator seals against the face, readjust the respirator and nosepiece and try again. When a proper fit is achieved, the respirator should bulge from the face and not leak around the seal.
2. Cover the respirator with both hands and inhale. If air leaks where the respirator seals against the face, readjust the respirator and nosepiece and try again. When a proper fit is achieved, the respirator should collapse slightly and not leak around the seal.

The following video provides additional demonstration of fitting the respirator to the face and performing a seal check: <https://www.youtube.com/watch?v=GmJxzGXelvo>.

3.3.8 Respirator Replacement, Maintenance, and Storage

FFRs are disposable and generally designed for single use (i.e., one 8-hour day); however, the total hours of use may vary by manufacturer. Employees will replace respirators according to the manufacturer-recommended schedule, or a minimum of once per work day if not specified. Disposable respirators should also be immediately discarded if, at any time during use, they become damaged, deformed, dirty, or difficult to breathe through. The number of times an FFR is doffed and donned should be limited whenever possible. Respirators other than FFRs will be maintained or replaced (in full or in part, such as in the case of respirators with detachable cartridges) according to the manufacturer specification. Respirators will be given to a specific employee and may not be shared among employees.

Before donning, respirators will be inspected by the user for damage, deterioration, or improper functioning before use. FFRs will also be checked for proper sealing using the seal check procedures described in Section 3.3.7.

Respirators will be stored in a clean, dry, and sealed area in the field room, field vehicle, or a designated clean area on the job site.

3.3.9 Training

Training will be provided to all employees who voluntarily wear respirators. At a minimum, the training will cover the following information:

- Identification of the hazard (i.e., wildfire smoke)
- Floyd|Snider's policy on hazard communication and how to obtain current information regarding the AQI
- Potential health affects as a result of exposure to the hazard
- Employee rights regarding medical treatment for exposures
- Mitigation measures for smoke exposure
- Employer requirements to provide respirators under the L&I emergency rule
- The respirator's capabilities and limitations
- Proper fit, use, and maintenance of respirators

3.3.10 Record Keeping

As per WAC 296-842-11010, voluntary use of respirators does not require record keeping; however, all employees are required to read and sign this APP, and Floyd|Snider will retain a copy of the signature page and any additional relevant training materials.

3.4 BUILDING SECURITY

For security purposes, Union Square is equipped with an access card system. Computerized proximity cards let you enter the building on your own, any time, but prevent unauthorized access to the building.

To help maintain the integrity of this system:

- Do not let others follow you into the building when exiting and entering when entrances to the building are locked.
- Notify Tenant Services of lost access cards.
- Notify the company when transferring ownership of access cards.

General regular building hours are defined as the time between 6:00 a.m. and 6:30 p.m. After-hours are defined as the time between 6:30 p.m. and 6:00 a.m. During this time period, One and Two Union Square are in after-hours mode and will require an after-hours access card for entry into the buildings.

There is a security guard desk in the main lobby where any security-related incidents should be reported. The security guards are also available to escort employees to their vehicles if they are

feeling unsafe for any reason or can provide access to the office (after verifying your employment status by calling a Principal) if you do not have your access card or keys with you.

3.5 VEHICLE SAFETY

Floyd|Snider maintains a company vehicle for use during field work and to attend meetings. Personal vehicles and/or rental vehicles may be used if additional transportation is needed for a specific task. General vehicle safety and Floyd|Snider vehicle-specific procedures when driving for business purposes are described in the following sections.

3.5.1 General Vehicle Safety

Before driving a vehicle, always perform a safety check:

- Walk around and look for damage such as broken reflectors, damaged mirrors, windshield cracks, missing wiper blades, obviously low tire pressure or damage to tires, new dents, or scratches. Report new damage to the Equipment Manager. Do not drive a vehicle with obvious tire damage or an unrepaired windshield crack. Also note collision hazards in the immediate area.
- Check the vehicle emergency kit for the following items: first aid kit, potable water, eye wash, fire extinguisher, Mylar blanket, road flares, and collapsible traffic cones.
- Ensure that all items stored inside the vehicle are secure and will not slide or tumble during transport. Do not drive with unsecured loads.
- Start the vehicle and check that safety systems are working: headlights, turn signals, emergency flashers, headlights, brake lights, and windshield wipers. Check for dashboard warning lights and address any critical safety warnings (low tire pressure, low oil pressure, high engine temperature, antilock brake system, battery) immediately.

When driving a vehicle for business purposes, all traffic laws must be obeyed. Obey speed limits and all posted signs. Minimize distractions and stay aware of your surroundings. In addition to your safety, you are also a representative of the company behind the wheel and should not conduct any behaviors that would put you or Floyd|Snider in a negative light.

The following safety violations will not be tolerated by Floyd|Snider and will cause revocation of your driving privileges for company business purposes (even if they occur after business hours):

- Texting/cell phone use while driving (hands-free device permitted)
- Citations for reckless driving
- Use of alcohol or drugs before or while driving
- Carrying more passengers than available seatbelts

In the event of an accident, call 911 and follow the procedures in Section 4.3. In the event of a breakdown, call roadside assistance if possible in the area where you are located. If roadside assistance is not available, staff may perform basic tasks (such as addressing a flat tire) in order to be able to return to the office safely only if they are trained and feel comfortable to do so. If you are stuck, call your PM to arrange for emergency assistance.

In the event of a multi-day field effort or a late-night finish, all field equipment (high-dollar-value items) must be stored in a locked garage or other locked storage area for the night and should not be left in the vehicle.

3.5.2 Floyd|Snider Vehicle Safety

The Floyd|Snider truck is equipped with 4-wheel drive, but the Floyd|Snider van is not. If the project site is especially muddy or has limited access, the Floyd|Snider truck or an appropriate rental vehicle should be used. Employees should be familiar with the 4-wheel drive controls of the vehicle they are driving before arriving at the project site. No one other than Floyd|Snider employees (except for emergency personnel in case of emergency or qualified repair personnel) should be allowed to drive the company vehicle. Do not smoke in the company vehicle.

A first aid kit and fire extinguisher will be kept in the vehicle at all times. A checklist of supplies is kept in the vehicle bulkhead vertical file area and inside the door to the field room for reference. Additional safety supplies that are stocked in the vehicle include nitrile and work gloves, hearing protection, safety glasses, and basic decontamination equipment including Alconox solution, distilled water, disinfectant spray/wipes, and paper towels. If you have used these items, please notify the Health and Safety Committee so they can be replenished. The vehicle is also equipped with basic maintenance supplies including a jack, air pump, and spare tire. The gas tank should always be left at least half full before returning the company vehicle to the garage. The vehicle engine has a minimum octane rating and should be filled with premium gasoline.

Report vehicle warning lights immediately to the Equipment Manager or a designated alternate in the event that the Equipment Manager is not available. The Equipment Manager will work with you to determine a plan to safely address the warning light. If you cannot use the field vehicle safely, notify your PM to assist you with arranging an alternate vehicle. Tire pressure warning lights should be addressed immediately using the pump stored in the van or at a service station if a station is readily available—never drive a vehicle with insufficient tire pressure.

The Equipment Manager will be responsible for making sure the following routine maintenance is performed (but please notify them immediately if you notice any other problems):

- Oil changes and periodic routine maintenance per dealer schedule
- Monthly walk-around check (tires, lights, damage, etc.)
- Detailing when needed

3.6 CONTROLLED SUBSTANCE ABUSE

Floyd|Snider has a strong commitment to provide a safe and drug-free workplace for its employees.

Drug or alcohol testing of current employees may be performed where (a) there are reasonable grounds to believe an employee is under the influence of or suspected of consuming alcohol or using marijuana during work hours or using illegal drugs at any time; (b) as a follow-up to a rehabilitative program; or (c) on a random basis when health and safety requirements for clients or projects necessitate testing.

If the alcohol or drug test reveals positive results, the employee may be suspended pending evaluation of the situation by management.

An employee who voluntarily seeks assistance on a timely basis for an alcohol- or drug-related problem, prior to the company identifying the problem, may do so without jeopardizing their employment status, provided the prescribed treatment is followed and work performance is acceptable. In some cases, temporary reassignment may be necessary.

If an employee is undergoing a prescribed medical treatment with a substance that may alter physical or mental capacity, the employee must report this to the Health and Safety Administrator, particularly if they will be conducting field work. The Health and Safety Administrator will coordinate with the Board of Directors, who will determine how to manage the affected employee's work load.

Any manager who observes or receives a report of alcohol or drug use must promptly investigate the allegations in a confidential manner. The Board of Directors should also be notified immediately. Any other employee who observes or has knowledge of a violation, whether by an employee or others, has an obligation to promptly report this to their immediate supervisor. If an employee's immediate supervisor is suspected of violating the company's drug and alcohol policy, the report should be made directly to the Board of Directors.

In any instance where there exists an imminent threat to the safety of persons or property, an employee shall immediately contact a Principal.

4.0 Emergency Procedures

This section defines the emergency procedures for Floyd|Snider. Reasonably foreseeable emergency situations include medical emergencies; accidental release of hazardous materials or hazardous waste; and general emergencies such as vehicle accident, fire, thunderstorm, and earthquake.

A muster point should be designated for all personnel. The Floyd|Snider office emergency muster point is at the Paramount Theatre, on the corner of Pine Street and 9th Avenue. A map of the office evacuation route and a map of the locations of first aid kits, fire extinguishers, and AEDs is posted in all communal office spaces including kitchens and conference rooms, is available on the Floyd|Snider SharePoint home page. On a job site, the SSO should designate a muster point that is clear of adjacent hazards and not located downwind of site activities and communicate this location to the field team each day. In an emergency, all personnel and visitors will evacuate to the muster point for roll call.

It is important that each person understand their role in an emergency and that they remain calm and act efficiently to ensure everyone's safety. Expected actions for potential emergency situations are outlined in the following sections.

4.1 MEDICAL EMERGENCIES

In the event of a medical emergency, the following procedures should be used:

- Stop any imminent hazard if you can safely do so.
- Remove ill, injured, or exposed persons from immediate danger if moving them will clearly not cause them harm and no hazards exist to the rescuers.
- Evacuate other personnel from the immediate vicinity until the ill, injured, or exposed persons have been evacuated and it is safe for work to resume.
- If serious injury or a life-threatening condition exists, call 911 for paramedics, fire department, and police. When in doubt, contact emergency services; do not drive a seriously ill or injured person to the hospital unless emergency services cannot be summoned (for example, if phone service is out or there is not an ambulance that can reach the location).
- Clearly describe the location, injury, and conditions to the dispatcher. Designate a person to go to the site entrance and direct emergency equipment to the injured persons. Provide the responders with information about any chemical hazards that might be present on a job site.
- Trained personnel may provide CPR/first aid if it is necessary and safe to do so. Remove contaminated clothing and PPE only if this can be done without endangering the injured person.

- Once more highly trained personnel (i.e., emergency services) have taken over care of the person experiencing the medical emergency, immediately contact the staff member's designated emergency contact person.
- If you are in the field, notify your PM and HSO/SS.
- If a person experiencing a medical emergency is taken to the hospital, another staff member should accompany whenever possible and remain at the hospital until a designated emergency contact person arrives.
- Immediately implement steps to prevent recurrence of the accident.

4.2 ACCIDENTAL RELEASE OF HAZARDOUS MATERIALS OR WASTES

In the event of a release of a hazardous material or waste:

1. Evacuate all personnel to the designated emergency muster point until it is safe for work to resume.
2. If you are in the field, instruct a designated person to contact the PM or HSO/SS and confirm a response. If a release occurs in the office, the Floor Wardens will contact building security.
3. Contain the spill, if it is a known material, is possible, and can be done safely.
4. If the release is not stopped, contact 911 to alert the fire department.
5. Contact the Washington State Emergency Response Commission at 1 (800) 258-5990 to report the release.
6. Initiate the cleanup process. Cleanup must be performed by professionals trained in cleanup response for the type of material released.
7. Submit a written report to the Washington State Department of Ecology in the event of a reportable release of hazardous materials or wastes.

4.3 OTHER EMERGENCIES AND NATURAL DISASTERS

4.3.1 Vehicle Accident

In the event of an accident:

- Check yourself and your passengers and, if safe to do so, any other persons involved in the accident for serious injuries. If anyone is seriously injured, call 911 and wait for emergency personnel.
- If the vehicle can be moved, move to the shoulder or side of the road out of the way of traffic before calling 911. Do not leave the scene of the accident, and avoid engaging in conversation with other persons involved, aside from confirming injury status.
- If the vehicle cannot be moved, get yourself and your passengers to safety if possible. If the vehicle is disabled in a place with fast moving traffic (such as a multi-lane freeway), it may be safest to wait in the vehicle. Use your best judgment.

- If you are able to move the vehicle to the shoulder, use road flares (located in the vehicle emergency kit) to warn oncoming drivers.
- Wait for police to arrive and fill out an accident report.
- Call your PM or HSO/SS to report the accident. In the case of a minor accident, the PM or HSO/SS will consult with the Equipment Manager to determine whether the vehicle should be driven back to the office or towed to a repair facility. Contact roadside assistance if towing is needed.

4.3.2 Fire

During the incipient phase of a fire, the available fire extinguisher may be used by persons trained in putting out fires, if it is safe for them to do so.

If a fire is identified in the office building (either by smell or by the fire alarm), walk to the nearest emergency exit and walk down the stairs (do not use the elevator). Walk to the emergency muster point. Use common sense during a fire to avoid injury if areas are inaccessible.

In the case of a fire in a job site, work shall be halted and all on-site personnel will be immediately evacuated to the emergency muster point, if the fire cannot be extinguished. The local police/fire department shall be notified if the emergency poses a continuing hazard by calling 911.

4.3.3 Thunderstorm

A thunderstorm may present danger of lightning strike any time that visible lightning or audible thunder are present.

In the event of a thunderstorm, seek shelter inside a building if possible. Avoid concrete walls and floors, corded phones, and puddles. When a thunderstorm is accompanied by high winds, also avoid windows. If sheltering in a building is not possible, shelter inside your vehicle, and avoid direct contact with any metal objects in contact with the frame of the vehicle.

Do not resume work activities outdoors until at least 30 minutes have elapsed since the last thunder or lightning was observed.

4.3.4 Earthquake

If you are inside a building during an earthquake, the area near the exterior wall of a building is the most dangerous place to be. Windows, facades, and architectural details are often the first parts of the building to collapse. To stay away from this danger zone, stay inside if you are inside and outside if you are outside. In a high-rise: drop, cover, and hold on. Face away from windows and other hazards. Do not use elevators. Do not be surprised if sprinkler systems or fire alarms activate. Once the earthquake is over, be alert for aftershocks that might occur, follow instructions of your Floor Warden or building security, take your emergency kit or emergency supplies, proceed to the emergency exit, and walk down the stairs. Walk to the emergency muster point. The above are general guidelines and are not meant to apply to every situation, so

please use common sense during an earthquake to avoid injury. Additional office safety precautions for earthquakes are posted in the Production Room of the Floyd|Snider office and posted to the Health and Safety department page on SharePoint.

If you are on a jobsite when an earthquake occurs, move away from buildings, overhead power lines, and any other structures that may collapse. Get down low and stay down until the shaking stops to avoid injury. If you are in a moving vehicle, stop as quickly and safely as possible. Move to the shoulder or curb, away from utility poles, overhead wires, and under- or overpasses. Stay in the car and set the parking brake. Turn on the radio for emergency broadcast information. A vehicle may jiggle violently on its springs, but it is a good place to stay until the shaking stops. If a power line falls on the vehicle, stay inside until a trained person removes the wire. After the shaking stops, take your emergency supplies and proceed to the emergency muster point if it is safe to do so. Call your PM or HSO/SS when it is safe to do so.

4.4 EMERGENCY COMMUNICATIONS

Emergencies at Union Square will be communicated by building security using the public address system. If an emergency announcement is made, pause what you are doing and listen to the entire message. Emergencies involving the Floyd|Snider office only may be communicated over the office telephone system.

In the case of a job site emergency, signals may vary by site and should be discussed at daily tailgate meetings so all personnel on-site are aware of the site-specific signals and alarms. In general, horns (vehicle or airhorns) are used as needed to signal the emergency. One long (5-second) blast will be given as the emergency/Stop Work signal. If horns are not working, waving of arms is typically used to signal an emergency. In any emergency, all personnel will evacuate to the designated muster point and await further instruction.

After an emergency is resolved, the involved personnel or management will meet and debrief on the incident—the purpose is not to fix blame, but to improve the planning and response to future emergencies. The debriefing will review the sequence of events, what was done well, and what can be improved. The debriefing will be documented in a written format and filed by the Health and Safety Administrator.

4.5 EMERGENCY EQUIPMENT

The following minimum emergency equipment will be readily available in the office and at all job sites and functional at all times:

- First aid kit: Contents approved by the HSO/SS, including two blood-borne pathogen barriers. First aid kits are located in the company vehicle; a personal vehicle kit is located in the field room and should be used when field staff drive personal or rental vehicles; and in the office, first aid kits are located at each fire extinguisher location in the north hall, west hall, main kitchen, and large conference room. The location of first aid kits and fire extinguishers will also be posted on maps kept in communal office spaces (kitchens and conference rooms).

- Portable fire extinguishers are included in the field first aid/safety kits and are also located in the office in the north hall, west hall, main kitchen south entrance, and Cedar Conference room.
- A copy of the HASP if on a job site.
- A binder of Safety Data Sheets (SDSs) for commonly encountered chemicals and all potential contaminants of concern that may be present on a job site. This binder is kept in the document organizer compartment of the company vehicle and an additional copy is kept in the field room.

4.6 INCLEMENT WEATHER

Occasionally, there are weather conditions, like snow, that make travel difficult. If the Seattle Public Schools are closed for the day due to hazardous road conditions, then the office will also be closed out of concern for your safety. Any field work scheduled during an office closure due to inclement weather should also be postponed.

4.7 CATASTROPHIC EVENTS

Floyd|Snider has formed an Emergency Planning Committee to develop preparation, communication, and safety plans to implement if a catastrophic event occurs. A catastrophic event is an event that disrupts or destroys critical infrastructure, such as a large-scale earthquake or other natural disaster.

4.7.1 Emergency Kits

Each staff member is provided one emergency kit backpack in case of emergencies that disrupt transportation or utilities. These backpacks include a map with critical structures, contact list and work plan, 32-ounce water bottle (to be filled and replaced every 6 months by the employee), additional 14-ounce water bottle and Platypus water container, water purification tablets, food bars, magnesium firestarter and matches, a multi-purpose tool, an LED flashlight and extra batteries, an emergency radio, an emergency (heat reflective) blanket, rags, nylon rope, a tarp and trash bags, duct tape, hand cleanser, Super Glue, and a hiker's first aid kit. Employees should provide their own raingear, extra socks, walking/hiking shoes, family plan, sunscreen, and 3-day supply of critical medicines. Not all packs are exactly the same, but all should include the items listed above. The Emergency Planning Committee will send regular reminders to check emergency kits and replace expired items.

Staff members should keep their emergency contact card up to date, listing phone numbers for whom to contact if they are unable to make calls themselves. Emergency contact cards should be kept in the front pocket of the backpack, where they can be easily located by others.

Staff should familiarize themselves with the contents of the emergency backpack to make sure all necessary items are included and that they are operational. The Emergency Planning Committee will remind staff every 6 months to check and update backpack contents (replace

water in water containers, check the expiration date on the nutrient bars, update contact list if it is not current, etc.). Staff are responsible for keeping the employee contact list updated and having a sensible pair of shoes available in the office.

4.7.2 WhatsApp Emergency Contact Group

The purpose of our WhatsApp group is for group coordination needs during periods of emergency. It will be an easy way for management to communicate next steps back to the entire group, such as the status of the office/IT and expected timelines for returning to work. It also serves as an additional way to check in and communicate that staff and family are safe. Remember, immediately after an emergency, the initial call to check in with Jessi should still be made. Join the Floyd|Snider group on WhatsApp:

1. Download the WhatsApp app on to your phone and setup your account
2. Join the “F|S Emergency Contact” group by following the instructions on the Health & Safety Department site:
<https://floydsnider.sharepoint.com/Dept/Safety/SitePages/Emergencies.aspx#emergency-coordination-whatsapp>

At the 6-month check-in time for backpack contents, employees should also confirm that they are still connected and included in the WhatsApp group. If an employee has been removed from the group (which can occur during software updates, etc.), the employee should notify the Emergency Planning Committee to have the group invitation resent so they can rejoin the group.

4.7.3 What to Do if You Are in the Office When a Disaster Occurs

If you are in the office when an emergency occurs, first and foremost is to remain safe. Wait until the building gives instructions over the PA system, then take your emergency kit and exit the building safely and quickly to meet at the Floyd|Snider muster point at the Paramount Theatre, on the corner of Pine Street and 9th Avenue. Once you have checked in with other Floyd|Snider staff there, you should find your way home safely to check on family and property. Jessi Massingale has been identified as the Disaster Contact. One person from the muster point will contact Jessi once all employees have been safely evacuated. Floyd|Snider will use the WhatsApp group to communicate next steps, as well as email (if available). WhatsApp is described in more detail above.

4.7.4 What to Do if You Are Not in the Office When a Disaster Occurs

If you are not in the office when an emergency occurs, the first thing to do after ensuring your safety and the safety of your family and property, is to text Jessi or Matt Massingale in Bend, Oregon. Report that you are okay and await further instructions. Other management team members can also be contacted if needed. Floyd|Snider will use the WhatsApp group to communicate next steps, as well as email (if available).

In Emergency, Text Jessi/Matt in Bend		
Jessi	206.683.4307 (cell)	
Matt	206.255.2799 (cell)	541.241.6255 (work)
Management Team Numbers		
Allison	206.722.2460 (cell)	206.842.4484 (home)
Tiffany	206.779.2806 (cell)	

4.7.5 Building Access

Depending on the severity of the disaster, Union Square may be closed for inspection, bus routes may be disrupted, and cell phone service may be limited. The nature and likely duration of the emergency aftermath will affect decision-making around working at the office during this time. Floyd|Snider will send out communications via WhatsApp and/or email with information on when to resume work and when it is safe to return to the office.

5.0 Hazard Awareness and Mitigation

In general, there are three broad hazard categories that may be encountered on the job: chemical exposure hazards, fire and explosion hazards, and physical hazards. Sections 5.1 through 5.3 discuss the specific hazards that fall within each of these broad categories and ways to mitigate these hazards.

Additional hazard analysis for specific chemicals present or tasks to be performed at a job site should be detailed in the HASP for the site.

5.1 CHEMICAL EXPOSURE HAZARDS

Potential toxic effects can occur from significant acute or chronic exposure to hazardous chemicals.

Hazardous products used in the office or on the job site should be sealed and stored in places where they cannot be easily spilled. Always follow manufacturer instructions for storage and use of hazardous chemicals. Discard chemicals no longer in use in accordance with manufacturer's instructions, and discard chemicals if containers are damaged, corroded, or otherwise leaking. Consider nontoxic alternatives to cleaning and other products when possible. Consider use of gloves or eye protection when handling or using chemicals with the potential to irritate eyes or skin if contacted.

On contaminated sites and on work sites where hazardous chemicals are used, chemical exposure hazards, monitoring procedures, and decontamination procedures should be detailed in the site HASP.

5.2 FIRE AND EXPLOSION HAZARDS

When storage of material posing a fire and explosion hazards is necessary, such material will be stored in containers approved by the Washington State Department of Transportation in a location not exposed to strike hazards and provided with secondary containment. A minimum 2A:20B fire extinguisher will be located within 25 feet of the storage location and where refueling occurs. Any subcontractors bringing flammable and combustible liquid hazards to a job site are responsible for providing appropriate material for containment and spill response, which should be addressed in their respective HASP, Job Hazard Analysis (JHA), or Job Safety Analysis (JSA). Transferring of flammable liquids (e.g., gasoline) will occur in areas with containment to capture any spillage, and only after making positive metal-to-metal connection between the containers, which may be achieved by using a bonding strap. Storage of ignition and combustible materials will be kept away from fueling operations.

5.3 PHYSICAL HAZARDS

When working in or around any hazardous or potentially hazardous substances or situations, all personnel should plan all activities before starting any task. Personnel shall identify health and safety hazards involved with the work planned. If you have concerns or uncertainty about the

safety of a given task, always consult with your PM or, if in the field, with your HSO/SS to determine how the task can be performed in the safest manner.

All field personnel will adhere to general safety rules including wearing appropriate PPE—hard hats, steel-toed boots, high-visibility vests, safety glasses, gloves, and hearing protection, as appropriate. Eating, drinking, and/or use of tobacco or cosmetics will be restricted in all work areas. Personnel will prevent splashing of liquids containing chemicals and minimize dust emissions.

The following table summarizes a variety of physical hazards that may be encountered during work activities. For convenience, these hazards have been categorized into several general groupings with recommended preventative measures.

Hazard	Cause	Prevention
Head strike	Falling and/or sharp objects, bumping hazards	Hard hats will be worn by all personnel at all times when overhead hazards exist.
Foot/ankle twist, crush, slip/trip/fall	Sharp objects, dropped objects, uneven and/or slippery surfaces	Steel-toed boots must be worn at all times on-site while heavy equipment is present. Pay attention to footing on uneven or wet terrain and do not run. Keep work areas organized and free from unmarked trip hazards.
Hand cuts, splinters, and chemical contact	Hands or fingers pinched or crushed; chemical hazards; cut or splinters from handling sharp/rough objects and tools	Nitrile safety gloves will be worn to protect the hands from dust and chemicals. Leather or cotton outer gloves will be used when handling sharp-edged rough materials or equipment. Refer to preventive measures for mechanical hazards below.
Eye damage from flying materials, or splash hazards	Sharp objects, poor lighting, exposure due to flying debris or splashes	Safety glasses will be worn at all times on a job site. If a pressure washer is used to decontaminate heavy equipment, a face shield will be worn over safety glasses or goggles. Care will be taken during decontamination procedures to avoid splashing or dropping equipment into decontamination water.

Hazard	Cause	Prevention
Electrical hazards	Electrical cord hazards	Make sure that no damage to extension cords occurs. If an extension cord is used, make sure it is the proper size for the load that is being served and rated SJOW or STOW (an “-A” extension is acceptable for either) and inspected prior to use for defects. The plug connection on each end should be of good integrity. Insulation must be intact and extend to the plugs at either end of the cord. All portable power tools will be inspected for defects before use and must be either double-insulated or grounded with a ground-fault circuit interrupter.
Mechanical hazards	Heavy equipment such as drilling machine	Ensure the use of competent operators, backup alarms, “kill” switches, regular maintenance, daily mechanical checks on all hoses and cables, and proper guards. Verify that “whip checks” or similar securing devices are installed on “quick-connections,” where the failure of high-pressure connections could lead to the whipping of hoses. Discuss the need for plastic sheeting or other methods to contain drips (hydraulic oil, motor oil, etc.) to determine if measures are needed to prevent releases to the ground. Subcontractors will supply their own JHA, HASP, or JSA. All personnel will make eye contact with operator and obtain a clear OK before approaching or working within a hazardous radius of the heavy equipment.
Noise damage to hearing	Machinery creating more than 85 decibels time-weighted average, less than 115 decibels continuous noise, or peak at less than 140 decibels	Wear earplugs or protective ear covers when a conversational level of speech is difficult to hear at a distance of 3 feet or if an employee must shout to be heard by nearby coworkers; when in doubt, a sound level meter may be used on-site to document noise exposure.

Hazard	Cause	Prevention
Strains from improper lifting	Injury due to improper lifting techniques, overreaching/ overextending, lifting overly heavy objects	Use proper lifting techniques and mechanical devices where appropriate. The proper lifting procedure first involves testing the weight of the load by tipping it. If in doubt, ask for help. Do not attempt to lift a heavy load alone. Take a good stance and plant your feet firmly with legs apart, one foot farther back than the other. Make sure you stand on a level area with no slick spots or loose gravel. Use as much of your hands as possible, not just your fingers. Keep your back straight, almost vertical. Bend at the hips, holding load close to your body. Keep the weight of your body over your feet for good balance. Use large leg muscles to lift. Push up with one foot positioned in the rear as you start to lift. Avoid quick, jerky movements and twisting motions. Turn the forward foot and point it in the direction of the eventual movement. Never try to lift more than you are accustomed to lifting.
Traffic hazards	Vehicle traffic and hazards when working near active operations	When working in or near the right-of-way, orange cones and/or flagging will be placed around the work area. Safety vests will be worn at all times while conducting work in or near the right-of-way. Multiple staff will work together (buddy system) and spot traffic for each other. Avoid working with your back to traffic whenever possible.
Cold stress	Cold temperatures and related exposure	Workers will ensure appropriate clothing, stay dry, and take breaks in a heated environment when working in cold temperatures. Further detail on cold stress is provided in Section 5.3.1.
Heat exposure	High temperatures exacerbated by PPE, dehydration	Workers will ensure adequate hydration, shade, and breaks when temperatures are elevated. Further detail on heat stress is provided in Section 5.3.2.
Accidents due to inadequate lighting	Improper illumination	Work will proceed during daylight hours only or under sufficient artificial light.

Hazard	Cause	Prevention
Drowning hazards	Work in or near water	Wear a personal flotation device at all times when working in or near water. Be aware of surroundings including head strike and trip hazards that could cause a fall into water.
Slip, trip, and fall hazards	Working in vegetated areas, areas with uneven ground surface, or areas with obstructions	Watch your step when walking and minimize distractions. Establish a path free of obstructions before mobilizing equipment.

5.3.1 Cold Stress

Exposure to moderate levels of cold can cause the body's internal temperature to drop to a dangerously low level, causing hypothermia. Symptoms of hypothermia include slow, slurred speech, mental confusion, forgetfulness, memory lapses, lack of coordination, and drowsiness.

To prevent hypothermia, stay dry and avoid exposure. On a job site, personnel will have access to a warm, dry area, such as a vehicle, to take breaks from the cold weather and warm up. Site personnel will be encouraged to wear sufficient clothing in layers such that outer clothing is wind- and waterproof and inner layers retain warmth (wool or polypropylene), if applicable. Site personnel will keep hands and feet well protected at all times. The signs and symptoms and treatment for hypothermia are summarized as follows.

Signs and Symptoms

- Mild hypothermia (body temperature of 98 to 90 °F)
 - Shivering
 - Lack of coordination, stumbling, fumbling hands
 - Slurred speech
 - Memory loss
 - Pale, purplish gray, or dusky and cold skin
- Moderate hypothermia (body temperature of 90 to 86 °F)
 - Shivering stops
 - Unable to walk or stand
 - Confused and irrational
- Severe hypothermia (body temperature of 86 to 78 °F)
 - Severe muscle stiffness
 - Very sleepy or unconscious
 - Ice cold skin
 - Death

Treatment of Hypothermia—Proper Treatment Depends on the Severity of the Hypothermia

- Mild hypothermia
 - Move to warm area.
 - Stay active.
 - Remove wet clothes, replace with dry clothes or blankets, and cover the head.
 - Drink warm (not hot) sugary drinks.
- Moderate hypothermia
 - All of the above, plus:
 - Call 911 for an ambulance.
 - Cover all extremities completely.
 - Place very warm objects such as hot packs or water bottles on the victim's head, neck, chest, and groin.
- Severe hypothermia
 - Call 911 for an ambulance.
 - Treat the victim very gently.
 - Do not attempt to re-warm—the victim should receive treatment in a hospital.

Frostbite

Frostbite occurs when the skin actually freezes and loses water. In severe cases, amputation of the frostbitten area may be required. Although frostbite usually occurs when the temperatures are 30 °F or lower, wind chill factors can allow frostbite to occur in above-freezing temperatures. Frostbite typically affects the extremities, particularly the feet and hands. Frostbite symptoms include cold, tingling, stinging, or aching feeling in the frostbitten area followed by numbness and skin discoloration: Paler skin may change from red to purple, then to white or very pale, and darker skin may become more pale, dusky, or purplish. Frostbitten skin will be waxy and firm while still frozen and may redden, swell, or blister when thawed. Should any of these symptoms be observed, wrap the area in soft cloth, do not rub the affected area, and seek medical assistance. Call 911 if the condition is severe.

Protective Clothing

Wearing the right clothing is the most important way to avoid cold stress. The type of fabric also makes a difference. Cotton loses its insulation value when it becomes wet. Wool, on the other hand, retains its insulation even when wet. The following are recommendations for working in cold environments:

- Wear at least three layers of clothing.
 - An outer layer to break the wind and allow some ventilation (like Gore-Tex or nylon)
 - A middle layer of down or wool to absorb sweat and provide insulation even when wet
 - An inner layer of cotton or synthetic weave to allow ventilation

- Wear a hat—up to 40 percent of body heat can be lost when the head is left exposed.
- Wear insulated boots or other footwear.
- Keep a change of dry clothing available in case work clothes become wet.
- Do not wear tight clothing—loose clothing allows better ventilation.

Work Practices

- Drinking—Drink plenty of liquids, avoiding caffeine and alcohol. It is easy to become dehydrated in cold weather.
- Work Schedule—If possible, heavy work should be scheduled during the warmer parts of the day. Take breaks out of the cold in heated vehicles.
- Buddy System—Work in pairs to keep an eye on each other and watch for signs of cold stress.

5.3.2 Heat Stress

To avoid heat-related illness, current regulations in WAC 296-62-095 through 296-62-09570 will be followed during all outdoor work activities. These regulations apply to any outdoor work environment from May 1 through September 30 when workers are exposed to temperatures greater than 89 °F when wearing breathable clothing, greater than 77 °F when wearing double-layered woven clothing (such as jackets or coveralls), or greater than 52 °F when wearing non-breathing clothing such as chemical-resistant suits or Tyvek. Floyd|Snider will identify and evaluate temperature, humidity, and other environmental factors associated with heat-related illness including, but not limited to, the provision of rest breaks that are adjusted for environmental factors and encourage frequent consumption of drinking water. Drinking water will be provided and made readily accessible in sufficient quantity to provide at least 1 quart per employee per hour. All Floyd|Snider personnel performing outdoor work will be informed and trained for responding to signs or symptoms of possible heat-related illness and accessing medical aid.

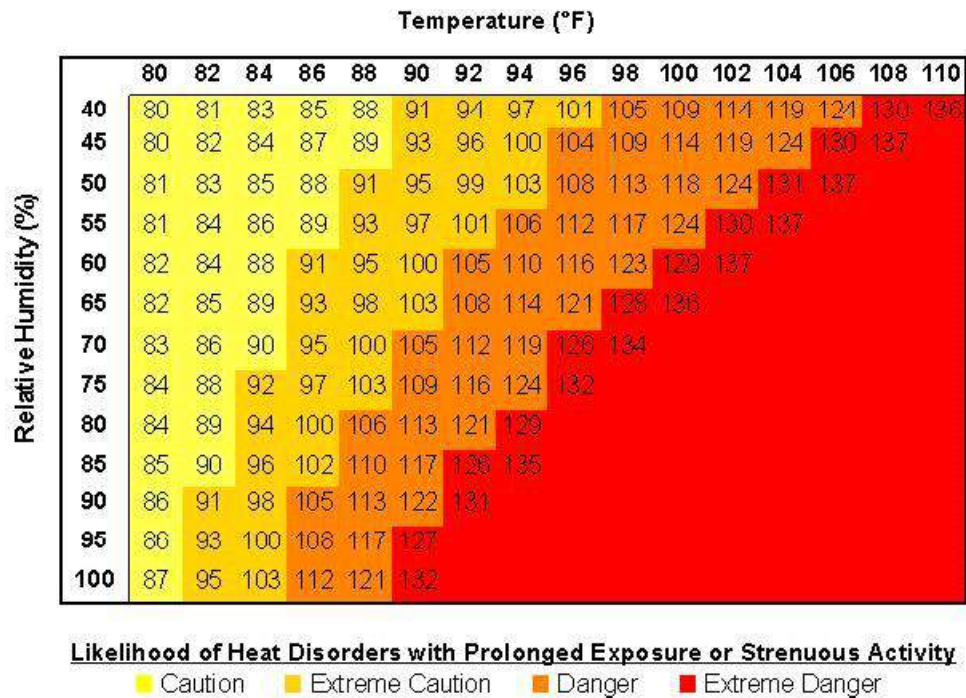
Employees showing signs or demonstrating symptoms of heat-related illness must be relieved from duty and provided with a sufficient means to reduce body temperature, including rest areas or temperature-controlled environments (i.e., air conditioned vehicle). Any employee showing signs or demonstrating symptoms of heat-related illness must be carefully evaluated to determine whether it is appropriate to return to work or whether medical attention is necessary.

Any incidence of heat-related illness must be immediately reported to the employer directly through the HSO/SS.

The signs, symptoms, and treatment of heat stress include the following:

Condition	Signs/Symptoms	Treatment
Heat cramps	Painful muscle spasms and heavy sweating	Increase water intake, rest in shade/cool environment.
Heat syncope	Brief fainting and blurred vision	Increase water intake, rest in shade/cool environment.
Dehydration	Fatigue, reduced movement, headaches	Increase water intake, rest in shade/cool environment.
Heat exhaustion	Pale and/or clammy skin, possible fainting, weakness, fatigue, nausea, dizziness, heaving sweating, blurred vision, body temperature slightly elevated	Lie down in cool environment, water intake, loosen clothing, and call 911 for ambulance transport if symptoms continue once in cool environment.
Heat stroke	Cessation of sweating, skin hot and dry, red or flushed face, high body temp, unconsciousness, collapse, convulsions, confusion or erratic behavior; life-threatening condition	Medical Emergency!! Call 911 for ambulance transport. Move victim to shade and immerse in water.

If site temperatures are forecast to exceed 85 °F and physically demanding site work will occur in impermeable clothing, the HSO/SS will promptly consult with a certified industrial hygienist and a radial pulse monitoring method will be implemented to ensure that heat stress is properly managed among the affected workers. The following heat index chart indicates the relative risk of heat stress.



5.3.3 Allergies and Biohazards

Allergens capable of triggering a severe reaction may be present in the office environment or the job site. Outdoor work presents additional biohazards such as bees and other insects and wildlife.

Staff with severe allergies should make these allergies known to Floyd|Snider and maintain appropriate preventative medications (EpiPen, Benadryl, etc.) as directed by their physician in a location that can be easily accessed in case of emergency. The locations of these medications should be shared with the Floor Wardens, along with instructions for delivery if needed.

In the field, persons with allergies to bees or other insects will make the HSO/SS aware of their allergies and will avoid areas where bees/insects are identified. Controls such as repellents, hoods, nettings, masks, or other personal protection may be used. Report any insect bites or stings to the HSO/SS and seek first aid, if necessary. Especially when working during the summer months, staff should monitor the work area for evidence of insect nests of stinging insects. A nest may be nearby if multiple flying insects are observed in the area, or if flying insects appear to be entering and leaving the same locations. Nests may be buried underground, located in vegetated areas, or in structures such as well monuments, vaults, and buildings.

Inspect the work area for hazardous plants, medical waste (syringes and similar items), and indications of hazardous organisms, and avoid such areas if possible. On job sites, personnel will maintain a safe distance from any urban wildlife encountered, including stray dogs, raccoons, and rodents, to preclude a bite from a sick or injured animal.

A severe allergic reaction, or anaphylaxis, is a rapid immune response that may be fatal if untreated. Persons experiencing anaphylaxis require medical care beyond preventative medication or first aid. The signs of anaphylaxis may include the following:

- Extensive skin rashes, itching, or hives
- Swelling of the lips, tongue, or throat
- Shortness of breath, trouble breathing, or wheezing
- Dizziness and/or fainting
- Stomach pain, bloating, vomiting, or diarrhea
- Uterine cramps
- Feelings of panic or dread

In some cases of bee or wasp stings it may be imperative that sufficient time has elapsed to confirm that a serious reaction will not occur. Sufficient time varies per person, location of the sting, and if multiple stings are involved. Stings to highly vascularized areas such as the face or neck can cause quicker absorption and reactions than stings to extremities. Most life-threatening reactions occur within minutes to an hour, but delayed reactions are possible. A person who has multiple stings might also need emergency care. In this case, it is not an allergic reaction but the quantity of venom injected all at once could cause nausea, dizziness, faintness, and seizures

(Gould n.d.). A CPR/first aid-certified staff member is responsible for monitoring the injured staff member for at least 1 hour if emergency services are not called. Medical care is mandatory if any of the above symptoms of anaphylaxis, dizziness, fainting, or seizures are present. A similar process should be followed for encounters with poison ivy or poison oak and other severe allergens.

5.3.4 Fatigue

Worker fatigue can impair judgment and increase the risk of injuries on the job site. Fatigue may be caused by physical exertion from difficult tasks, extended working hours, and environmental challenges, including exposure and extreme weather. Fatigue can be caused by working extended hours for a duration of 1 week or more (including overtime work, consecutive long shifts, and extended work weeks) or by extremely physically and mentally demanding work of any duration. Tasks should be assessed individually for risk of fatigue. Variable weather conditions (high and low temperatures, sustained strong winds) can place additional physical and mental strain on field personnel.

5.3.4.1 Fatigue Symptoms and Self-Monitoring

Signs and symptoms of fatigue may present similarly to inebriation and can include:

- Reduced fine motor skills and coordination (e.g., tripping or dropping items)
- Impaired concentration
- Poor communication
- Poor judgment
- Mood swings or irritation

The above are typical symptoms of fatigue, but individuals can also experience or present fatigue in other ways that may be less obvious to an observer. The HSO/SS should additionally check in with staff members to ensure they are not experiencing any symptoms of fatigue that may impair their judgment or coordination in the field.

5.3.4.2 Managing Fatigue

Fatigue should be managed by limiting working hours and implementing rest days. Signs and symptoms of fatigue and fatigue management should be discussed, when applicable, at the daily tailgate and debrief meetings.

Potential actions to minimize fatigue include the following:

- Plan to get 7 to 9 hours of sleep each night
- Take a lunch break inside, or out of the weather
- Take snack and hydration breaks throughout the day
- Take a late start, half-day, or rest day during the field event

5.3.4.3 Fatigue Response Actions

In job situations where fatigue is likely, the HSO/SS should monitor employee fatigue using the following guide.

If the answer is yes to any of the following questions, the HSO/SS should consider implementing a shortened work day, light duty, or a day off for the affected employee.

- Do environmental factors pose an additional fatigue load (e.g., exposure to extreme hot/cold weather or wind)?
- Has the team member exhibited signs of fatigue?
- Has the team member worked on a physically intense task?
- Has the team member worked through the day without taking regular breaks to eat, stay hydrated, and rest?
- Has the team member had less than 6 hours of sleep in the past 24 hours?
- Did the team member work more than 12.5 hours in the past day?

If the answer is yes to either of the following questions, the HSO/SS will implement a day off for the affected employee.

- Did the team member work more than 75 to 80 hours in the past week?
- By the end of the shift, has the team member been awake for more than 17 hours?

Employees should also self-monitor for signs of fatigue and immediately report to the HSO/SS if fatigue becomes a concern.

If fatigue becomes a team-wide safety issue on the job site, the HSO/SS should coordinate with the PM to determine the actions that will be taken at the project level to manage fatigue. Actions may include adding team members, changing work practices, and/or adjusting the work schedule.

6.0 Job Site Controls

This section describes the best practices to be implemented on a field job site to protect personnel and the environment. These best practices are considered the minimum controls for any job site, and additional site-specific protocols should be detailed in the site-specific HASP.

- All site work should be completed in teams when possible. Teams should establish a primary means of communication on-site and with off-site contacts (generally via cell phones or radios on-site). An agreed-upon system of alerting via air horns and/or vehicle horns may be used around heavy equipment to signal an emergency if shouting is ineffective.
- Work area perimeter controls should be established to ensure that members of the public do not enter the work area and limit the potential for chemical exposure associated with site activities when hazardous materials may be present. These work areas include a support zone, a contaminant reduction zone (decontamination area), and an exclusion zone.
- Staff will take precautions to prevent contamination:
 - Inspect all PPE prior to entering the exclusion zone.
 - Avoid walking through puddles or areas of known or obvious surface soil contamination.
 - Do not carry unnecessary items into the exclusion zone.
 - Take care to limit contact with heavy equipment and vehicles.
 - Protect the ground surface when processing samples and wipe down or sweep surfaces frequently to minimize the amount of potential contaminated material that may be spread during site work.
- Staff will decontaminate all equipment and gear as necessary during field events. Decontamination procedures will be strictly followed to prevent off-site spread of contaminated materials. Decontamination procedures should be detailed in the site-specific HASP but at a minimum will include cleaning equipment to a visually debris-free surface. The HSO/SS will assess the effectiveness of decontamination procedures by visual inspection.
- Hands must be thoroughly washed before leaving the Site to eat, drink, or use tobacco or cosmetics.
- Visual monitoring for fugitive dust and soil track-out by vehicles leaving the job site should be conducted by the HSO/SS or a dedicated member of the field staff. If visible dust leaving the work area or track-out are observed, immediate action should be taken to correct the issue.
- The HSO/SS will ensure the proper collection, packaging, and identification of waste materials so that waste materials will be properly disposed of.

7.0 Training Requirements

All Floyd|Snider field personnel must comply with applicable regulations specified in WAC Chapter 296-843, Hazardous Waste Operations, and WISHA (WAC Chapter 296-800). WISHA states that personnel who may come into contact with hazardous materials must have current HAZWOPER certification and participate in an employer-sponsored medical monitoring program. Therefore, these sections apply to any employee at Floyd|Snider who performs work where they have the potential to come in to contact with hazardous or dangerous substances. Additionally, when doing site work, at least one person on-site must be trained in CPR/first aid. In order to maintain compliance with the regulation, **employees whose medical clearance or HAZWOPER certification are expired may not conduct field work unless their medical examination or refresher course is scheduled to occur within 30 days of their previous certification expiration date.**

7.1 MEDICAL MONITORING

In accordance with state medical surveillance regulations, field staff employees must participate in the medical monitoring program, which benefits both the employees and Floyd|Snider by evaluating the overall health of each individual in connection with the work to be performed, as well as monitoring workplace health and safety initiatives. Employees who will be working on-site are required to participate in a baseline examination and biennial examinations, as well as completion of an exit exam should an employee no longer conduct on-site work requiring medical monitoring.

The purpose of the Floyd|Snider examination program is to:

- Provide a baseline of health information for an employee, which can be used for comparison in related future examinations;
- Detect any adverse health effect that might be a result of workplace exposures;
- Detect any underlying medical condition that may place an employee at higher risk for medical problems related to workplace activities; and
- Ensure that an employee is able to function safely while performing their essential job functions at Floyd|Snider.

When an employee is no longer participating in fieldwork and wishes to unenroll from the Floyd|Snider medical monitoring program, the employee should contact the Health and Safety Administrator for approval and to begin the medical monitoring program exit process described in Section 7.5.

7.2 HAZWOPER TRAINING

HAZWOPER training and certification are required for all staff on-site at sites regulated by the Model Toxics Control Act (MTCA) or the USEPA more than 30 days per year. This training typically includes an initial 40-hour HAZWOPER certification and annual 8-hour refresher courses. Field

staff who have the potential to contact contaminated materials must have 40-hour HAZWOPER certification and attend annual 8-hour refresher courses. HAZWOPER certification may also be necessary on a project-specific basis for PMs who are not active in the field safety training and medical monitoring program. Field staff who do not have the potential to contact contaminated material, and are not in a supervisory field role, may require fewer hours of HAZWOPER training, to be determined on a case-by-case basis. These employees will also be required to attend annual 8-hour refresher courses.

7.3 JOB-SPECIFIC TRAINING

In addition to the 40-hour classroom training required by HAZWOPER, all field staff must complete 24 hours of job-specific training. This training is conducted on-site in the field under direct supervision of a skilled supervisor who is another Floyd|Snider employee. These training hours can occur on one or multiple field events and can cover an array of standard field activities. Once the 24-hours of training is complete, job-specific training forms (available on Floyd|Snider's Health and Safety department page on SharePoint) must be completed and signed by the trainer and submitted to the Health and Safety Administrator.

Additional site-specific training should be conducted to cover on-site hazards; PPE requirements, use, and limitations; decontamination procedures; and emergency response information as outlined in the HASP for the site.

7.4 CPR/FIRST AID

When conducting field work, at least one person on-site must be trained in CPR/first aid, with a current certification. All employees who are on-site at MTCA- or USEPA-regulated sites more than 30 days per year are required to have current CPR/first aid certification. This training is also provided by the company to any interested employees, including those who do not do field work.

7.5 EXITING THE FIELD STAFF SAFETY TRAINING AND MEDICAL MONITORING PROGRAM

This section presents the protocols to be followed in the event that an employee must exit the field staff safety training and medical monitoring program due to termination of their employment or transition to a different role at Floyd|Snider.

7.5.1 Termination of Employment

Washington's medical surveillance regulations require Floyd|Snider to schedule an exit exam for an employee upon termination of employment. Upon termination, employees will be notified of the appointment date and time and will be given information to reschedule the appointment if needed. The exit exam will be provided at Floyd|Snider's sole expense, and it is strongly recommended, in the best interest of your health, that you attend the appointment. Floyd|Snider reserves the right to withhold payment of any severance package offered until confirmation of the exam is received.

7.5.2 Transition of Role

Floyd|Snider is a company of versatile employees with technical expertise who collaborate effectively to meet client and project needs; because of this collaborative approach, we do not employ full-time field technicians who exclusively fill a sampling role. Therefore, to ensure that client needs are met even during our busiest times and spread workload equitably across the firm, it is essential that all staff involved in field data collection, including in a supervisory capacity, maintain current field safety certification and medical clearance.

However, under certain limited circumstances, an employee may transition roles at the company such that field certifications are no longer needed. An employee who wishes to exit the field staff safety training and medical monitoring program must:

- Document that employee has performed fewer than 30 partial or full days of field work for each of the past 2 calendar years; and
- Obtain approval from the Management Committee, by coordinating with the Health and Safety Administrator.

If an employee's exit from the program is approved, the employee is required by WISHA to complete a medical monitoring exit exam. Failure to complete an exit exam may result in withholding any bonus pay and a delay in annual pay increases.

A letter to document the date and reason for an employee's rationale for terminating participation in the field staff safety training and medical monitoring program, signed by the employee and a Principal, must be maintained in the employee's personnel file.

8.0 Record Keeping and Reporting

Prompt and accurate recording and reporting is essential for continuing to improve the Floyd|Snider Health and Safety Program and comply with the safety regulations.

8.1 RECORD KEEPING

Records should be kept of all employee training, safety meetings including Health and Safety Committee meetings, daily tailgate safety meetings conducted in the field, and good catches and incidents. Forms for on-the-job employee training, daily tailgate safety meetings, and good catches and incidents are available on the company's Health and Safety department page on SharePoint and Survey123.

The minutes of Health and Safety Committee meetings are recorded by the Health and Safety Administrator and maintained on Floyd|Snider's Health and Safety department page on SharePoint.

The HSO/SS, or a designated alternate, will be responsible for conducting daily tailgate safety meetings and recording the meeting on a Daily Tailgate Safety Meeting Form. The form, which must be appended to all HASPs, lists the hazards discussed and is signed by all personnel present at the meeting. The HSO/SS will manage the administration of job-specific training. Job-specific training forms must be completed and signed by the trainer.

Daily tailgate safety meeting and job-specific training forms must be reviewed with the PM after completion of the field event. After PM review, scans of the forms should be saved to the appropriate project folder, and the original copies of the forms will be submitted to the Health and Safety Administrator. The PM and the Health and Safety Administrator will determine whether any issues identified on tailgate safety meeting forms require further review or follow-up actions.

8.2 REPORTING

Good catches and incidents should be recorded on the Good Catch and Incident Reporting Form. Good catches can also be recorded on the Daily Tailgate Safety Meeting Form. The Good Catch and Incident Reporting Form gathers information regarding the circumstances of the good catch or incident, consequences, and corrective actions implemented. Good Catch and Incident Reporting Forms may be filled out by any Floyd|Snider staff. If a good catch or incident occurs in the field, the form must be reviewed and signed by the HSO/SS and the PM. This form must be appended to all site-specific HASPs. Good Catch and Incident Reporting Forms will be reviewed by the HSO.

Good Catch and Incident Reporting Forms and Daily Tailgate Safety Meeting Forms will be maintained by the Health and Safety Administrator and made accessible to all staff for review after information that may identify specific individuals is redacted. In the event that an injury occurs in the workplace, the Health and Safety Administrator will coordinate with the PM or Management Committee to determine whether the injury is OSHA-reportable and implement follow-up reporting.

9.0 References

- Gould Soloway, R. A. (n.d.). "Bee Stings: Is it an allergic reaction?" Poison Control. <https://www.poison.org/articles/bee-stings-is-it-an-allergic-reaction>
- U.S. Centers for Disease Control and Prevention. 2024. "How Wildfire Smoke Affects Your Body." Last accessed 30 May 2025. <https://www.cdc.gov/wildfires/risk-factors/index.html>
- U.S. Environmental Protection Agency (USEPA). 2025. "Health and Environmental Effects of Particulate Matter (PM)." Last accessed 30 May 2025. <https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm>

10.0 Signature Page

I have read this Accident Prevention Plan and understand its contents. I agree to abide by its provisions and will immediately notify the Health and Safety Administrator or Board of Directors if conditions or hazards not specifically designated herein are encountered.

[illegible]

Phase 1 Remedial Investigation Work Plan

Cosmo Specialty Fibers Site

Appendix D

Attachment D.2 Daily Tailgate Safety Meeting Form

DAILY TAILGATE SAFETY MEETING FORM

Instructions: To be completed by the Field Lead or Site Safety Officer (SSO) prior to beginning of work each day, when changes in work procedures occur, or when additional hazards are present. Review with your Project Manager (PM) at the conclusion of your event and file with your field notes.

PROJECT NAME AND SCOPE OF WORK:**SITE ADDRESS FOR EMERGENCY RESPONDERS:**

Date:	

EMERGENCY RESPONSE:

Muster Point:
Emergency Contacts & Resources:
Allergies/ Medical Alerts:

GENERAL TOPICS/HAZARDS: (Discuss all)

☐ Emergency Response Information ☐ HASP Review and Location ☐ Safety Equipment Location: AED, First Aid Kit & Fire Extinguisher ☐ Chemicals of Concern & SDS locations	☐ Weather/Heat or Cold Stress ☐ Required PPE: Overview and Verification ☐ Slip, Trip, Fall Hazards ☐ Buddy System and Communication ☐ Vehicle Safety, Road Conditions
---	--

DETAILS OF DISCUSSION**GOOD CATCHES/SAFETY CONSIDERATIONS FROM THE PREVIOUS DAY****SITE-SPECIFIC CONSIDERATIONS:** (Discuss as applicable)

☐ Lessons Learned ☐ Fatigue ☐ Site Access & Security ☐ Establishing Work Zones ☐ Urban Environment	☐ Construction ☐ Heavy Equipment ☐ Overhead Hazards ☐ Excavation/Trenching ☐ Flammables/Sparks ☐ Tool Usage	☐ Forested/Brush Environment ☐ Insects/Animals ☐ Water Hazards & Vessel Safety ☐ Decontamination ☐ Mob/Demob ☐ Other (Describe)
---	--	--

DETAILS OF DISCUSSION**ATTENDEE NAME/AFFILIATION/SIGNATURE:**

SSO/Field Lead Signature & Date: _____

Phase 1 Remedial Investigation Work Plan

Cosmo Specialty Fibers Site

Appendix D

Attachment D.3 Good Catch and Incident Reporting Form

GOOD CATCH AND INCIDENT REPORTING FORM

Date & Time:	Project:
Incident Type: ☐ Good Catch ☐ Incident	Site/Location:
Check all that apply: ☐ Injury/illness ☐ Vehicle/Equipment ☐ Workplace Violence ☐ Evacuation/Emergency ☐ Other Stop Work Hazard (describe:_____)	

Employee(s) Involved (include witnesses, teaming partners, and subcontractors):

Description of Incident (include precise location, injuries, the task performed, equipment/materials involved, 3rd party involvement, structure, or property damage):

Describe Any First Aid or Medical Treatment:

What Was the Root Cause of the Incident Based on the 5 Whys Approach?

What were the Contributing Factors or Conditions during the incident? (weather, fatigue, low visibility, lighting, etc.):

What actions can be taken to prevent the incident from reoccurring? (Include any preliminary actions taken):

Preparer Signature:_____ **Date:**_____

SSO or Field Lead Signature:_____ **Date:**_____

Instructions:

- A Good Catch is a potential hazard or incident in which no property was damaged, and no personal injury was sustained, but where, given a slight shift in time or position, damage or injury could have easily occurred. An incident is when injuries or damage do occur and can range in severity.
- If there are multiple employees involved in an incident or good catch, select one to be the primary reporter.
- Complete the form as soon as practical after the incident with any witnesses or involved employees. A witness may complete the form on behalf of an injured employee if they cannot complete the form themselves.
- Fill out the forms completely. If a section does not apply mark the section as “N/A”.

Field Good Catch/Incident

1. All good catches/incidents in the field shall be reported to the Site Safety Officer or Field Lead.
 - A. Serious field incidents (Injury, equipment damage, stop work etc.) are to be reported to the Project Manager (PM) as soon as it is safe to do so.
2. Complete the Good Catch and Incident Reporting Form with the SSO/Field lead as soon as practical after the good catch/incident.
 - A. The SSO/Field Lead will ensure any required reporting is made to the Client on the site.
3. Review the completed form with the PM at the end of the field work for the day.
4. Submit the final form to the Safety Program Manager after the PM review.

For incidents that result in injury, the SSO or PM will complete the Injury Reporting Follow-up Form within 24 hours and submit it to the Safety Program Manager.

Non-Field Good Catch/Incidents

1. Report the Good Catch or Incident to the Safety Program Manager or a Safety Committee Member.
2. Complete the Good Catch and Incident Reporting Form as soon as practical after the incident with any witnesses or involved employees.
3. Review the completed form with the Safety Program Manager or a Safety Committee Member.
4. For incidents that result in injury, the Safety Committee Member or Safety Program Manager will complete the Injury Reporting Follow-up Form within 24 hours.
5. Final versions of all forms should be submitted to the Safety Program Manager.

Follow-Up from an Incident

- For all good catches/incidents additional information (i.e., corrective action or medical updates) should be reported to the Safety Program Manager within 1 week.
- Notification of the event to the firm will be shared in a timely manner in the format most appropriate for the severity/complexity of the incident.
- Corrective action completion will be tracked and verified by the Safety Program Manager as applicable.
- Additional notifications to 3rd parties (agencies, teaming partners, or clients) may be required by the PM or Principal-in-charge as appropriate.
- For vehicle incidents, notify Tiffany of the accident as insurance reporting may be required.
- Notify the Field Equipment Manager of any damage to equipment or vehicles.

INJURY REPORTING FOLLOW-UP FORM

Instructions for the Site Safety Officer or Project Manager:

- Complete this form following an incident with an injury within 24 hours of the incident.
- Submit this form with a copy of the completed Good Catch and Incident Reporting Form to the Safety Program Manager with copies to the Principal-in-Charge for the project if applicable.¹
- Any additional information (i.e., corrective action or medical updates) should be reported to the Safety Program Manager within 1 week of the incident.

Was This an OSHA-Recordable Injury/Illness? Why?

☐ Yes	☐ Loss of consciousness ☐ Days away from work ☐ Restricted work/Job transfer ☐ Medical Treatment Beyond First Aid ¹ ☐ Other _____
☐ No	☐ First Aid treatment only ☐ Recordkeeping exemption ☐ No treatment ☐ Other _____

Describe Any Follow-Up First Aid or Medical Treatment:

Did the Injury/Illness involve Inpatient Hospitalization, Amputation or Loss of an Eye?

☐ No ☐ Yes – Contact the Principal-in-Charge

What Was the Root Cause of the Incident Based on the 5 Why's Approach?

Follow-Up Actions Taken (include owners & dates):

SSO or Field Lead's Signature: _____ **Date:** _____

Project Manager Signature: _____ **Date:** _____

¹ First Aid is defined as: using non-prescription medication at non-prescription strength, cleaning wounds on the skin surface, applying wound coverings (not sutures/staples), removing foreign bodies from the eye using irrigation or a swab, removing foreign bodies from elsewhere (not the eye) using tweezers, hot/cold therapy, drinking fluids to relieve heat stress, using finger guards or eye patches, using non-rigid means of support (such as bandages), using temporary immobilizing devices while transporting an injured person, administering tetanus immunizations. Guidelines for determining what incidents are OSHA Recordable are available here: <https://www.osha.gov/recordkeeping/>. The principal in charge is to be notified of any Recordable Incidents.

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Appendix E Inadvertent Discovery Plan



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: Kara Hitchko
Organization: Floyd|Snider
Phone: (206) 292-2078
Email: kara.hitchko@floydsnider.com

Alternate Contact

Name: Jessi Massingale
Organization: Floyd|Snider
Phone: (206) 292-2078
Email: jessi.massingale@floydsnider.com

Ecology Contacts (completed by Ecology Project Manager)

Ecology Project Manager

Name: Ha Tran, Environmental Engineer
Program: Toxics Cleanup
Phone: (360) 790-6276
Email: ha.tran@ecy.wa.gov

Alternate or Cultural Resource Contact

Name: Jon Klem, Archaeologist
Program: Toxics Cleanup
Phone: (564) 250-6671
Email: jonk461@ecy.wa.gov

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:	Squaxin Island Tribe	Tribe:	Quinault Indian Nation
Name:	Shaun Dinubilo, Archaeologist	Name:	Justin James, Cultural Resources
Title:	Tribal Archaeologist	Title:	Tribal Archaeologist
Phone:	(360) 432-3998	Phone:	(360) 276-8215 Ext: 7330
Email:	sdinubilo@squaxin.us	Email:	jjames@quinault.org
Tribe:	The Confederated Tribes of the Chehalis Reservation	Tribe:	
Name:	Brinn Marri, THPO	Name:	
Title:	Tribal Historic Preservation Officer	Title:	
Phone:	(360) 273-5911	Phone:	
Email:	bmarri@chehalis tribe.org	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)

[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>)

[WSDOT Tribal Contact Website](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.

Historic-period cultural resources have been documented on the Cosmopolis mill site, beginning with the former mill (DAH P 2026). Historic building evaluations conducted at the mill location identified standing and previously standing industrial features associated with historic lumber processing activities. These evaluations determined that the property contains historic-period structural remains and associated deposits that reflect the areas industrial development and maritime activities. The mill site represents a documented historic resource area with the potential to contain additional subsurface features or artifacts related to mill operations. The mill site is located within an area of high probability for encountering cultural resources. In addition to the former mill site, the Westport Ponds area is located adjacent to the Newskah Creek Fish Trap Complex, an extensive archaeological site consisting of intertidal wood stake alignments interpreted as tribal fishing weirs and trap features, as well as late 19th century commercial fish trap pilings (WISAARD 2026). Radiocarbon dating demonstrates multiple episodes of use spanning at least the last 1,000 years, and the site has been determined eligible for listing in the National Register of Historic Places. The Westport Ponds Area is situated adjacent to this complex and within an area identified as having a high probability for encountering both pre-contact and historic-period cultural resources. It is possible that previously unidentified archaeological materials may be encountered during ground-disturbing activities.

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 (45K11200).*

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!